Cisco MetroPlanner DWDM Operations Guide

Software Release 2.5
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About this Guide

This section explains the objectives, intended audience, and organization of this publication and describes the conventions that convey instructions and other information.

This section provides the following information:

Document Objectives

This user guide explains how to design networks using the MetroPlanner design tool for the Cisco ONS 15454 system. It contains information about how to design an optical network, the types of available topologies, and some example designs. Use this user guide in conjunction with the appropriate publications listed in the Related Documentation section.

Audience

This publication is intended for experienced network system engineers who are responsible for planning and ordering equipment for Cisco optical networking systems.

Document Organization

This Cisco MetroPlanner DWDM Operations Guide, Release 2.5 is organized into the following chapters:

- Chapter 1, "Overview" provides a list of features, an overview of the network design process, a description of the internal architecture, and the MetroPlanner procedural flow.
- Chapter 2, "Designing Networks with MetroPlanner" provides instructions for using the MetroPlanner tool to create a network design, and information about how to adjust and optimize design components, and how to generate build reports and bills of materials.
- Chapter 3, "Modeled Network Examples" provides examples of typical optical networks you can model using MetroPlanner.
- Appendix A, "Card Types" provides a listing of card types and the corresponding CCO card description.
- Appendix B, "Troubleshooting" describes problems you may encounter using MetroPlanner, and their possible solutions.

Related Documentation

Use this Cisco MetroPlanner DWDM Operations Guide, Release 2.5 in conjunction with the following referenced publications:

- *Cisco ONS 15454 Procedure Guide, R4.7*—Provides procedures to install, turn up, provision, and maintain a Cisco ONS 15454 node and network.
- *Cisco ONS 15454 Reference Manual, R4.7*—Provides reference material for Cisco ONS 15454 nodes and networks.
- *Cisco ONS 15454 Troubleshooting Guide, R4.7*—Provides general troubleshooting procedures, alarm descriptions, and performance monitoring and SNMP information.
- *Cisco ONS 15454 and Cisco ONS 15327 TL1 Command Guide, Release 4.7*—Provides test access TL1 commands, configurations, and parameter types.
- *Release Notes for the Cisco ONS 15454, R4.7*—Provides caveats, closed issues, and new feature and functionality information.

Document Conventions

This publication uses the following conventions:

Convention	Application
boldface	Commands and keywords in body text.
italic	Command input that is supplied by the user.
[ ]	Keywords or arguments that appear within square brackets are optional.

Convention	Application
{ x | x | x }	A choice of keywords (represented by x) appears in braces separated by vertical bars. The user must select one.
Ctrl	The control key. For example, where Ctrl + D is written, hold down the Control key while pressing the D key.
`screen font`	Examples of information displayed on the screen.
`boldface screen font`	Examples of information that the user must enter.
< >	Command parameters that must be replaced by module-specific codes.

Note Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the document.

Caution Means *reader be careful*. In this situation, the user might do something that could result in equipment damage or loss of data.

Warning **IMPORTANT SAFETY INSTRUCTIONS**

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the translated safety warnings that accompanied this device.

Note: SAVE THESE INSTRUCTIONS

Note: This documentation is to be used in conjunction with the specific product installation guide that shipped with the product. Please refer to the Installation Guide, Configuration Guide, or other enclosed additional documentation for further details.

Where to Find Safety and Warning Information

For safety and warning information, refer to the *Cisco Optical Transport Products Safety and Compliance Information* document that accompanied the product. This publication describes the international agency compliance and safety information for the Cisco ONS 15454 systems. It also includes translations of the safety warnings that appear in the ONS 15454 system documentation.

Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

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You can access the most current Cisco documentation at this URL:

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- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 1 800 553-NETS (6387).

Cisco Optical Networking Product Documentation CD-ROM

Optical networking-related documentation, including Cisco ONS 15454 product documentation, is available in a CD-ROM package that ships with your product. The Optical Networking Product Documentation CD-ROM is updated periodically and may be more current than printed documentation.

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Cisco Technical Support Website

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http://www.cisco.com/techsupport

Access to all tools on the Cisco Technical Support Website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

http://tools.cisco.com/RPF/register/register.do

Note Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support Website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco TAC engineer. The TAC Service Request Tool is located at this URL:

http://www.cisco.com/techsupport/servicerequest

For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco TAC engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
EMEA: +32 2 704 55 55
USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

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Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—Your network is "down," or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

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- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

  http://www.cisco.com/ipj

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Overview

Cisco MetroPlanner 2.5 provides a means to construct and test wavelength division multiplexing (WDM) optical networks in a modelled graphical environment. Well-designed optical networks can take advantage of the availability of dark fiber to build a common infrastructure that supports data, storage area network (SAN), and time-division multiplexing (TDM) traffic.

The primary purpose of MetroPlanner is to assist sales engineers (SEs) in the design and validation of optical networking deployment using Cisco Optical Networking System (ONS) 15454 Multi-Service Transport Platforms (MSTP). MetroPlanner generates a shelf view of all the sites deployed in the optical network and provides a complete bill of materials (BOM) for the network.

This chapter describes how you use MetroPlanner to design, analyze, and optimize new or existing Cisco optical networks.

This chapter contains the following sections:

1.1 MetroPlanner Features

MetroPlanner 2.5 provides a simple tool set for designing optical networks with Cisco ONS 15454 MSTP products. By entering specific configurations, or only the barest essentials of site distances, you can make the correct choices for the type of network you wish to build. Several solutions can correspond to one type of equipment or platform. The MetroPlanner 2.5 graphical user interface (GUI) models general specifications and produces detailed BOMs to provision optimized networks.

Designing optical networks requires the verification of multiple constraints such as optical budget limitations and platform architectural constraints. Both simple and complex optical network designs are automatically modelled and tested by MetroPlanner 2.5.

1.2 Network Design Process

The MetroPlanner 2.5 GUI allows SEs to design and document network designs and validate optical networking implementations on the Cisco ONS 15454 MSTP platform. Using MetroPlanner 2.5, you can perform the following tasks:

- Create network topologies
- Define network requirements (service demands, protection)
- Validate the network constraints (optical budget, receiver overload)
- Create corresponding BOMs and build reports

Using the MetroPlanner-generated BOM, you can place the order directly on Cisco.com.

The MetroPlanner 2.5 GUI allows the SE to do the following:

- Create a node at a site
- Interconnect sites with fiber spans
- Specify the requested service demands between nodes
- Define the type of protection scheme

1.2.1 Network Design Optimization

The total network cost is the cost of the equipment for all of the sites in the designed network. MetroPlanner 2.5 searches for the best solution to a designed network using an optimization algorithm.

1.2.2 Network Design Constraints

A network design must meet the optical budget and receiver overload criteria to operate efficiently. The analysis of optical budget and receiver overload evaluates the strength of the signal traversing the ring. If a design solution satisfies the constraints, it is a valid design. The MetroPlanner 2.5 optimization algorithms generate multiple solutions and verify the constraints against those solutions. If the constraints are satisfied, the solution with the lowest cost-to-utilization ratio is selected as the optimal solution.

If the network design solution fails to satisfy all the constraints, MetroPlanner 2.5 makes adjustments to parameters such as signal attenuation and amplification. Amplification is achieved either by using an erbium-doped fiber amplifier (EDFA). Attenuation is achieved by using variable optical attenuator (VOA) modules integrated into the platform. MetroPlanner 2.5 corrects the optical budget using an algorithm that includes automatic placement of EDFAs and VOA regulation.

For each internodal demand, MetroPlanner 2.5 performs an optical budget and receiver overload analysis and the displays the results in form of various reports in the GUI. If the network design algorithms are not able to provide a solution, then the user can modify the input data (for example, by relaxing some user constraints) and run the analysis again.

1.3 Internal Architecture

To generate a network design, the SE enters the following parameters:

- The number of network sites

- The type of equipment used at each site
- The distance separating the sites
- The type of fiber connecting the sites
- Service demands, including the service type, the protection type, and the number of channels between nodes

Once the network parameters have been entered, the MetroPlanner finds the best routing, defines the required add/drop filters, and places optical amplifiers and dispersion compensation units (DCUs) to fit the user traffic demands at the minimum cost. Optimization is performed to meet the boundary conditions. The optimization includes attenuation and amplification.

Finally, MetroPlanner 2.5 generates the BOM, which includes the product code, the quantity, and pricing information. In addition, it creates other reports, such as a shelf-level view of the configuration, which can be printed. This helps the SE understand how the shelf is built and helps to avoid confusion and errors during the actual deployment. Within the BOM is the total network cost, which allows a quick comparison of various design options.

1.3.1 Platform Support

MetroPlanner Release 2.5 supports the Cisco ONS 15454 DWDM optical platform.

1.3.2 Topology Support

MetroPlanner 2.5 supports the following network topologies:

- Bus (single span, point-to-point, and linear)
- Open (or hubbed) ring
- Closed (or meshed) ring
- Any to Any ring

1.3.3 Protection Scheme Support

MetroPlanner 2.5 designs support the following protection schemes:

- Client-based 1+1 protection
- Fiber switched protection
- Y-cable protection
- Unprotected

1.3.4 Service Support

MetroPlanner 2.5 can support any subset of the following services:

- 2R Any Rate
- Gigabit Ethernet
- 10GE—10 Gigabit Ethernet

- ESCON—Enterprise System Connection
- Fibre Channel
- Fibre Channel 2G
- Fibre Channel 10G
- STM-1
- STM-4
- STM-16
- STM-64
- OC-3
- OC-12
- OC-48
- OC-192
- Sysplex CLO—Control Link Oscillator
- Sysplex ETR—External Throughput Rate
- D1 Video
- SDI—Serial Data Input
- FICON—Fiber Connection
- FICON 2G
- ISC-Peer (ISC-1 Peer Mode)
- ISC-Compat (ISC-3 Compatibility Mode)
- 15530 2.5Gbps Aggregated
- 15530 10Gbps Aggregated
- 15530 MR Transport
- 15530 Data MXP
- HDTV
- D1 Video
- DV-6000

1.4 MetroPlanner Procedural Flow

The flowchart in Figure 1-1 on page 1-6 shows the following stages used to create a complete network design:

1. Place sites in the network. A site represents a potential location for placing equipment. This can be accomplished by adding one site at a time or by using the Add Network tool to add multiple sites at once.
2. Place fiber spans between the sites. A span represents a pair of fibers.
3. Specify service demands between sites as required. For Fixed adn P-Ring demands, only one line will be drawn to represent all services between a particular service source and service destination site.

4. Analyze the network design.
5. In the event that the user would like to force automatic tool choices, there are options to adjust the design and repeat the analysis until the desired configuration is achieved.

1.5 Planning Traffic in MetroPlanner 2.5

Traffic in MetroPlanner 2.5 is defined as an optical path for each pair of nodes requiring a service demand. An optical path (connectivity) is defined as the sum of a wavelength between the two nodes. This task is performed by creating a network design that minimizes the overall cost.

MetroPlanner 2.5 allows you to design flexible networks. A flexible network is a network that, leveraging on the Reconfigurable OADM (ROADM) nodes, allows traffic modification/reconfiguration as traffic requirements change. The main feature of flexible networks is the traffic reconfiguration/modification among all the networked nodes or among a subset of them.

1.5.1 Basic Traffic Items

The following list gives definitions for some basic traffic items:

- Circuit—A single wavelength between a pair of source and destination nodes. In addition to the source and destination nodes and all the attributes that are common to the demand containing the circuit, it defines the following list of attributes:
  - Present/Forecast indication
  - Routing direction for unprotected service
  - ITU channel
  - Optical bypass indication
- Connectivity—An undefined number of channels than can vary from 0 to 32 between a pair of nodes. The connectivity takes the meaningful parameter values of the circuit demand to which the connectivity belongs.
- Demand—A set of services of the same type. It defines the set of parameters common to all the circuits or connectivity that are part of this demand. The list of relevant attributes are:
  - Service Demand Label
  - Number of circuit in present
  - Number of circuit in forecast
  - Client Service Type
  - Protection Type
  - Optical bypass number of channels
  - Optical bypass site
  - Wave division multiplexing (WDM) Interface Type (TXT or ITU-LC choice)
  - WDM Card Type
  - Src Client Interface (SR, IR, or LR)
  - Dst Client Interface (SR, IR, or LR)

- Traffic Group: Groups all the demands between same set of nodes. The following traffic groups are supported:
  - ROADM—All nodes in the subset can be connected. The way each node can be connected with the others depends on the way you define the Traffic Type parameter. The number of channels can vary from 0 to 32.
    - Meshed—Each node defined in the set is connected to each other. This is the most common traffic type.
    - Hub—The user-defined hub node is connected to each of the other nodes defined in the subset.
  - P-Ring—Contains all the demands to support traffic topologies similar to bidirectional line switch ring (BLSR) or multiplex section-shared protection ring (MS-SPRing). Each demand that is part of the P-Ring is defined between a pair of nodes in the list of the added/dropped nodes where BLSR-like (or MS-SPRing-like) traffic must be opened. The number of circuits is the same for each demand, and must be user-specified (from 1 to 32).
  - Fixed—Restricts the set of nodes at 2 sites. The number of circuits of each demand must be user-specified (from 1 to 32).

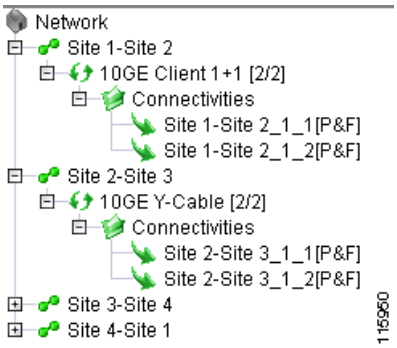
1.5.2 Any-to-Any Traffic Demands

An any-to-any traffic demand is defined among a subset of nodes (minimum of two, maximum of every node in the network). An any-to-any traffic demand allows each node belonging to the subset to establish one or more circuits (an optical path carrying a service) with the other nodes. These circutis have the same protection types and services to be carried. The actual connection capacity between each pair of nodes belonging to the subset is dependant on the specific traffic pattern present in the overall network, not just within the selected subset.

1.6 Viewing Traffic in MetroPlanner 2.5

MetroPlanner 2.5 represents all the user-defined traffic services as an explorer tree view within the Traffic Tree window. Fixed, P-Ring, and ROADM traffic groups are shown on the tree view (Figure 1-1).

Figure 1-1 Tree View



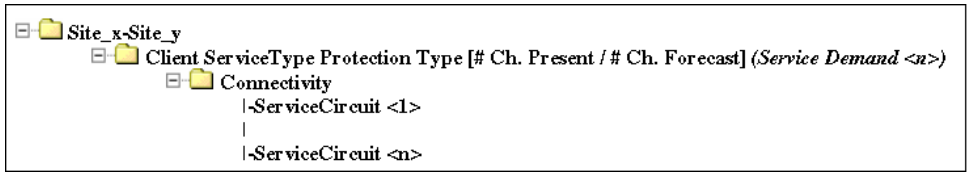
Right-click an item to view a menu that allows you to view the optical results or the traffic matrix. Right-clicking on the site name also allows you to edit the services. Refer to Chapter 2, "Designing Networks with MetroPlanner" for more information about optical results, the traffic matrix, and editing services.

Note The tree view appears gray until you analyze the network. Refer to the "2.4 Analyzing the Network" section on page 2-31. You cannot access the right-click menu until the network is analyzed.

1.6.1 Fixed Traffic Groups

Each fixed traffic group is represented by a folder labeled with a concatenation of the source and destination site names. All the fixed services between these nodes are represented in this traffic group (Figure 1-2).

Figure 1-2 Fixed Traffic Group



Each fixed demand defined between these nodes is represented by an item in this traffic group. The fixed demand is labeled using the following information:

- Client Service Type
- Protection Type
- The number of present and forecast channels

The tree view shows a list of defined service circuits under each fixed demand. All the service circuits are grouped in the Connectivities folder.

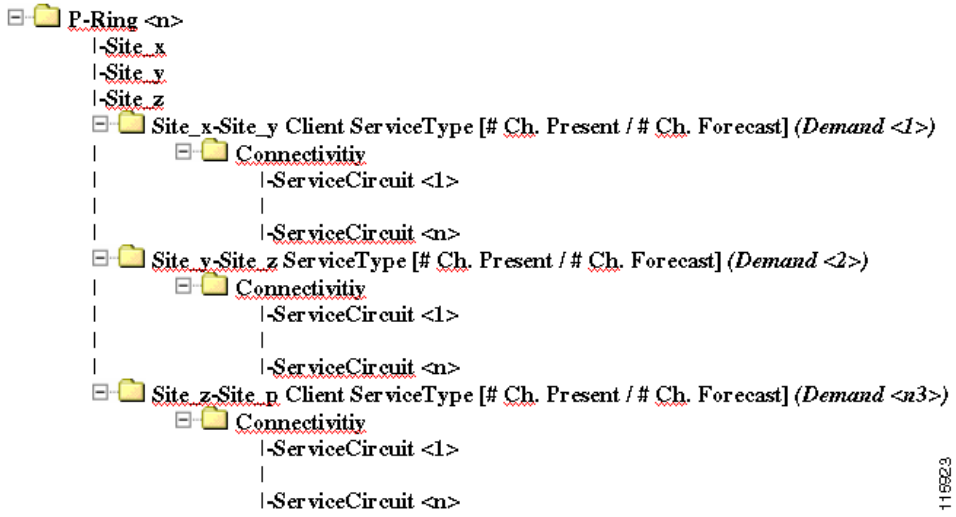
Each service circuit is labeled with a string containing the service circuit label and the Present/Forecast (P&F) indication. The P represents circuits present since day 1, and the F represents circuits defined in the forecast.

Note For ROADM network topologies, fixed traffic can also include traffic demand with optical-bypass sites. No additional patch cords are required for express or optical bypass channels in ROADM sites.

1.6.2 P-Ring Traffic Groups

Protected ring (P-ring) traffics groups are represented in the tree by a folder. This folder is labeled by using a concatenation of the P-Ring substring and a progressive number automatically assigned by MetroPlanner 2.5. Figure 1-3 shows an example of a P-ring traffic group.

Figure 1-3 P-Ring Traffic Group Example



The list of add/drop sites (as defined in the P-Ring request) is shown in the P-Ring Traffic Group folder. All the demands between each node pair are represented under this traffic group. Each demand (generated by the P-Ring wizard) is labeled concatenating the following information:

- SiteA-SiteB (source and destination node labels for this demand)
- Client Service Type
- The number of present and forecast channels

Each service circuit is labeled as described in the "1.6.1 Fixed Traffic Groups" section on page 1-7.

Note For ROADM network topologies, P-ring traffic can also include traffic demand with optical-bypass sites. No additional patch cords are required for express or optical bypass channels in ROADM sites.

1.6.3 ROADM Traffic Groups

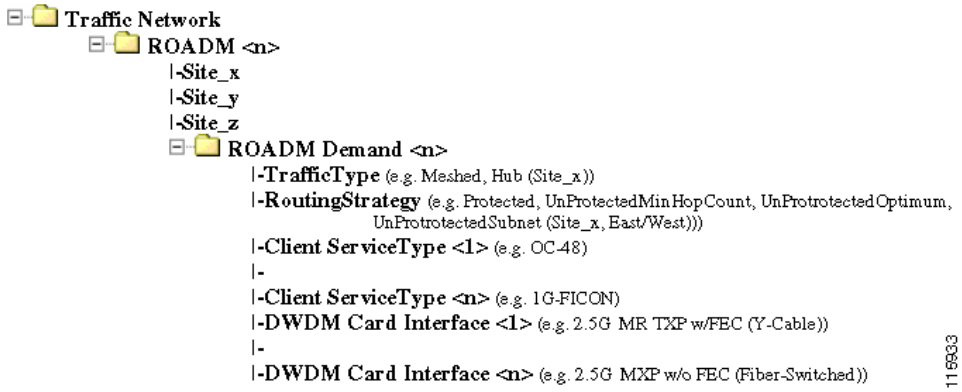
Each ROADM traffic group is represented in the tree view by a folder labeled under the root traffic network. All the sites and demands between each node pairs defined in the list (of added/dropped nodes) are represented under this traffic group.

The ROADM traffic group folder contains the following information:

- One item for each site that is part of this ROADM group. You can only define one set of nodes for each ROADM group.
- One folder for each defined ROADM demand. You can define more demands for the same ROADM group for the same set of nodes.

Figure 1-4 shows an example of an ROADM traffic group.

Figure 1-4 ROADM Traffic Group Example



Each ROADM demand is defined by the ROADM demand name. The following set of parameters are represented as an item of the ROADM demand in the tree view:

- Traffic Type—Defines the supported traffic pattern type. The following options are supported:
  - Meshed (Default)—A traffic pattern where a connectivity is defined for each node pair in the traffic group
  - Hub (Hub Node)—Defines connectivity between the defined hub node and every other node in the traffic group. You must specify the selected hub node among the list in the group.
- Routing Strategy—defines the maximum number of allowed connectivities, and the way the connectivities are routed by MetroPlanner 2.5. The following options are supported:
  - Protected (Default)—Each node pair in the traffic group is connected using two connectivities.
  - Unprotected Optimum Optical Path—Each node pair is connected using one connectivity. The Unprotected Optimum Optical Path minimizes the number of required optical amplifiers, but also restricts the number of channels that can be deployed among the nodes of the traffic group (maximum of 32 channels between each node pair) in the installed network.
  - Unprotected Minimum Hop Count—Each node pair in the traffic group is connected by one connectivity. The unprotected minimum hop count maximizes the number of channels (for unprotected traffic types only) that can be deployed among the nodes of the traffic group, but can requires a higher number of optical amplifiers on the unprotected optimum optical path (maximum of 32 channels between each node pair) in the installed network.
  - Unprotected Subnet—Each node pair in the traffic group is connected using one connectivity. You can manually force connectivities on only one branch of the ring. For unprotected subnets, you must manually select one starting node of the branch and the direction the ring must be traversed to define the subnet, starting from the initial site. Branch direction is specified defining the outgoing side referred to the starting node.This routing strategy option allows you to exclude some critical paths and (with ROADM traffic groups containing 2 sites) to force each ROADM connectivity clockwise or counterclockwise.
- List of selected Client Service Types—The list of client service types to be supported for this demand is represent by a set of item under the related ROADM Demand folder. You can simultaneously request more then one Client Service Type for each demand (Any Client).
- List of selected DWDM Card Interfaces—Represents the list of DWDM card interfaces you selected to support the list of selected Client Service Types. You can simultaneously request more than one DWDM card interface for each demand and for each client service type. Each DWDM card interface

is characterized by a set of optical performances. Each DWDM card interface is labeled by concatenating the selected DWDM card type and the protection type information. A tooltip on each DWDM card interface item shows which client service types are supported by this interface.

To avoid duplication in the tree view while using the Protected routing strategy:

- DWDM card interfaces with client 1+1 and Y-cable protection types are represented by only one DWDM card interface item. The selected protection types are listed in brackets, separated by commas.
- DWDM card interfaces with fiber-switched protection types are represented by a separate DWDM card interface item.

CHAPTER 2

Designing Networks with MetroPlanner

Cisco MetroPlanner provides you numerous tools for customizing the software, creating and analyzing networks, and creating a bill of materials. You can use to MetroPlanner perform the following tasks:

Note To run MetroPlanner, you must install the Java 2 Platform, Standard Edition (J2SE), v 1.4.2_04 Java Runtime Environment (JRE). You can download it from the following URL:

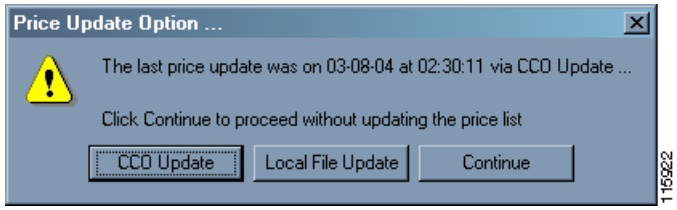
http://java.sun.com/j2se/1.4.2/download.html

2.1 Launching MetroPlanner and Updating the Pricing File

When MetroPlanner Release 2.5 is first launched, you will have the option of downloading an updated pricing file from CCO.

Step 1 Launch MetroPlanner by double-clicking the MetroPlanner R2.5 icon. The Price Update Option window appears (Figure 2-1).

Figure 2-1 Price Update Option



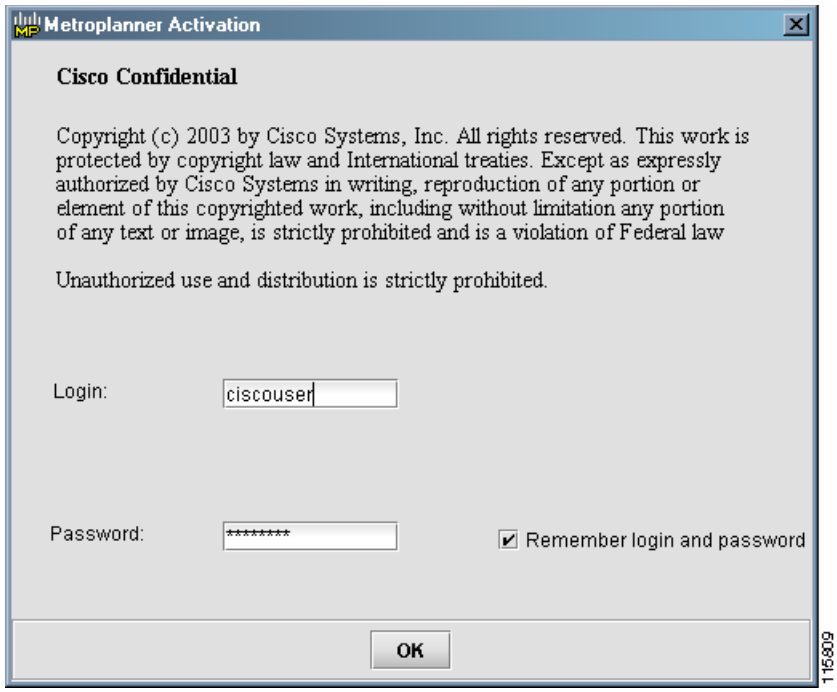
Step 2 To obtain a new price list from CCO, click **CCO Update**. You will be asked for your CCO login and password before the new price list is downloaded.

To use a pricing file that is already located on your workstation, click **Local File Update**. You will then be able to browse your workstation for the pricing file. The file format of the pricing file are separated by pipes. Each part has the following fields:

- List ID (Not used by MetroPlanner)
- Product Family or Major Parent
- Minor Parent (Not used by MetroPlanner)
- Product Number or Product ID
- Product Description
- Service Category
- Unit Price ($USD)
- Major ID (Not used by MetroPlanner)
- Minor ID (Not used by MetroPlanner

Step 3 To open MetroPlanner without updating, click **Continue**. The MetroPlanner Activation window opens (Figure 2-2).

Figure 2-2 MetroPlanner Activation Window



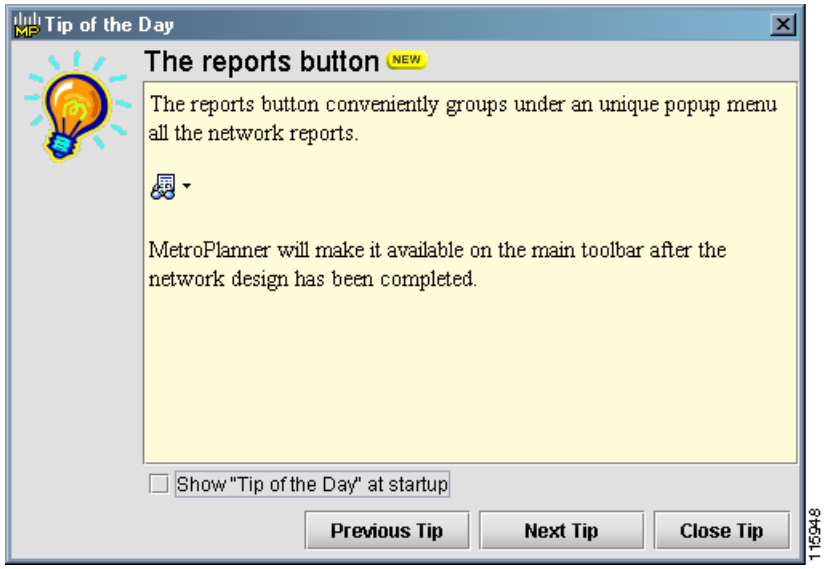
Step 4 Enter your user name in the Login field.

Step 5 Enter your password in the Password field.

Step 6 Click Remember login and password if you want MetroPlanner to save your user login name and password.

Step 7 Click **OK**. The Tip of the Day window opens (Figure 2-3).

Figure 2-3 Tip of the Day Window



The Tip of the Day window displays important tips about MetroPlanner features.

Step 8 Click **Previous Tip** or **Next Tip** to see either the previous or next tip in the tip sequence.

Step 9 Click **Close Tip** to close the window.

Step 10 If you want the Tip of the Day window to display each time you open MetroPlanner, select Show "Tip of the Day" At Startup. Deselecting this option causes the window to remain closed when you open MetroPlanner.

You can open the Tip of the Day window at any time from MetroPlanner by selecting **Help > Tip of the day** in the menu bar.

2.2 Setting MetroPlanner Options

MetroPlanner provides numerous options for customizing the tool and the designs. You can set the options for individual projects, you can create defaults for all projects, and you can set general options for the MetroPlanner tool.

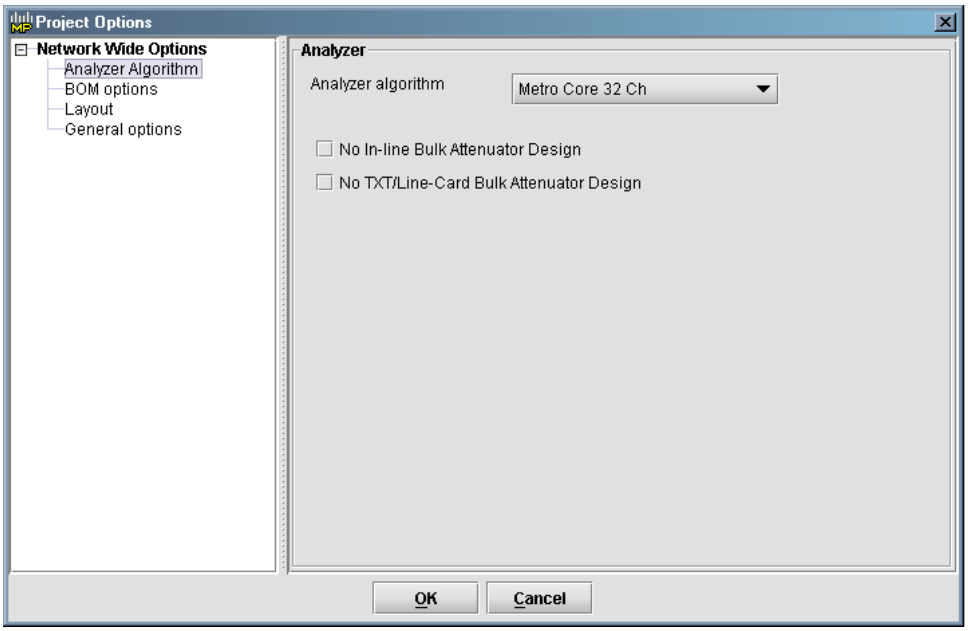
2.2.1 Setting Project Options

Setting the options for individual projects allows you to adjust the layout, BOM options, and other project-related options. You can only set project options when the network is in Design mode.

Step 1 Choose **Options > Project Options**. The Project Options window appears.

Step 2 Click **Analyzer Algorithm**. The Analyzer Algorithm section comes into focus (Figure 2-4).

Figure 2-4 Project Options Window—Analyzer Algorithm



Step 3 Select the analyzer algorithm type.

MetroPlanner distinguishes between two classes of applications: Metro Core, where the channel power is equalized and dispersion compensation is applied; and Metro Access, where the channels are not equalized and dispersion compensation is not applied. MetroPlanner offers 8, 16, and 32 channel Metro Core algorithm types.

Note Placing an upper limit on the maximum number of allowed wavelengths in the design allows MetroPlanner to provide better optical performances.

Note Use Metro Access for small networks. Small networks have a low number of sites (approximately three to five nodes) and short spans.

The Metro Access algorithm applicability is restricted by:

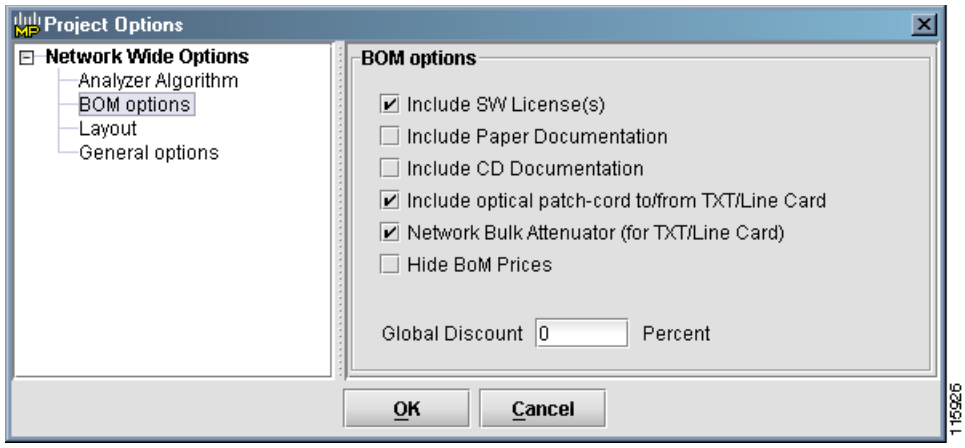
- The maximum number of required amplifiers for each path direction and for each subnetwork (maximum 5)
- Lack of Dispersion Compensation Unit (DCU) compensation requirement
- The overall network circumference (45 km [28.0 miles] if there is at least one 10-Gbps service circuit, and 120 km [74.5 miles] if there are only 2.5-Gbps service circuits)

Step 4 Select No In-line Bulk Attenuator Design to design the network without using any in-line bulk attenuators. If the network cannot be designed without using external in-line attenuators, MetroPlanner displays the following error message: "Unfeasible Network design. Site X should require usage of in-line attenuator".

Step 5 Select No TXT/Line-Card Bulk Attenuator Design to design the network without using any external Rx bulk attenuators on transponder or line cards. If any of the clients require Rx bulk attenuators, the related channel is shown with anomalous working condition (red, orange or yellow), and no Rx bulk attenuators are shown in any of the reports or BOMs.

Step 6 Click **BOM Options**. The BOM Options section comes into focus (Figure 2-5).

Figure 2-5 Project Options—BOM Options



Step 7 Select the following options, as required:

- Include SW License(s)—BOM includes one software license for each shelf for every site in the network. Only shelves containing cards that are carrying present traffic are included.
- Include Paper Documentation—BOM includes one hardcopy documentation item for each site in the network. Pass-through sites are not included.
- Include CD Documentation—BOM includes one documentation CD item for each site in the network. Pass-through sites are not included.
- Include Optical patch-cord to/from TXT/Line Card—The BOM includes both:
  - All patch cords connecting the transponder and the line card with the optical add/drop multiplexing (OADM) and multiplexing/demultiplexing filters
  - All patch cords connecting the transponder with the Y-cable flex-layer modules

  Only the patch cord connecting the transponder and line card for present traffic are included on the BOM. The patch cord for connecting TXT cards and line card can be of different types and lengths.
- Network Bulk Attenuator (for TXT/Line Card)—The BOM includes all the receive bulk attenuators (based on the results in the Optical Channel Results tab) and the in-line bulk attenuator. Only the receive bulk attenuators that refer to the present traffic are included in BOM.

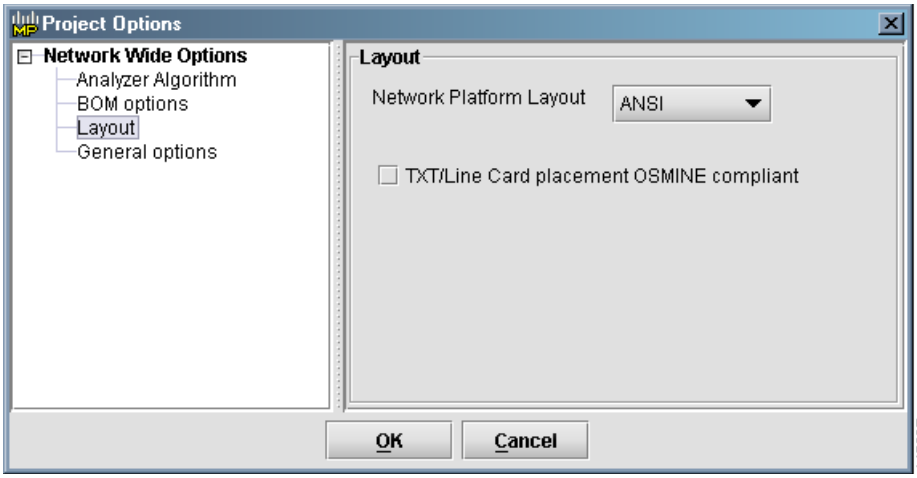
  Bulk attenuators are also used in the following cases:
  - In-line attenuation for sites without any added or dropped channels in one side, where attenuation is required to equalize the channels
  - Line amplifier sites where both preamplifier and booster cards require 10 dB of attenuation between the preamplifier and the booster amplifier.

  These bulk attenuators are always in the BOM, regardless of the TXT/Line Card Bulk Attenuator selection.
- Hide BoM Prices—Hides the dollar values of the items on the BOM.

Step 8 Enter the global discount percentage in the Global Discount field. MetroPlanner applies this percentage to all networks.

Step 9 Click **Layout**. The Layout section comes into focus (Figure 2-6).

Figure 2-6 Project Options—Layout



Step 10 Select either American National Standards Institute (ANSI) or European Telecommunications Standards Institute (ETSI) in the Network Platform Layout drop-down list.

Step 11 Check **TXT/Line Card placement OSMINE compliant** to place the TXT/line card in the shelf, with the following constraints:

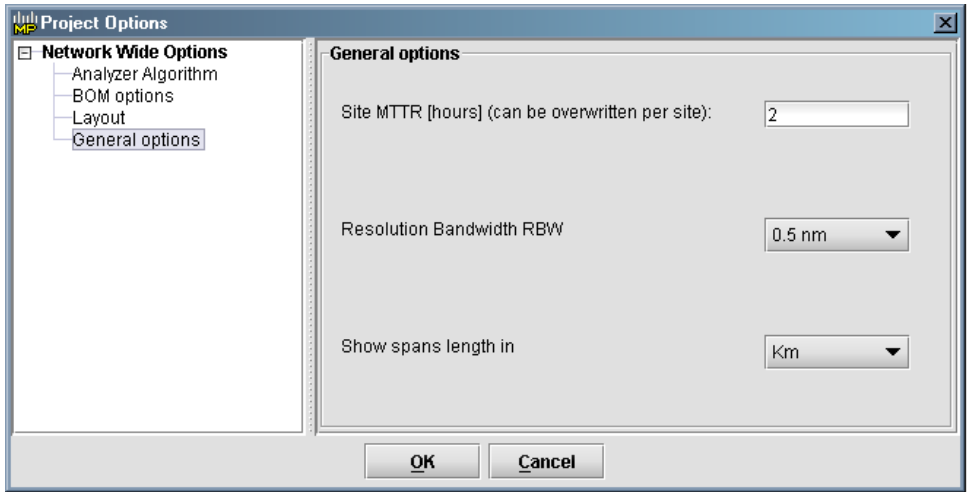
- Each unprotected transponder or line card facing west can only be placed on the left side of the shelf (Slots 1 to 6), and each unprotected transponder or line card facing east can only be placed on the right side of the shelf (Slots 12 to 17).
- Each pair of transponders or line cards that is involved in a Client 1+1 or Y-cable protection group must be placed in adjacent slots.
- Each transponder involved in fiber-switched protection can be placed on the left or right side of the shelf in order to fill the empty slots.

Leave **TXT/Line Card placement OSMINE compliant** unchecked to place the TXT/line card in the shelf with the following constraints:

- The transponder and line card facing west-side traffic must be placed in the left shelf section (Slots 1 to 6), and the transponder and line card facing the east side traffic must be placed in the right shelf section (Slots 12 to 17).
- If the number of west and east added and dropped channels changes, the remaining client transponder/line cards are placed to fill the remaining available slots.
- When using Y-cable protection, the two transponders must be placed in the same shelf.
- When using Client 1+1 protection, MetroPlanner places the two client cards in the same shelf.

Step 12 Click **General Options**. The General Options section comes into focus (Figure 2-7).

Figure 2-7 Project Options—General Options



Step 13 In the Site MTTR field, enter the mean time to repair (MTTR) for each site in the network. If you change the MTTR value after creating sites, the new value will only apply to sites you create after the change.

Step 14 Select whether the OSNR values in the Result tables are reported using 0.1-nm resolution bandwidth (RBW) or 0.5-nm RBW in the Resolution Bandwidth RBW field. The default value is 0.5 nm.

Step 15 Choose either kilometers (km) or miles as the default span length unit of measure in the Show spans length in field.

Step 16 Click **OK** when finished.

2.2.2 Setting Default Project Options

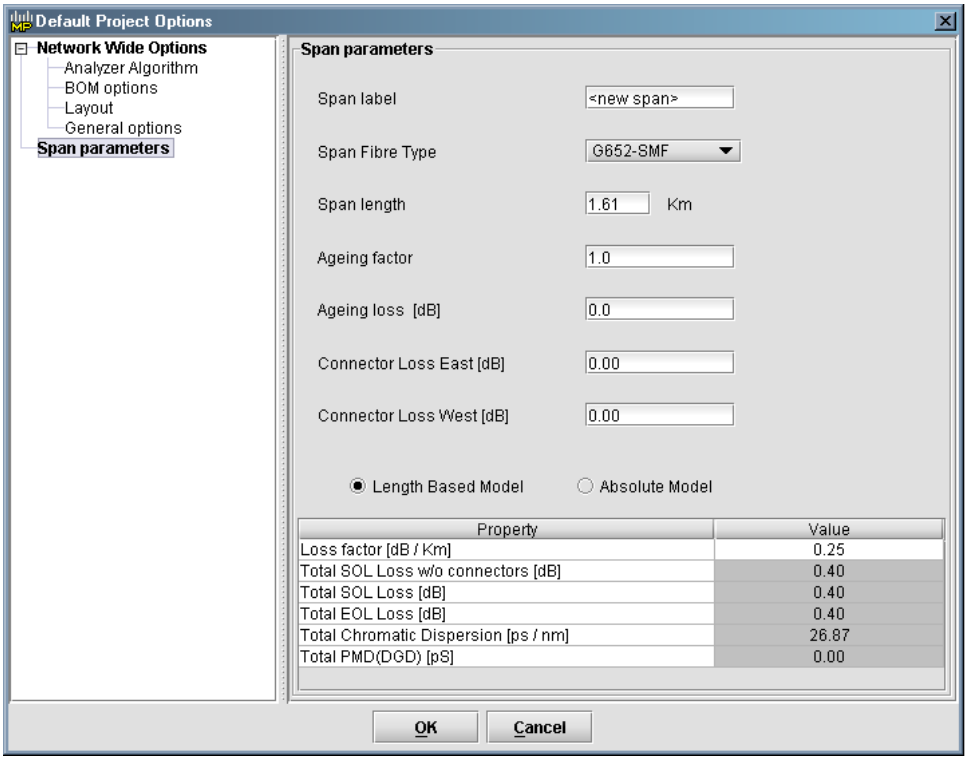
Setting the default options for all new projects allows you to adjust the layout, BOM settings, and other project-related options. These options will be the default settings for each new project.

Step 1 Select **Options > Default Project Options**. The Default Project Options window appears. The Default Project Options window is nearly identical to the Project Options window, with the addition of the Span Parameters option in the left panel.

Step 2 Complete the steps in the "2.2.1 Setting Project Options" section on page 2-4.

Step 3 Click **Span Parameters**. The Span Parameters area comes into focus (Figure 2-8).

Figure 2-8 Default Project Options—Span Parameters



The Span Parameters area displays the same information as the Fibres Dialog window (Figure 2-20 on page 2-22).

Step 4 Complete Step 5 through Step 14 in the "2.3.2.2 Adding Fiber Spans" section on page 2-22.

Step 5 Click **OK**. These settings are now the default settings for all new projects.

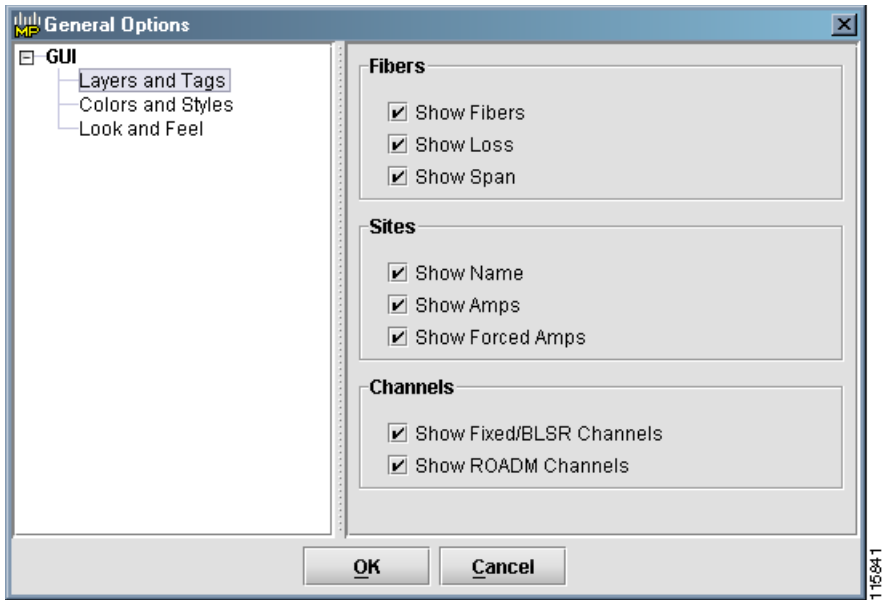
2.2.3 Setting General Options

Setting the general options allows you to change the way MetroPlanner displays information.

Step 1 Choose **Options > General Options** from the menu. The General Options window appears.

Step 2 Select **Layers and Tags**. The Layers and Tags section comes into focus (Figure 2-9).

Figure 2-9 General Options—Layers and Tags



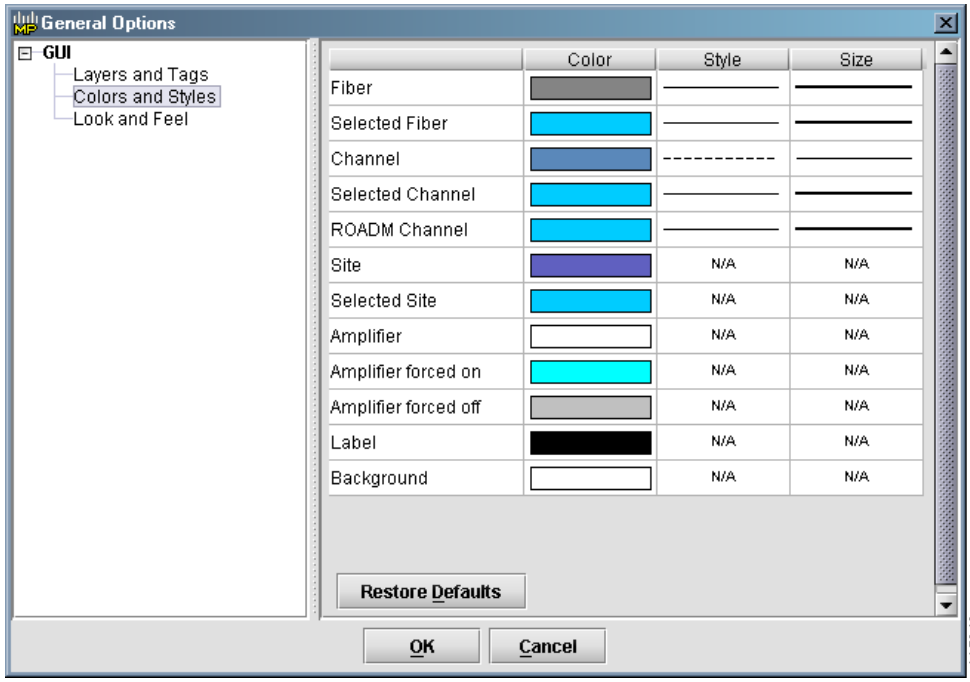
Step 3 In the Fibers area, select one or more check box depending on whether or not you want MetroPlanner to display the fibers, the span loss, and the span.

Step 4 In the Sites area, select one or more check box depending on whether or not you want MetroPlanner to display the names, the amplifiers (amps), and the forced amps of the sites in the network design.

Step 5 In the Channels area, select one or more check box depending on whether or not you want MetroPlanner to display the Fixed/BLSR and ROADM channels in the network design.

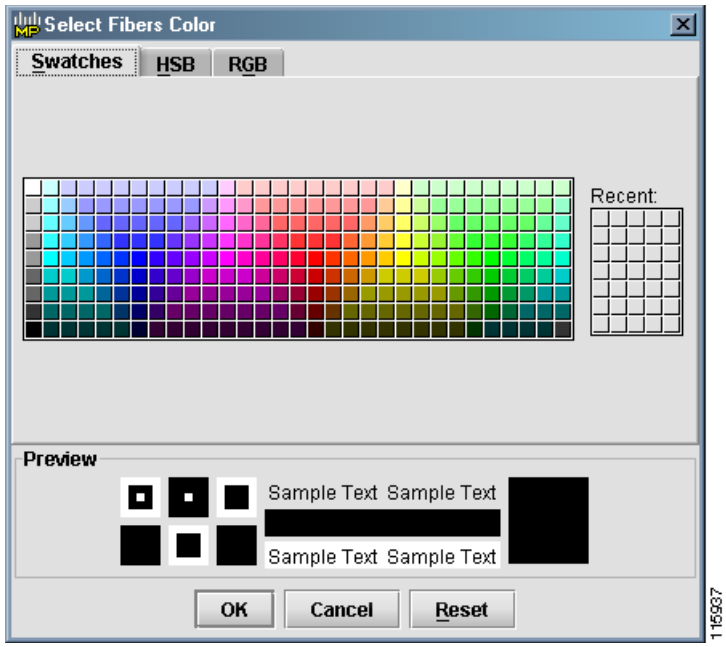
Step 6 Click **Colors and Styles**. The Colors and Styles section comes into focus (Figure 2-10).

Figure 2-10 General Options—Colors and Styles



Step 7 Select the color for the items in the window by clicking the rectangles to the right of the text. The Pick a Color window appears (Figure 2-11).

Figure 2-11 Pick a Color Window



Step 8 Use the Swatches, HSB, or RGB tab to select a new color for the item.

Step 9 Click **OK** to keep the new color, or click **Reset** to restore the default color.

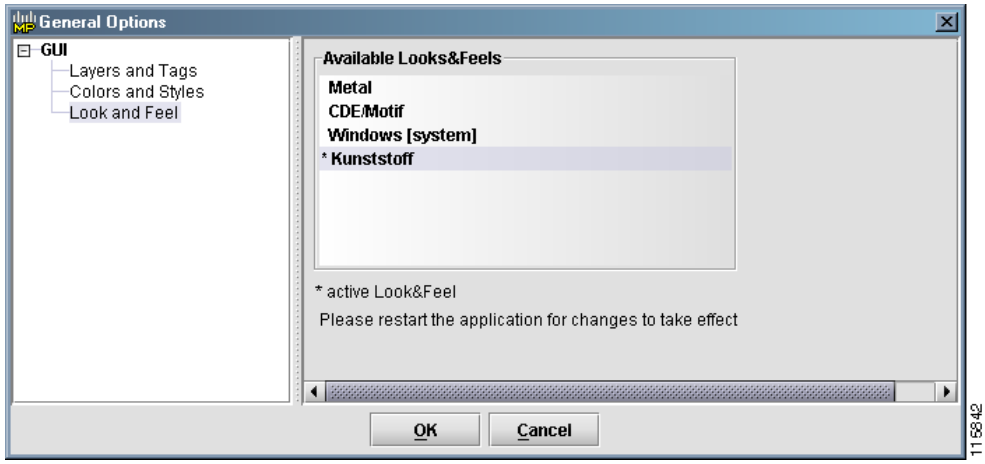
Step 10 To change the line style for fibers, selected fibers, channels, selected channels, and ROADM channels, select a new style from the drop-down list in the Style column.

Step 11 To change the line width for fibers, selected fibers, channels, selected channels, and ROADM channels, select a new width from the drop-down list in the Size column.

Step 12 To discard all the changes, click **Restore Defaults** at the bottom of the graphic.

Step 13 Select **Look and Feel**. The Look and Feel section comes into focus (Figure 2-12).

Figure 2-12 General Options—Look and Feel



Step 14 Select appearance for the MetroPlanner application. In order to see the new appearance, you must restart the application. The Windows (system) selection displays the application in your current Windows session.

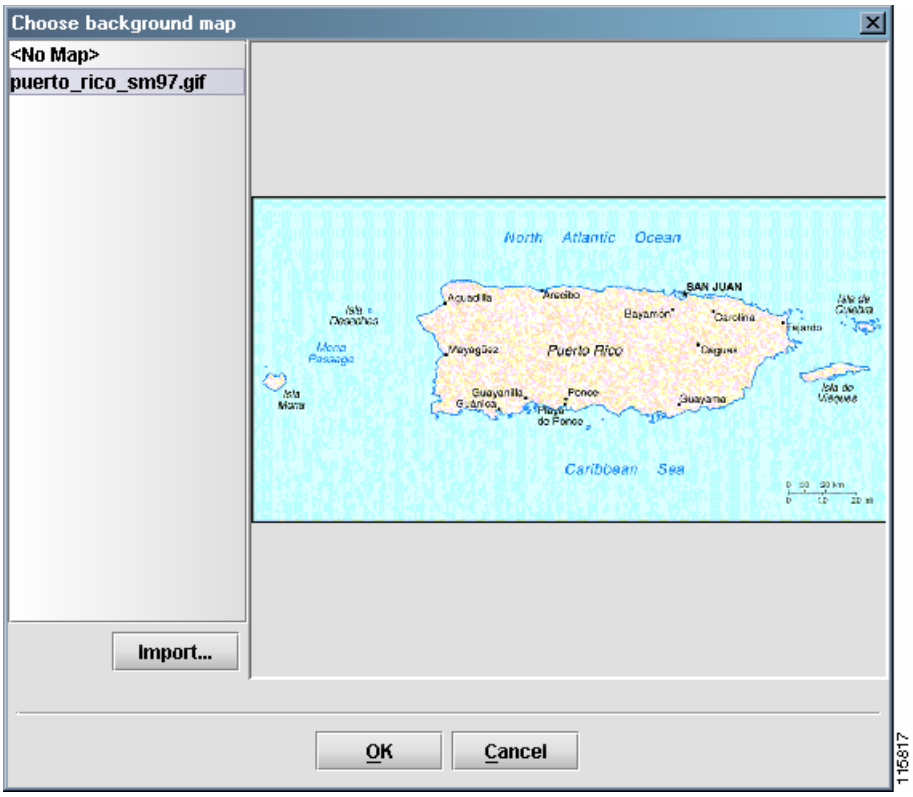
Step 15 Click **OK** to keep the changes and close the window.

2.2.4 Customizing the Design Background

You can customize your MetroPlanner window background with a graphic image to enhance the presentation of your network design.

Step 1 Choose **Options > Background Map** from the menu. The Choose Background Map window appears (Figure 2-13), allowing you to select a file in JPG or GIF format.

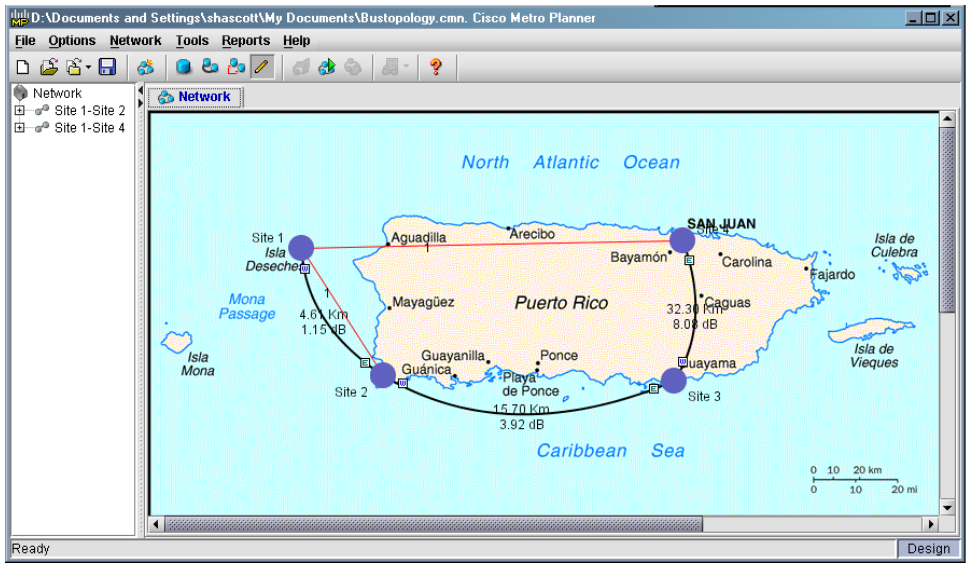
Figure 2-13 Choose Background Map Window



Step 2 Select a map from the list on the left, or click **Import** to add a new map to the list.

Step 3 Click **OK**. The file will appear as a background for any new network, or for the network you currently have open (Figure 2-14).

Figure 2-14 Map File Background



Step 4 If the network map does not appear, choose **Options > Show Map** from the menu.

2.3 Creating Networks

In MetroPlanner, network design components consist of sites, spans, and service demands. Components can be added to a network design by selecting the buttons shown in Table 2-1.

Table 2-1 Menu Buttons for Adding Network Design Components

Button	Description
	Network Wizard
	Add Site
	Add Fibre
	Add Channel/Service
	Edit Mode

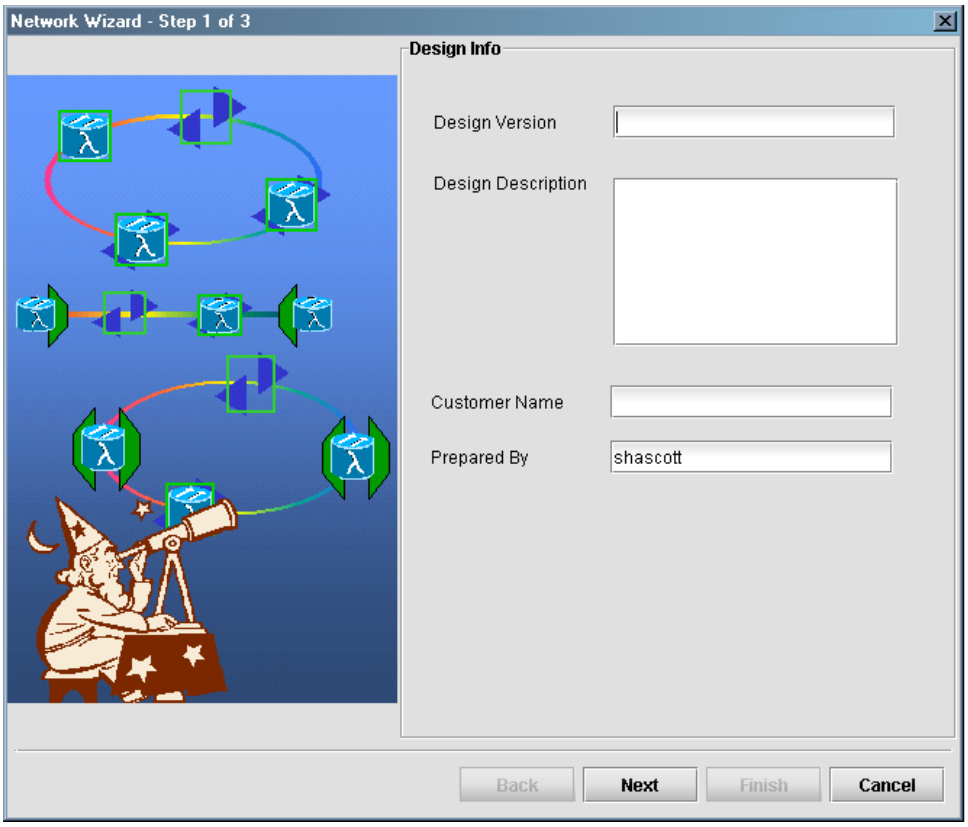
2.3.1 Adding Networks Using the Network Wizard

Use the Network Wizard button to add a ring or linear dense wavelength division multiplexing (DWDM) network to the network design. The Network Wizard button allows you to add several sites to the network design in one step.

Note The Network Wizard feature adds a ring or linear DWDM network with a maximum of 16 active sites.

Step 1 Click **Network Wizard** on the menu bar. The Network Wizard window appears (Figure 2-15).

Figure 2-15 Network Wizard (Step 1) Window



Step 2 Enter a name for the designed network in the Design Version field (128 maximum characters).

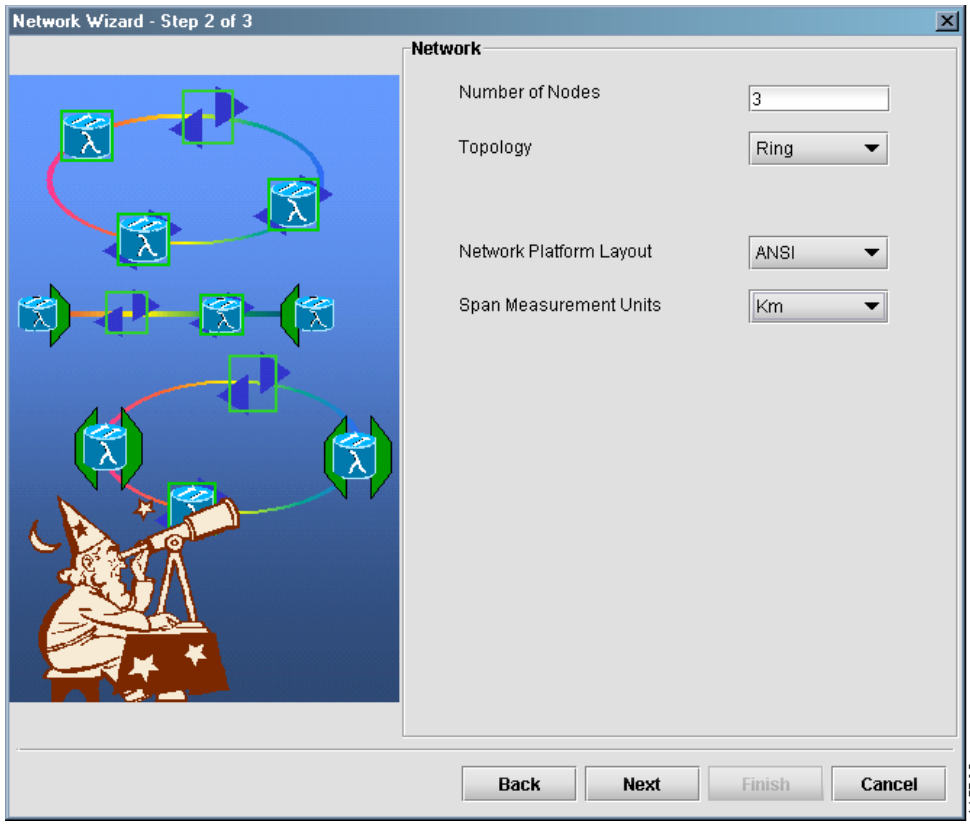
Step 3 Enter a description of the designed network in the Design Description field (256 maximum characters).

Step 4 Enter the name of the customer requiring this network design in the Customer Name field (128 maximum characters).

Step 5 Enter the name of the person who designed the network in the Prepared By field (128 maximum characters).

Step 6 Click **Next**. The second panel of the Network Wizard appears (Figure 2-16).

Figure 2-16 Network Wizard (Step 2) Window



Step 7 Enter the number of desired nodes in the network in the Number Of Nodes field. The maximum allowed value is 60.

Note The maximum number of non-passthrough ONS 15454 Multi-Service Transport Platform (MSTP) nodes is 16.

Step 8 Select a topology from the Topology drop-down list. You can choose either a ring or a linear topology.

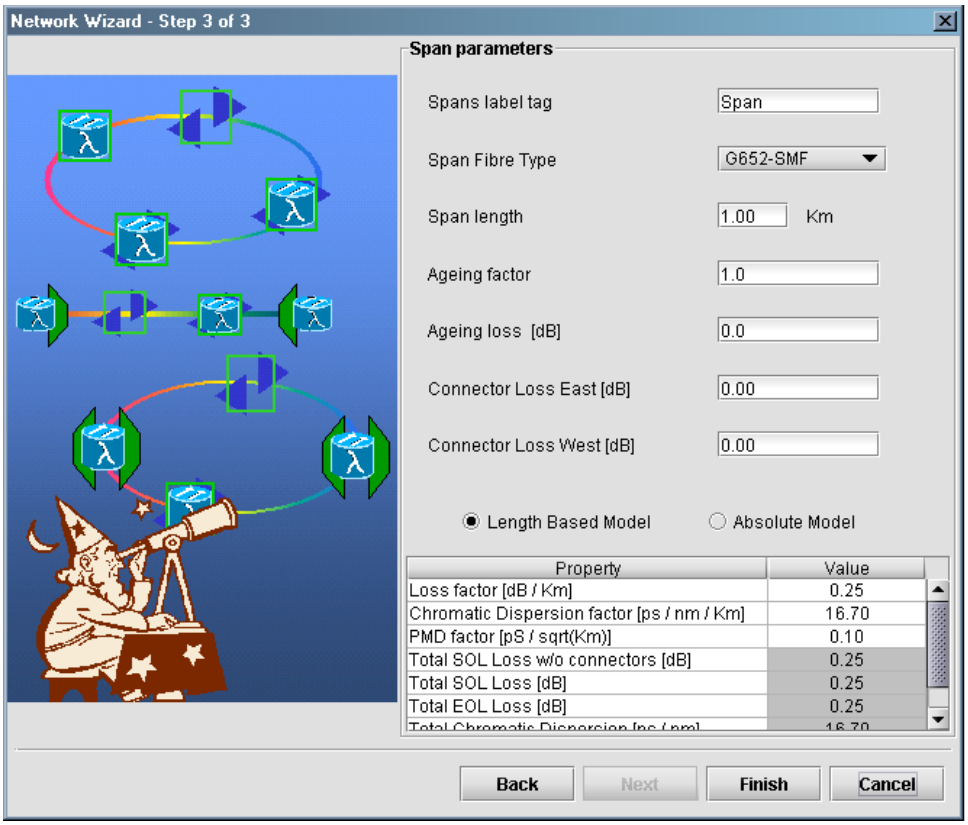
Step 9 Select a network platform layout from the Network Platform Layout drop-down list. You can choose either ANSI (the North American standard) or ETSI (the international standard). ANSI networks will not allow you to define SDH (ETSI) service demands. ETSI networks will not allow you to define SONET (ANSI) service demands.

Note After the layout is set for a network, you cannot change the individual sites.

Step 10 Select the unit of measure that MetroPlanner will use to specify the span length in each span in the Span Measurement Units drop-down list. The span units can be either kilometers (km) or miles.

Step 11 Click **Next**. The third panel of the Network Wizard appears (Figure 2-17).

Figure 2-17 Network Wizard (Step 3) Window



Step 12 Enter the substring text that defines the span labels in the Spans Label Tag field. MetroPlanner defines all subsequent spans by adding a sequential number to the label in the Spans Label Tag field (for example, Span 1).

Step 13 Select a fiber type from the Span Fibre Type drop-down list. The MetroPlanner Analyzer performs a check to make sure that the network contains spans with fiber types that the design algorithm can manage on the same network. If this condition is not met, the analyzer stops analyzing the network and creates an error. The available fiber types are:

- G652-SMF–Supported for both Metro Core and Metro Access
- E-LEAF–Supported for Metro Core only
- TW-RS–Supported for Metro Core only

Step 14 Enter a span length in the Span Length field. The displayed unit of measure is retrieved from the Span Measurements Units field.

Step 15 Enter the end of life (EOL) aging factor in the Ageing Factor field. This factor is multiplied by the start of life (SOL) total span loss without connectors.

Step 16 Enter the EOL aging loss in the Ageing Loss field. The EOL loss per span value is added at the end of life to each discrete fiber in the network (for example, to add an EOL margin for splicing).

Step 17 Enter the concentrated loss at the east end of the span in the Connector Loss East field.

Step 18 Enter the concentrated loss at the west end of the span in the Connector Loss West field.

Step 19 Choose either the Length Based Model or the Absolute Model radio button.

Step 20 If you choose Length Based Model in Step 19, enter values in value fields for the following properties listed in the table at the bottom of the window:

- Loss Factor—The value of the SOL fiber loss per kilometer used to calculate the loss of each span in the network. The fiber loss factor is always entered in dB/km, even if you selected miles as the span measurement unit. MetroPlanner automatically converts the loss factor from miles to kilometers.
- Chromatic Dispersion factor—The fiber chromatic dispersion factor. The default value is dependent on the selected fiber type. Any value you enter is lost whenever you change the fiber type. Chromatic dispersion is always entered in ps/nm/km, even if you selected miles as the span measurement unit. MetroPlanner automatically converts the loss factor from miles to kilometers. Fiber chromatic dispersion is defined for the middle of the wavelength band. It is defined at approximately 1545.3 nm.
- PMD factor—The polarization mode dispersion (PMD) factor. The default value is dependent on the selected fiber type. Any value you enter is lost whenever you change the fiber type. PMD is always entered in $ps/(\sqrt{km})$, even if you selected miles as the s pan measurement unit. MetroPlanner automatically converts the loss factor from miles to kilometers.
- Total SOL Loss w/o Connectors—The start of life link fiber loss for each span, without the connector concentrated loss. The total SOL loss without connectors is equal to the loss factor multiplied by the length. In the Length Based model, this value is calculated automatically.
- Total SOL Loss—The start of life link fiber loss for each span with the connector concentrated loss contributions. The total SOL loss is equal to the total SOL loss without connectors added to the connector loss west and connector loss east. In the Length Based model, this value is calculated automatically.
- Total EOL Loss—The end of life link fiber loss for each span. In the Length Based model, this value is calculated automatically.
- Total Chromatic Dispersion—The overall link fiber chromatic dispersion for each span. In the Length Based model, this value is calculated automatically.
- Total PMD (DGD)—The differential group delay (DGD) is the difference in arrival times of the two polarization modes at a particular wavelength and time with a specific PMD coefficient. In the Length Based model, this value is calculated automatically.

Step 21 If you chose Absolute Model in Step 19, enter values in value fields for the following properties listed in the table at the bottom of the window:

- Total SOL Loss w/o Connectors—The start of life link fiber loss for each span, without the connector concentrated loss. The total SOL loss without connectors is equal to the loss factor multiplied by the length.

Step 22 Click **Finish**. MetroPlanner performs a check for fiber factor valid values. If the fiber factor values are within the valid range (refer to Table 2-2 on page 2-19), MetroPlanner creates a visual representation of the network (Figure 2-18 on page 2-18). If the values are out of range, MetroPlanner issues a warning, asking you to confirm the input values.

Figure 2-18 Initial Network View

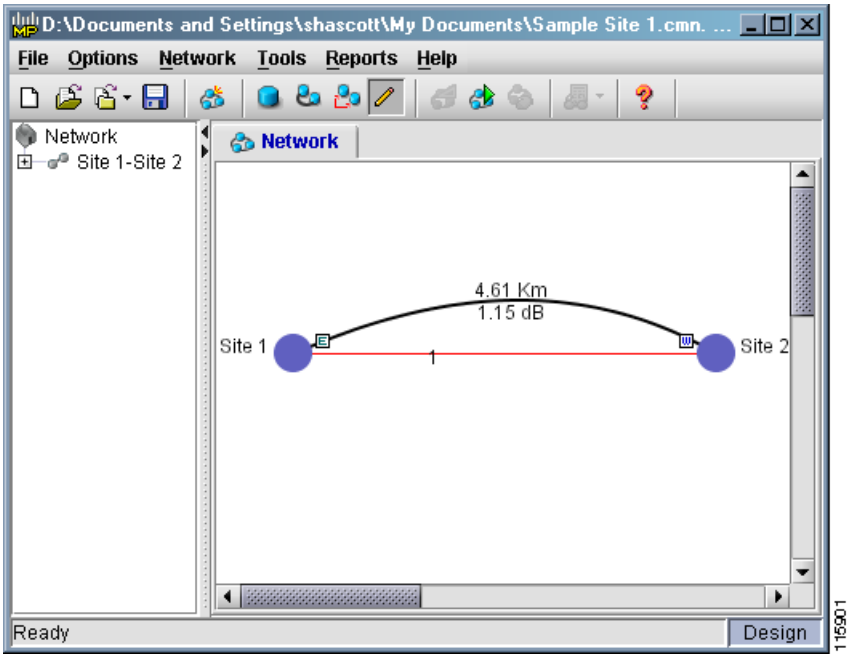


Table 2-2 Valid Ranges for Fiber Coefficient Values

Fiber Type	Parameter	Min Error Value	Min Warning Value	Default Value	Max Warning Value	Max Error Value
G..652-SMF	Loss factor	0 dB/km	0.2 dB/km	(*) dB/km	0.4 dB/km	10 dB/km
	Chromatic Dispersion factor @ 1545.3 nm	0 ps/nm/km	16.2 ps/nm/km	16.7 ps/nm/km	17.1 ps/nm/km	30 ps/nm/km
	PMD factor	0 ps/(√km)	0.0 ps/(√km)	0.1 ps/(√km)	0.5 ps/(√km)	10 ps/(√km)
G.655-E-LEAF	Loss factor	0 dB/km	0.2 dB/km	(*) dB/km	0.4 dB/km	10 dB/km
	Chromatic Dispersion factor @ 1545.3 nm	0 ps/nm/km	3.4 ps/nm/km	3.80 ps/nm/km	4.2 ps/nm/km	10 ps/nm/km
	PMD factor	0 ps/(√km)	0 ps/(√km)	0.1 ps/(√km)	0.5 ps/(√km)	10 ps/(√km)
G.655-TW-RS	Loss factor	0 dB/km	0.2 dB/km	(*) dB/km	0.4 dB/km	10 dB/km
	Chromatic Dispersion factor @ 1545.3 nm	0 ps/nm/km	3.8 ps/nm/km	4.19 ps/nm/km	4.6 ps/nm/km	10 ps/nm/km
	PMD factor	0 ps/(√km)	0 ps/(√km)	0.1 ps/(√km)	0.5 ps/(√km)	10 ps/(√km)

2.3.2 Adding Networks Manually

You can manually add network design elements using the following network design functions: adding sites, adding spans, and adding services.

2.3.2.1 Adding Sites

Use the Site Dialog window to place an empty site in the network design. You can also use the Site Dialog window to build a network manually, bypassing the Network Wizard, or to add new sites to an existing design. A site is a customer premises location where any equipment can be collocated in a rack within a building.

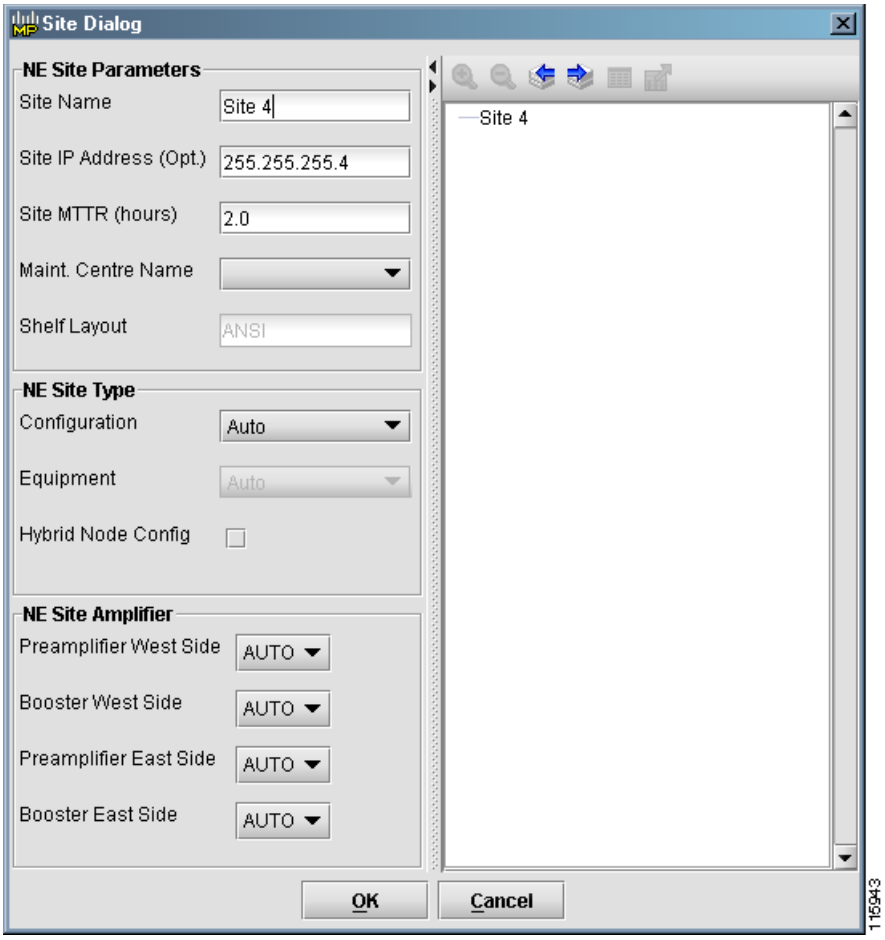
Note MetroPlanner supports up to 60 sites. However, the ONS 15454 DWDM platform will only support up to 16 non-passthrough sites on any given network. Although MetroPlanner will allow you to add more than 16 sites, it will generate errors when the network analysis runs.

Note MetroPlanner R2.5 only supports two fiber spans per site (east and west).

Step 1 Click **Add Site Mode** on the menu bar. Alternatively, you can right-click in the main window and select Add New Default Site or Add New Site from the shortcut menu. The cursor then changes to a hand holding a blue circle.

Step 2 Double-click the MetroPlanner window at the point where you want to place the new site. The Site Dialog window appears (Figure 2-19).

Figure 2-19 Site Dialog Window



Step 3 Enter the name of the site in the Site Name field.

Step 4 Enter the site IP address (if desired) in the Site IP Address field.

Step 5 Enter the site MTTR hours in the Site MTTR field.

Step 6 Select the maintenance center that will support this site in the Maint. Centre Name field. If there are no listed maintenance centers, create one using the steps in the "2.9.6 Establishing Maintenance Centers" section on page 2-71.

Step 7 Select an ANSI or ETSI shelf layout in the Shelf Layout field.

Step 8 Select a network element (NE) site type in the Configuration field. The choices are:

- Auto—The site type is determined based on the network analysis.
- Hub—The site is a hub site.
- Terminal—The site is a full (32 channel) terminal site.
- ROADM—The site is an ROADM site with a single- or double-slot 32 DMX demultiplexer.
- OADM Full—The site is a full OADM site.
- OADM Active—The site is an active (amplified) OADM site.
- OADM Passive—The site is a passive (non-amplified) OADM site.

Hub, terminal, and ROADM sites support the equipment listed in Table 2-3. OADM Full Configuration sites are always implemented using 32 MUX-O and 32 DMX-O cards.

Table 2-3 Site Equipment

Site Configuration	Supported Equipment
Hub	Auto (default)
	32MUX-O/32DMX-O
	32 WSS/32 DMX
	32 WSS/32 DMX-O
Terminal	Auto (default)
	32MUX-O/32DMX-O
	32 WSS/32 DMX
	32 WSS/32 DMX-O
ROADM	32 WSS/32 DMX (default)
	32 WSS/32 DMX-O

Step 9 Select the set of cards required for the selected configuration from the list in the Equipment field. Available choices are Auto, 32 Channel Mux/Demux, 32WSS/32DMX, and 32WSS/32DMX-O.

Step 10 If this site is part of a hybrid node configuration, check the Hybrid Node Config check box. Hybrid node configuration is only available if you select Auto, OADM Active, OADM Passive, Line Amplifier, or Terminal.

Step 11 In the Preamplifier West Side field, select whether to place a preamplifier on the west side of the node. If you select Auto, MetroPlanner decides whether to place the item automatically. This option is not available if you selected OADM Passive as the site type.

Step 12 In the Booster West Side field, select whether to place a booster amplifier on the west side of the node. If you select Auto, MetroPlanner decides whether to place the item automatically. This option is not available if you selected OADM Passive as the site type.

Step 13 In the Preamplifier East Side field, select whether to place a preamplifier on the east side of the node. If you select Auto, MetroPlanner decides whether to place the item automatically. This option is not available if you selected OADM Passive as the site type.

Step 14 In the Booster East Side field, select whether to place a booster amplifier on the east side of the node. If you select Auto, MetroPlanner decides whether to place the item automatically. This option is not available if you selected OADM Passive as the site type.

Step 15 Click **OK** to place the site, or **Cancel** to quit. The site appears as a blue icon, with the site name appearing below it.

Step 16 To edit the site, click **Edit Mode** on the menu bar, then double-click the site you want to edit. The Site Dialog window (Figure 2-19) appears, allowing you to make changes to the site.

2.3.2.2 Adding Fiber Spans

After adding the sites, use the Add Fibre Mode feature to draw the fiber spans between sites. A fiber span consists of a pair of fibers (one transmit and one receive) between two sites.

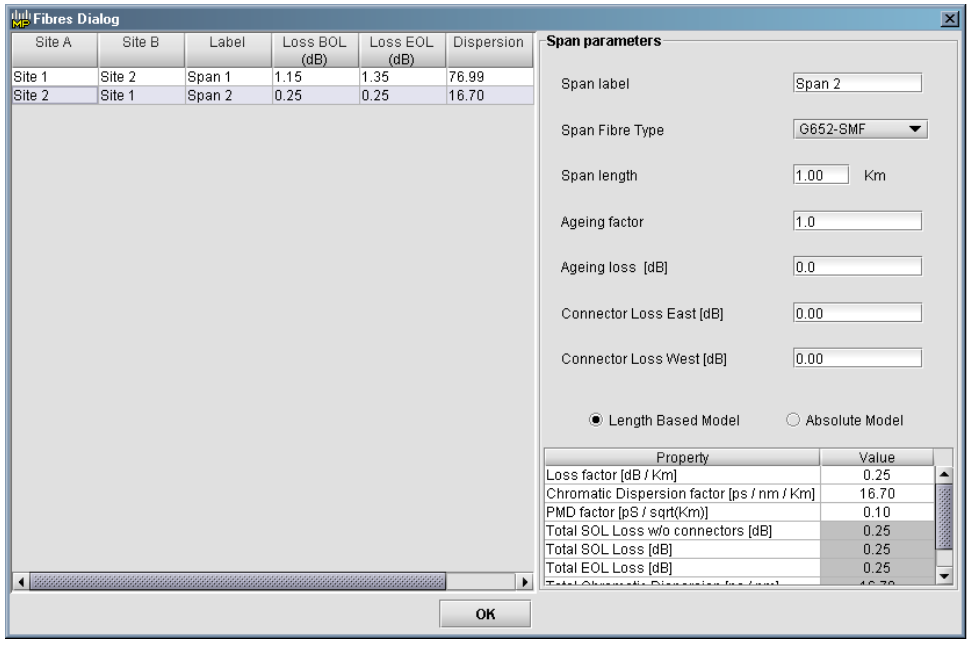
Step 1 Click **Add Fibre Mode** on the menu bar. The cursor changes to a pencil with a series of numbers beside it.

Step 2 Click one of the sites you want to connect with a fiber span. This site will be the source site for later network analysis output.

Step 3 Move the cursor to the other site. When you move the cursor, a line appears between the two sites. This site will be the destination site for later network analysis output.

Step 4 Click the destination site. The Fibres Dialog window appears (Figure 2-20).

Figure 2-20 Fibres Dialog Window



Step 5 Enter the name of the span displayed on the network design in the Span Label field. MetroPlanner automatically generates a default span name, starting with “Span 1”, and numbering sequetially. A second span would have the default name of “Span 2”.

Step 6 Select the fiber type from the Span Fibre Type drop-down list.

Step 7 Enter the length of the span, in kilometers, in the Span Length field.

Step 8 Enter the EOL aging factor in the Ageing Factor field.

Step 9 Enter the EOL aging loss in the Ageing Loss field. The EOL loss per span value is added at the EOL to each discrete fiber in the network.

Step 10 Enter the concentrated loss at the east end of the span in the Connector Loss East field.

Step 11 Enter the concentrated loss at the west end of the span in the Connector Loss West field.

Step 12 Choose either the Length Based Model or the Absolute Model radio button.

Step 13 If you choose Length Based Model in Step 12, enter values in value fields for the following properties listed in the table at the bottom of the window:

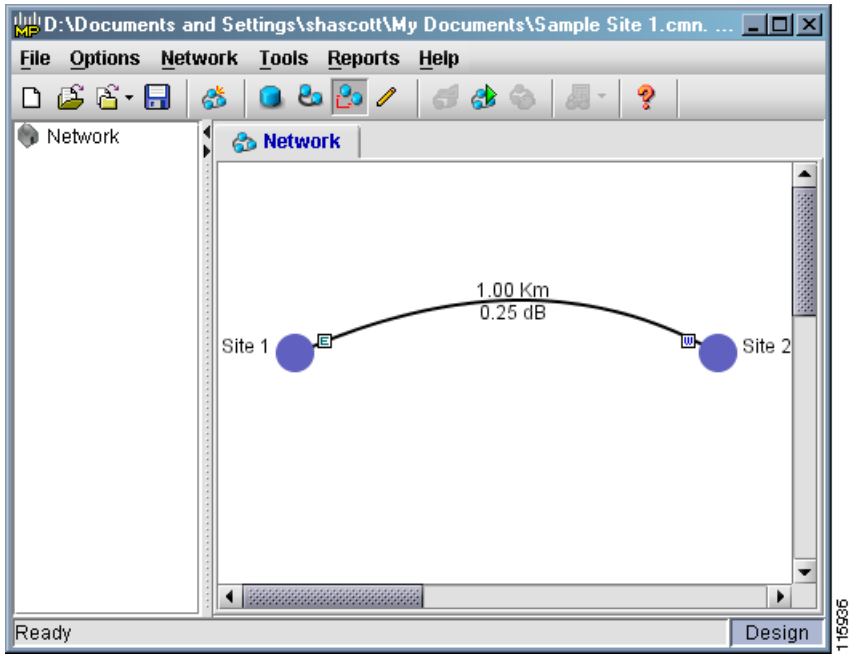
- Loss Factor—The value of the start of life fiber loss per kilometer used to calculate the loss of each span in the network. The fiber loss factor is always entered in dB/km, even if you selected miles as the span measurement unit. MetroPlanner automatically converts the loss factor from miles to kilometers.
- Chromatic Dispersion factor—The fiber chromatic dispersion factor. The default value is dependent on the selected fiber type. Any value you enter is lost whenever you change the fiber type. Chromatic dispersion is always entered in ps/nm/km, even if you selected miles as the span measurement unit. MetroPlanner automatically converts the loss factor from miles to kilometers. Fiber chromatic dispersion is defined for the middle of the wavelength band. It is defined at approximately 1545.3 nm.
- PMD factor—The PMD factor. The default value is dependent on the selected fiber type. Any value you enter is lost whenever you change the fiber type. PMD is always entered in $ps/(\sqrt{km})$, even if you selected miles as the span measurement unit. MetroPlanner automatically converts the loss factor from miles to kilometers.
- Total SOL Loss w/o Connectors—The start of life link fiber loss for each span, without the connector concentrated loss. The total SOL loss without connectors is equal to the loss factor multiplied by the length. This field is read-only.
- Total SOL Loss—The start of life link fiber loss for each span with the connector concentrated loss contributions. The total SOL loss is equal to the total SOL loss without connectors added to the connector loss west and connector loss east. This field is read-only.
- Total EOL Loss—The end of life link fiber loss for each span. This field is read-only.
- Total Chromatic Dispersion—The overall link fiber chromatic dispersion for each span. This field is read-only.
- Total PMD (DGD)—The DGD is the difference in arrival times of the two polarization modes at a particular wavelength and time with a specific PMD coefficient. This field is read-only.

Step 14 If you chose Absolute Model in Step 13, enter values in value fields for the following properties listed in the table at the bottom of the window:

- Total SOL Loss w/o Connectors—The start of life link fiber loss for each span, without the connector concentrated loss. The total SOL loss without connectors is equal to the loss factor multiplied by the length.

Step 15 Click **OK** to place the span. The span length appears between the selected sites (Figure 2-21).

Figure 2-21 Sample Span Length Between Two Sites



2.3.2.3 Adding Services

Adding services between sites allows you to specify the fixed service requests that are needed between two sites.

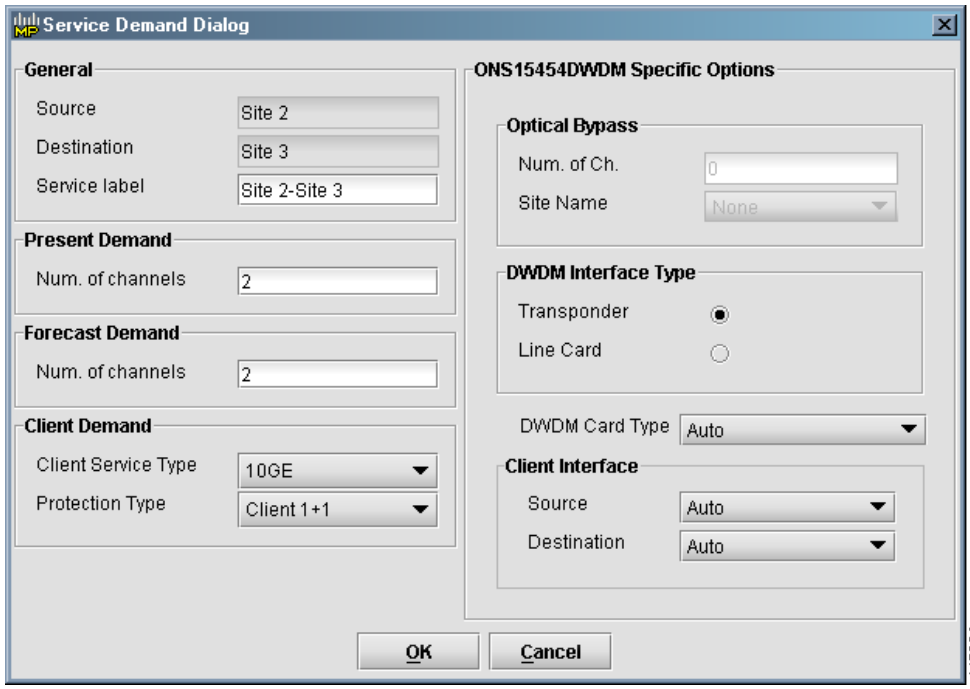
Step 1 Click **Add Channel Mode** on the menu bar. The cursor changes to a pencil with arrows pointing in opposite directions beside it.

Step 2 Click and release on one of the sites to which you want to add a channel.

Step 3 Move the cursor to the other site. When you move the cursor, a line appears between the two sites.

Step 4 Click the destination site. The Service Demand Dialog window appears (Figure 2-22).

Figure 2-22 Service Demand Dialog Window



Step 5 Enter a label for identifying the service in the Service Label field.

Step 6 In the Present Demand area, enter the present number of demand channels required in the Num of Channels field.

Step 7 In the Forecast Demand area, enter the total number of channels that will be needed in the future in the Num of Channels field. The value should be the number of channels needed on day one plus the number of channels the network will need to accommodate future growth.

Step 8 Select a Client Service Type for the channel. The choices are:

- OC-3/12/48/192 (ANSI)
- STM-1/4/16/64 (ETSI)
- Gigabit Ethernet
- 10GE—10 Gigabit Ethernet
- Fibre Channel
- Fibre Channel 2G
- Fibre Channel 10G
- 1G FICON (1 Gigabit Ethernet–FICON)
- 2G FICON (2 Gigabit Ethernet–FICON)
- ISC-Compat (ISC-1)
- ISC-Peer (ISC-3)
- Sysplex ETR (Sysplex External Time Reference)
- Sysplex CLO (Sysplex Control Link Oscillator)
- ESCON—Enterprise System Connection

- D1 Video
- SDI—Serial digital interface
- HDTV—High-definition television
- DV-6000
- 2R Any Rate
- 15530 10-Gbps Aggregate
- 15530 2.5-Gbps Aggregate
- 15530 MR Transport
- 15530 Data MXP

Step 9 Select a protection type from the Protection Type field. The four protection types are Client 1+1, Fiber Switched, Unprotected, and Y-Cable.

Step 10 In the Optical Bypass area, enter the number of channels for the optical bypass in the Num. of Ch. field. The number of optical bypass channels must be less than the number of channels listed in the Present Demand area.

Step 11 Select an optical bypass site name from the Site Name drop-down list.

Step 12 Choose a DWDM interface type. The two choices are Transponder and Line Card.

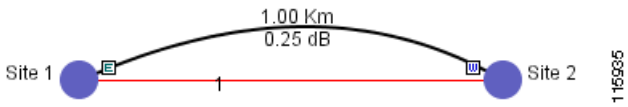
Step 13 Select a DWDM Card Type from the drop-down list.

Step 14 Select a Client Interface Source from the drop-down list.

Step 15 Select a Client Interface Destination from the drop-down list.

Step 16 Click **OK** to place the channel, or **Cancel** to quit. If you click OK, a line representing the channel appears between the two sites (Figure 2-23). The line has a number above it that indicates the number of channels present.

Figure 2-23 Sample Channel Between Two Sites



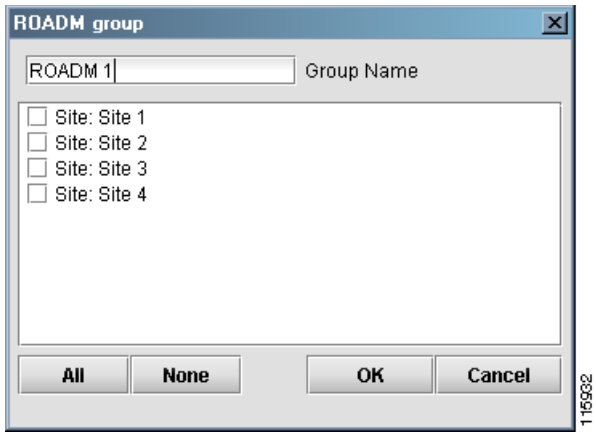
2.3.3 Creating an ROADM Traffic Group

MetroPlanner allows you to create ROADM traffic groups for a defined list of nodes.

Step 1 Right-click the Network folder in the traffic view. A menu appears.

Step 2 Select **Add ROADM Group** from the menu. The ROADM Group window appears (Figure 2-24).

Figure 2-24 ROADM Group Window



Step 3 Enter a name for the group in the Group Name field.

Step 4 Click the check boxes beside the nodes you want to include in the ROADM group. Only Auto, ROADM, and Terminal sites are available. Refer to the "2.3.2.1 Adding Sites" section on page 2-19 for more information.

Step 5 Click **All** to add all the sites to the group.

Step 6 Click **None** to remove all the sites from the group.

Step 7 Click **OK** to create the group, or **Cancel** to close the window without creating the group.

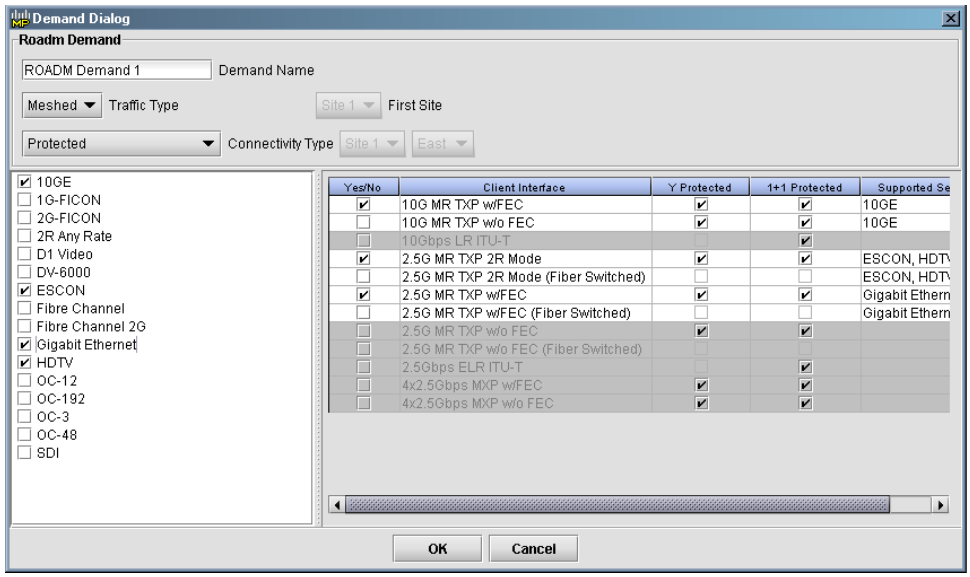
2.3.4 Creating an ROADM Demand

MetroPlanner allows you to manually create ROADM demands for the selected ROADM traffic group.

Step 1 Right-click on an ROADM traffic group. A menu appears.

Step 2 Select **Add Demand > Roadm** from the menu. The Demand Dialog window appears (Figure 2-25).

Figure 2-25 Demand Dialog Window



Step 3 Enter a name for the demand in the Demand Name field.

Step 4 Select a traffic type from the drop-down list. If you select Hub, the First Site drop-down button becomes available. If you selected Meshed, skip to Step 6.

Step 5 For Hub traffic types, select the originating site from the First Site drop-down list.

Step 6 Select a connectivity type from the Connectivity drop-down list. The connectivity choices are Protected, Unprotected Minimum Hop, Unprotected Optimum Path, and Unprotected Subnet. Refer to the "1.6.3 ROADM Traffic Groups" section on page 1-8 for more information on the connectivity choices. If you select Unprotected Subnet, the two drop-down buttons to the right of the Connectivity drop-down button become available. Skip to Step 8 if you selected any other connectivity type.

Step 7 Select the subnet starting node and outgoing side from the two drop-down buttons beside the Connectivity drop-down button.

Step 8 Check the boxes for one or more service types for the ROADM demand from the list in the left panel.

Step 9 You can further refine your choices in the right panel by adding client interfaces, and by choosing protection types. You can select more than one client interface to support the same service type. All the client interfaces supporting each selected service type are shown in the right panel. Client interfaces that only support unrequired service types are unavailable. MetroPlanner, by default, checks the best client interface to support each service. The protection check boxes allow you to define the type of protection that is supported for the selected client interface. These check boxes are only available when:

- The selected connectivity type is Protected
- The client interface is not Fiber Switched
- The Yes/No check box is checked

Step 10 Click **OK** to create the demand, or **Cancel** to close the window without saving any changes.

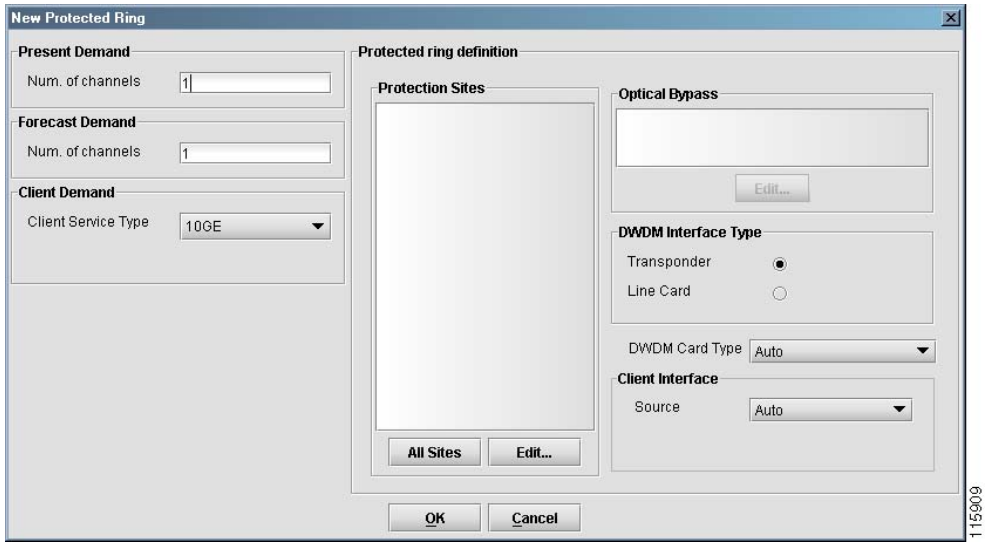
2.3.5 Creating a Protected Ring Network

MetroPlanner allows you to create protected ring networks.

Step 1 Create a ring network using either the procedures in the "2.3.1 Adding Networks Using the Network Wizard" section on page 2-14 or by manually placing sites into a ring configuration.

Step 2 Select **Tools > Create P-Ring** from the menu. The New Protected Ring window appears (Figure 2-26).

Figure 2-26 New Protected Ring Window



Step 3 Enter the number of present demand channels in the Num. of Channels field.

Step 4 Enter the number of forecasted demand channels in the second Num. of Channels field.

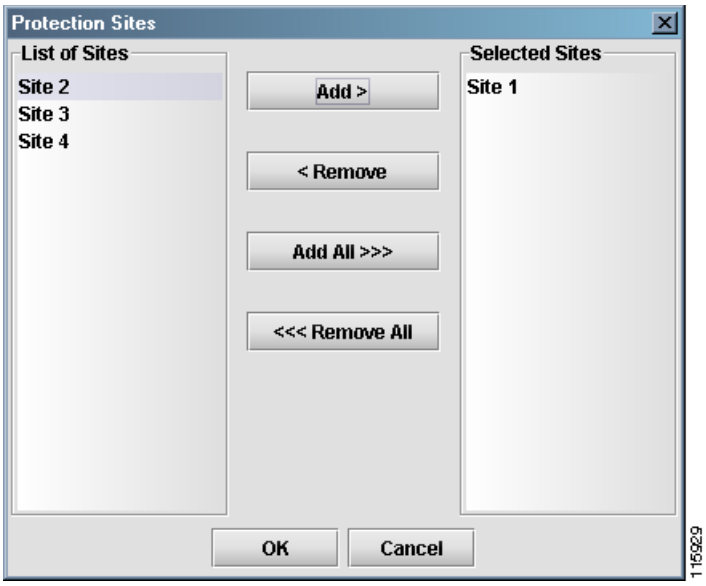
Step 5 Select a service type from the Client Service Type drop-down list.

Note Refer to the "2.3.2.3 Adding Services" section on page 2-24 for a detailed list of the items in the Client Equipment Type and Client Service Type fields.

Step 6 In the Protection Sites area, click **All Sites** to add all the sites in the ring as protection sites, or click **Edit** to add individual sites. Clicking Edit displays the Protection Sites window (Figure 2-27).

Note If you click All Sites, skip to Step 13.

Figure 2-27 Protection Sites Window



Step 7 Select one or more sites in the List of Sites area.

Step 8 Click **Add** to add the sites to the Selected Sites area.

Step 9 Click **Add All** to add all of the sites to the Selected Sites area.

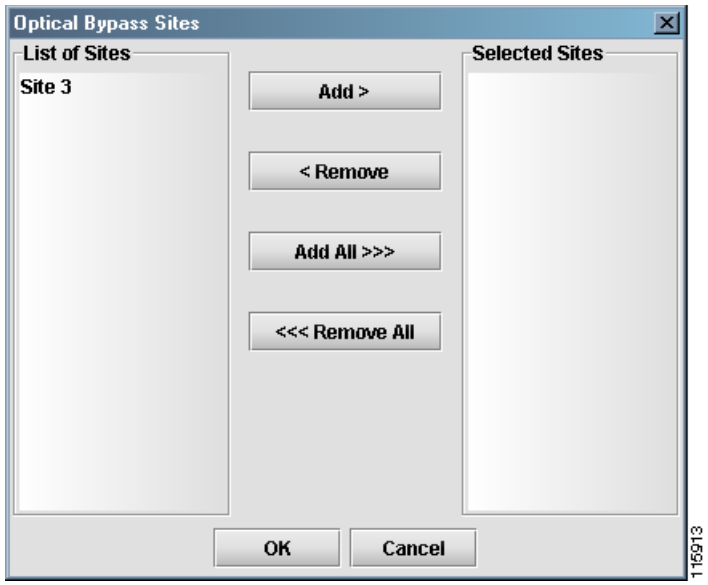
Step 10 Select one or more sites in the Selected Sites are and click **Remove** to remove sites from the area.

Step 11 Click **Remove All** to remove all of the sites from the Selected Sites area.

Step 12 Click **OK** to display the selected protection sites in the Protection Sites area of the New Protected Ring window. Click **Cancel** to close the window without making any changes.

Step 13 If you want to add optical bypass sites, click **Edit** in the Optical Bypass area. The Optical Bypass Sites window appears (Figure 2-28). If you do not want to add optical bypass sites, proceed to Step 20.

Figure 2-28 Optical Bypass Sites Window



The Optical Bypass Sites window lists any sites that are not part of the protection scheme.

Step 14 Select one or more sites in the List of Sites area.

Step 15 Click **Add** to add the sites to the Selected Sites area.

Step 16 Click **Add All** to add all of the sites to the Selected Sites area.

Step 17 Select one or more sites in the Selected Sites are and click **Remove** to remove sites from the area.

Step 18 Click **Remove All** to remove all of the sites from the Selected Sites area.

Step 19 Click **OK** to display the bypass sites in the Optical Bypass area of the New Protected Ring window. Click **Cancel** to close the window without making any changes.

Step 20 Choose a DWDM interface type.

Step 21 Select a DWDM card type from the drop-down list.

Step 22 Select a client interface source from the drop-down list.

Step 23 Click **OK** to create the protected ring group, or click **Cancel** to close the window without saving any changes.

2.4 Analyzing the Network

After you have placed the desired sites, spans, and service demands, click **Analyze Network** to examine the network performance. MetroPlanner automatically optimizes the design and summarizes the optical transmission performance in a summary report.

The Analyzer perform the following checks concerning the Any-to-Any and Any Client pattern:

- ROADM nodes cannot be used in conjunction with following node types:
  - HUB/Full-OADM (multi-hubbed ring cannot have ROADM units)

– OADM (both active and passive)

Note These constraints allows MetroPlanner to simultaneously define ROADM (Any-to-Any), fixed and P-Ring traffic on the same network if all the added/dropped sites are ROADM, and if neither OADM nor Hub/Full-OADM sites are defined in the same network (with the exception of linear networks, where end sites must be terminal sites).

- Networks with Any-to-Any clients only support 32-channel Metro-Core algorithms.

After the network has been analyzed, MetroPlanner changes the appearance of the boosters and preamplifiers associated with the sites (Figure 2-29).

Figure 2-29 Booster and Preamplifier Examples

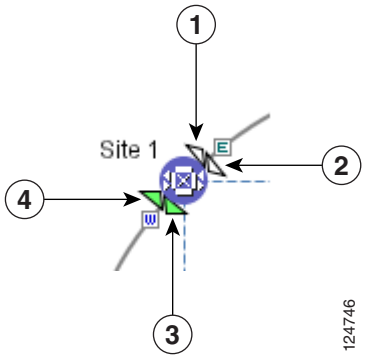


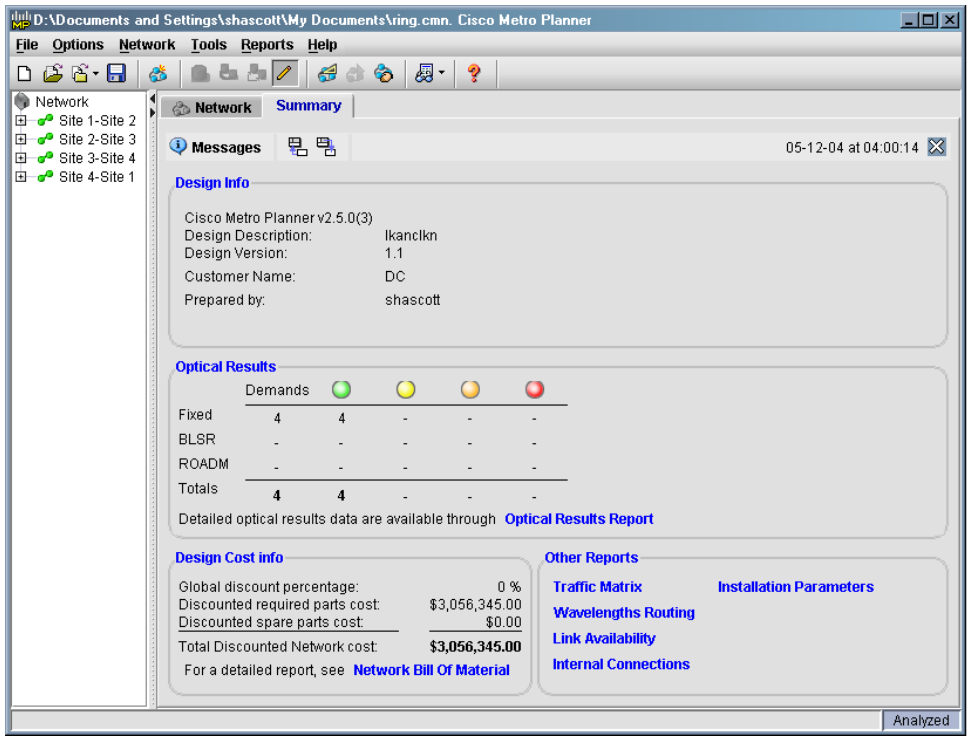
Table 2-4 Booster and Preamplifier Example Legend

Number	Description
1	East booster—unforced
2	East preamplifier—unforced
3	West booster—forced
4	West preamplifier—forced

2.4.1 Network Analysis Summary Tab

The Summary tab (Figure 2-30) is divided into four areas: Design Info, Optical Results, Design Cost Info, and Other Reports. The Design Info area displays information about the network. It is similar to the information found in the Add Network Wizard window (Figure 2-15).

Figure 2-30 Summary Tab



The Optical Results area displays the number of fixed, BLSR, and ROADM demands. The color in the columns indicate whether or not the current network design meets the requirements for the start to end of the equipment life. If a cell is green, the current design meets the requirements. If a cell is yellow or orange, the design is marginal. If the cell is red, the current network design does not meet the requirements for proper operation. Click the blue Optical Results Report text to view the Optical Results tab.

The Design Cost Info area displays the global discount percentage, the discounted required parts cost, the discounted spare parts cost, and the total discounted network cost. Click the blue Network Bill Of Material text to view the network bill of materials.

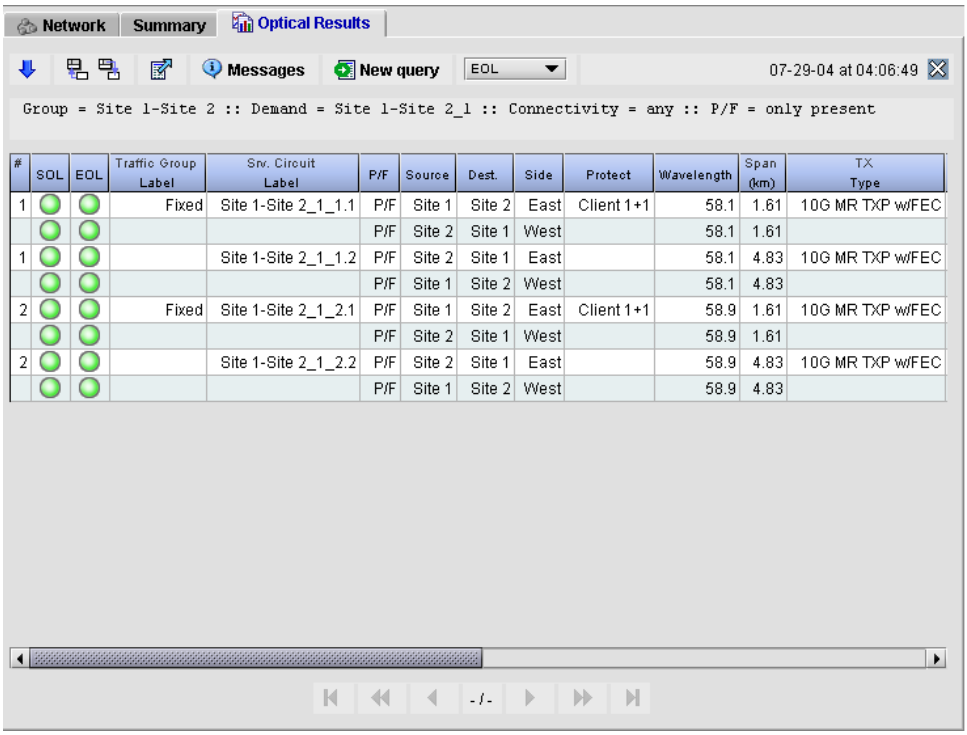
The Other Reports area allows you to view other MetroPlanner reports by clicking on the different selections in the area.

2.4.2 Viewing the Optical Results Tab

The Optical Results tab allows you to view the optical results of the network you created and analyzed.

Step 1 You can launch the Optical Results tab from the Summary window, or by selecting **Reports > Optical Results** from the menu. The Optical Results tab (Figure 2-31) appears.

Figure 2-31 Optical Results Tab



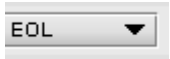
#	SOL	EOL	Traffic Group Label	Srv. Circuit Label	P/F	Source	Dest.	Side	Protect	Wavelength	Span (km)	TX Type
1			Fixed	Site 1-Site 2_1_1.1	P/F	Site 1	Site 2	East	Client 1+1	58.1	1.61	10G MR TXP w/FEC
					P/F	Site 2	Site 1	West		58.1	1.61	
1				Site 1-Site 2_1_1.2	P/F	Site 2	Site 1	East		58.1	4.83	10G MR TXP w/FEC
					P/F	Site 1	Site 2	West		58.1	4.83	
2			Fixed	Site 1-Site 2_1_2.1	P/F	Site 1	Site 2	East	Client 1+1	58.9	1.61	10G MR TXP w/FEC
					P/F	Site 2	Site 1	West		58.9	1.61	
2				Site 1-Site 2_1_2.2	P/F	Site 2	Site 1	East		58.9	4.83	10G MR TXP w/FEC
					P/F	Site 1	Site 2	West		58.9	4.83	

Table 2-5 displays the various buttons and lists that appear on all the tabs.

Table 2-5 Tab Icons

Button	Description
	Expand Header—Shows an expanded view of the header, including design information.
	Shrink Header—Shows the default view of the header, without the additional design information.
	Dock View to Bottom Area—Moves the tab information to the bottom of the screen.
	Dock View to Center Area—Moves the tab information from the bottom area to the default center view.
	Undock View on Desktop—Moves the tab information to a separate window on the desktop. Click Dock View to Center Area or Dock View to Bottom Area to move the tab information back to the tab view.
	Export Report—Opens the Export Report window, which allows you to export the tab information to a text or HTML file.
	Show Messages Detail—Opens the Analyzer Messages window, which shows you any messages pertinent to the current network design.

Table 2-5 Tab Icons (continued)

Button	Description
	Show Errors Detail—Opens the Analyzer Messages window, which displays any error messages that occurred when you analyzed the network. It indicates that the network may not be feasible.
	Run New Query—Opens the Optical Results Query Dialog Window.
	The EOL drop-down list allows you to filter the tab information. You can select start-of-life (SOL) information, EOL information, or both.
	The P/F drop-down list allows you to filter the tab information for present information, forecast information, or both.
	Go to the first page of the report.
	Go back 10 pages in the report.
	Go to the previous page.
	Displays the current page number and the total number of pages in the report.
	Go to the next page.
	Go forward 10 pages in the report.
	Go to the last page in the report.

Step 2 To change the table view to show SOL information, EOL information, or both, chooses a view from the SOL/EOL Filter drop-down list.

Each row in the tab shows the performance of one optical path. A protected channel has two paths, and therefore four rows. Table 2-6 describes the information in the columns.

Table 2-6 Network Optical Channel Results Tab Columns

Column Label	Description
#	Displays the identification number automatically given to each path in the order that the channels were entered into the design.
SOL	Displays the results of the start of life analysis. The indicator displays the optical performance for the path. Green indicates success, yellow indicates success with a marginal failure risk (between 0-16%), orange indicates the channel has a higher risk of failure (between 16-50%), and red indicates failure.

Table 2-6 Network Optical Channel Results Tab Columns (continued)

Column Label	Description
EOL	Displays the end of life analysis. The indicator displays the optical performance for the path at the end of the fiber's life. Green indicates success, yellow indicates success with a marginal failure risk (between 0-16%), orange indicates the channel has a higher risk of failure (between 16-50%), and red indicates failure.
Traffic Group Label	Displays the Traffic Group name for ROADM and P-Ring traffic. Displays the predefined string "Fixed" for fixed traffic.
Srv Circuit Label	Displays the service circuit name. This field is optionally entered from the Channel Dialog window.
P/F	Displays the present/forecast services indication.
Source	Displays the name of the source site.
Dest	Displays the name of the destination site.
Side	Identifies the side of the source site that each path of the service circuit leaves.
Protect	Displays the protection type of the channel. For a protected channel, both paths are shown. The path leaving the east side of the source is shown first.
Wavelength	Displays the assigned wavelength of the optical path.
Span (km)	Displays the total span (source -> destination) for this path in kilometers.
TX type	Displays the type of transceiver that is the DWDM Card Type (see 2.3.2.3 Adding Services).
BER target	Displays the bit error rate (BER) target for this channel based on the capability of the channel's optical interface. It is 1.0E-15 for the interfaces using forward error correction (FEC) and 1.0E-12 for interfaces without FEC.
OSNR (dB)	Displays the SOL/EOL average OSNR value at the receiver. OSNR refers to the selected RBW bandwidth.
OSNR Margin	Displays the OSNR margin.
RX (dBm)	Displays the SOL and EOL received average power at the destination site.
Power Margin (dB)	Displays the power budget margin at the receiver. It is defined as the offset between the receiver working point and the "BER curve with margin." A positive value indicates no power problems.
Overload Margin (dB)	Displays the overload margin at the receiver. A positive value indicates no overload problems.
RX atten	Displays the attenuator at the input of the receiver.
PMD (ps)	Displays the calculated total PMD for each circuit. If the overall PMD for the link overcomes the maximum allowed, the PMD value is colored red. The maximum allowed value depends on the client interface. For these special cases, the network must be manually resolved by contacting a Cisco optical sales engineer.
Latency	Displays the latency time for the current circuit.
Chr Disp Check	Displays the status of the chromatic dispersion check. Green indicates that the dispersion check passed. Red indicates that the dispersion check failed.

Step 3 Use the directional buttons at the bottom of the tab to scroll forward and backward through the optical results pages.

Step 4 Click **Shrink Header** to hide all the table header information.

Step 5 Click **Export Report** to export the optical results information to a file. You can save the file as an HTML file, or as a tab-separated text file that can be opened by several applications.

Step 6 Click **New Query** to open the Optical Results Query Dialog window (Figure 2-32). The Optical Results Query Dialog window allows you to filter the optical results using a variety of parameters and templates.

Figure 2-32 Optical Results Query Dialog Window

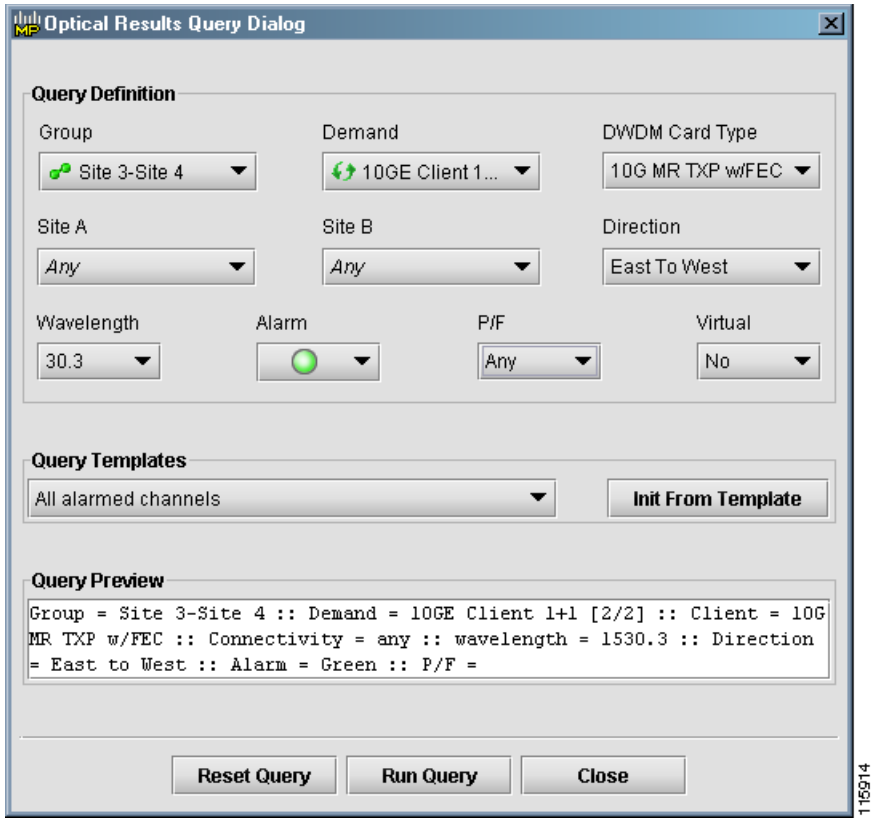


Table 2-7 describes the fields on the Optical Results Query Dialog Window.

Table 2-7 Optical Results Query Dialog Window Fields

Column Label	Description
Group	Selecting a traffic group filters the report to include only the data in the selected group. You can also view groups on the tree view under the Network root.
Demand	Selecting a traffic demand filters the report to include only the data in the selected demand. The demand field is available only when you select a specific traffic group.
DWDM Card Type	Selecting a card type filters the report to include only the data in the selected DWDM card type.
Site A / Site B	Allows you to filter only the results of incoming/outgoing services to or from a specific site (if you select Any), or between a pair of sites (if both are specified).

Table 2-7 Optical Results Query Dialog Window Fields (continued)

Column Label	Description
Direction	Allows you to filter for services that are routed in the specified direction. The direction refers to the fiber transmitting direction.
Wavelength	Allows you to filter for services using the specified wavelength.
Alarm	Allows you to filter for services flagged with a green, yellow, orange, or red indicator.
P/F	Allows you to filter for present services, forecast services, or both.
Virtual	Allows you to include or exclude virtual channels in the Optical Results Table.

Step 7 To perform a query using individual parameters, select the desired parameters from the 10 drop-down lists in the Query Definition area. The selected parameters appear in the Query Preview area at the bottom of the screen.

Step 8 To perform a query using a pre-defined query template, select a template from the Query Templates drop-down list and click **Init From Template**. The parameters included in the template appear in the Query Preview area.

Step 9 Click **Run Query**. The window closes, and the query results appear in the Optical Results tab. The parameters of the query appear in the horizontal area just below the button bar.

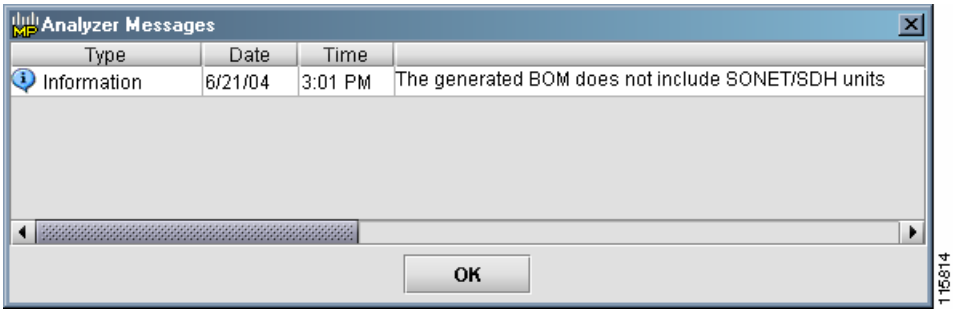
Step 10 Click **Reset Query** to clear your selections in the Optical Results Query Dialog window, or click **Close** to close the window without running a query.

Step 11 To view a demand's optical channel result at any time, right-click on the desired traffic demand in the tree view and select Optical Results.

Step 12 Click **Messages** on the tab to view the Analyzer Messages window (Figure 2-33), which displays any messages that occurred during the network analysis. If there are any errors in the analysis, click **Errors** to view the error messages in the window.

Note You can also select **Reports > Show Messages** to view the Analyzer Messages window.

Figure 2-33 Analyzer Messages Window



Step 13 Click **OK** to close the Analyzer Messages window.

Step 14 Click **Dock View to Bottom Area** to position the Optical Results tab below the Network tab. Click it again to return to the previous view.

Step 15 Click **Undock View on Desktop** to detach the Optical Results tab and view it as a stand-alone window.

Step 16 Click **Dock View to Center Area** to return to the previous view.

2.5 Editing and Viewing Network Components

MetroPlanner allows you to edit and view the network components either before or after the analysis. Error messages that occur during the analysis often cannot be resolved until you edit one or more network components.

2.5.1 Editing Site Parameters

Editing the site parameters allows you to make changes to the current site configuration.

Step 1 Create or open a network design.

Step 2 Click **Edit** on the menu bar.

Step 3 Double-click a site in the main MetroPlanner window, or right-click a site and select Edit Site from the menu. The Site Dialog window (Figure 2-19) appears.

The window displays site, rack, shelf, slot, and card information, in addition to the site parameters, type, and amplifier information you selected when you created the site. The window is divided into three areas. The area on the far left contains the information you entered when you created the site. The middle area contains a button bar and expandable nodes that represent the site, racks, shelves, and additional equipment. The area at the far right contains a graphical representation of the site, racks, and shelves.

Step 4 Make any changes to the fields as described in the "2.3.2.1 Adding Sites" section on page 2-19.

Step 5 To change the layout of the node graphic, right-click on the tree root site icon and select **Layout Customization**. A sub-menu opens, displaying the following custimization options: AIC, Fibre Storage, and Patch Panels.

Step 6 Select the items you want to display on the node graphic. The node graphic updates in real-time to display the selected item.

Although there are two distinct patch panel options, the final network design only contains a single option that applies to both. The patch panel options are only available for Hub, Full OADM and Terminal site types. For Terminal types, only one patch panel is added/removed. For Hub and Full-OADM types, both patch panels are added/removed.

Note If you change the network design after the design has been analyzed, the changes are applied immediately to the site layout without having to re-analyze the network.

Step 7 Click **OK** to save the changes and close the window.

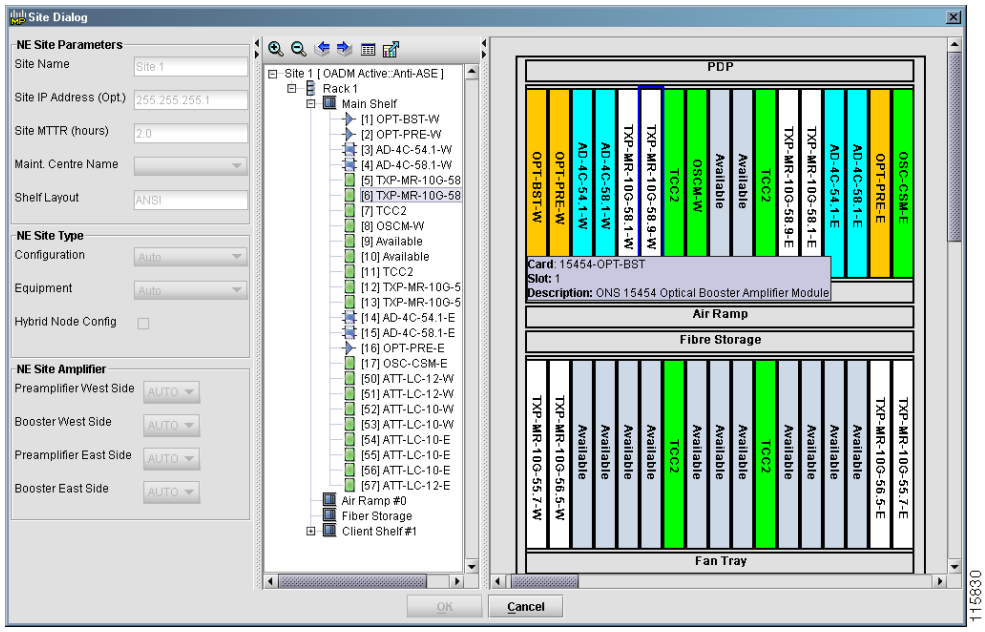
Note You can only make site changes before running the network analysis. If you need to make changes to a site that is a part of an analyzed network, click **Design Mode** on the menu bar to revert the network to the design mode, where you can edit the site. You must then run the Network Analyzer again to obtain a valid network configuration.

2.5.2 Displaying Shelf Configurations

After analyzing the network design, you can examine the shelf configuration for each of the sites using the Edit Site dialog box.

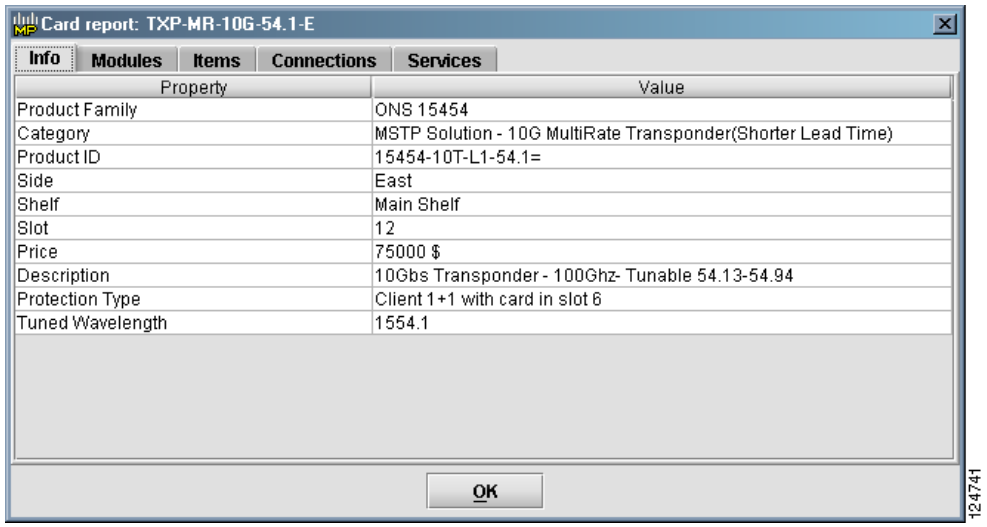
Step 1 Click **Edit** and double-click a site in the Network tab to display the Site Dialog window (Figure 2-34).

Figure 2-34 Site Dialog Window Showing Shelf Configuration



Step 2 Double-click different areas of the graphic on the far right of the window to see information specific to that rack, shelf, or card. A separate window appears, displaying information for the selected item.

Figure 2-35 Sample Report Window



The information displayed in the window varies from item to item. See Table 2-8 for a complete listing of the tabs and columns available in the window.

Table 2-8 Site Dialog Report Window Tabs and Columns

Tab	Column	Description
Info	Property	Displays the categories of information available for the selected item.
	Value	Displays the actual item description.
Modules	P/F	Displays the present and forecast module information.
	Module PID	Displays the module part number.
	Ch #	Displays the channel number.
	Description	Displays the description of the module.
Items	Item PID	Displays the item part number.
	Category	Displays the category to which the item belongs.
	Description	Displays a description of the item.
	Count	Indicates the number of these items present.
	Notes	Displays any notes available for the item.
Connections	Port	Displays the port name.
	Conn. Port	Displays the connection port name.
	Conn. Card	Displays the connection card name.
	Conn. Position	Displays the position of the connection.

Table 2-8 Site Dialog Report Window Tabs and Columns (continued)

Tab	Column	Description
Services	Service Filtering Option	Select a filtering option for the services. Choices are None, Only Added, Only Dropped, Only Express, and Only Optical Bypass.
	Service Label	Displays the service label.
	Src Site	Displays the source site name.
	Src Pos	Displays the source rack and shelf position.
	Src Unit	Displays the source card (unit) name.
	Src Port	Displays the source port.
	Dest Site	Displays the destination site name.
	Dest Pos	Displays the destination rack and shelf position.
	Dest Unit	Displays the destination card (unit) name.
	Dest Port	Displays the destination port.
	Cl. Service	Displays the client service type.
	Protection	Displays the current protection scheme.
	ITU Ch.	Displays the ITU channel.
	Op. Bypass	Displays the name of the optical bypass site.
	Cl. Interf.	Displays the DWDM interface type (transponder or line card).
	Cl. Card	Displays the DWDM card type.

Step 3 Click **Zoom In** and **Zoom Out** on the button bar to view more or less detail on the graphic.

Step 4 Click either the left or right arrow button to view information for the next or previous site in the network.

Step 5 To view the site layout in table format, click **View Layout As Table**. The site information appears as a separate window in table format, allowing you to export to an external application, if you desire.

Step 6 To export the layout to an image file, click **Export View To Image**.

Step 7 To exit the shelf layout window, click **Cancel**.

2.5.3 Deleting a Site

Perform the following steps to delete an existing site from the network design.

Step 1 Right-click the site in the main MetroPlanner window and select **Delete Site** from the menu. A confirmation message appears, asking you to confirm the deletion of the site.

Step 2 Click **Yes** to delete the site.

Note If the site has associated service demands or channels, you must first delete those demands or channels before deleting the site.

2.5.4 Editing Service Demand Allocations

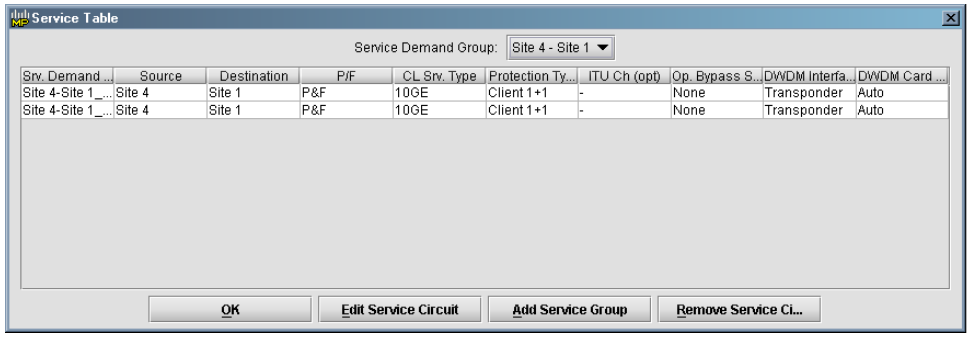
You can change the distribution of services in a group of fixed or P-ring service demands as well as view the service requests between to sites using the following steps.

Step 1 Create or open a network design.

Step 2 Click **Edit Mode** on the menu bar.

Step 3 Double-click a channel/service in the main MetroPlanner window, or right-click a service and select Edit Service from the menu. The Service Table window (Figure 2-36) appears.

Figure 2-36 Service Table Window



The Services Table window displays information about the selected service. Table 2-9 lists the fields and columns and their descriptions.

Table 2-9 Service Table Columns

Column/Field Label	Description
Srv. Demand Label	Displays the service demand label.
Source	Displays the name of the source node.
Destination	Displays the name of the destination node.
P/F	Present and Forecast. This column displays “P&F” if services are configured both currently and in the future. If services are for future only, “F” is displayed. If services are configured only for current activity, “P” is displayed.
Cl Srv. Type	Displays the client service type.
Protection Type	Specifies the protection type, if any. You can force routing of service by selecting Unprotected-East or Unprotected-West from the drop-down list.

Table 2-9 Service Table Columns (continued)

Column/Field Label	Description
ITU Ch (opt)	Displays the ITU channel of the service demand. You can force the channel number by selecting a new channel from the drop-down list in the field.
Op. Bypass Site Name	Displays the name of the optical bypass site, if one is assigned.
DWDM Interface Type	Displays the DWDM interface type.
DWDM Card Type (opt)	Displays the DWDM card type.

Step 4 To display the Service Demand Dialog window, double-click a row, or select a row and click **Edit Service Circuit**. The Service Demand Dialog window (Figure 2-22) appears, allowing you make changes to the service.

Note You can only make service changes before running the network analysis. If you need to make changes to a service that is a part of an analyzed network, click **Design Mode** on the menu bar to revert the network to the design mode, where you can edit the service. You must then run the Network Analyzer again to obtain a valid network configuration.

Step 5 Make any changes to the fields as described in the "2.3.2.3 Adding Services" section on page 2-24.

Step 6 To delete a service, select the service and click **Remove Service Circuit**.

Step 7 To add a service group, click the **Add Service Group** button. The Service Demand Dialog window appears, allowing you to create a new service.

Step 8 Click **OK** to save the changes and close the window.

2.5.5 Editing Fiber Span Parameters

Editing the fiber span parameters allows you make changes to fiber type, span length, and other fiber-related items.

Step 1 Create or open a network design.

Step 2 Click **Edit Mode** on the menu bar.

Step 3 Double-click a fiber span in the main MetroPlanner window, or right-click the fiber span and select Edit Fibre from the menu. The Fibres Dialog window (Figure 2-20) appears, allowing you to make changes to the fiber span.

Note You can only make fiber changes before running the network analysis. If you need to make changes to a fiber that is a part of an analyzed network, click **Design Mode** on the menu bar to revert the network to the design mode, where you can edit the fiber. You must then run the Network Analyzer again to obtain a valid network configuration.

Step 4 Make any changes to the fields as described in the "2.3.2.2 Adding Fiber Spans" section on page 2-22.

Step 5 To save the changes, click **OK**.

2.5.6 Deleting a Fiber Span

Perform the following steps to delete a fiber span from the network design.

Step 1 Right-click the fiber and select **Delete Fibre** from the menu. A confirmation dialog box appears, asking you to confirm the fiber deletion.

Step 2 Click **Yes** to confirm the fiber deletion.

2.5.7 Viewing the Traffic Matrix

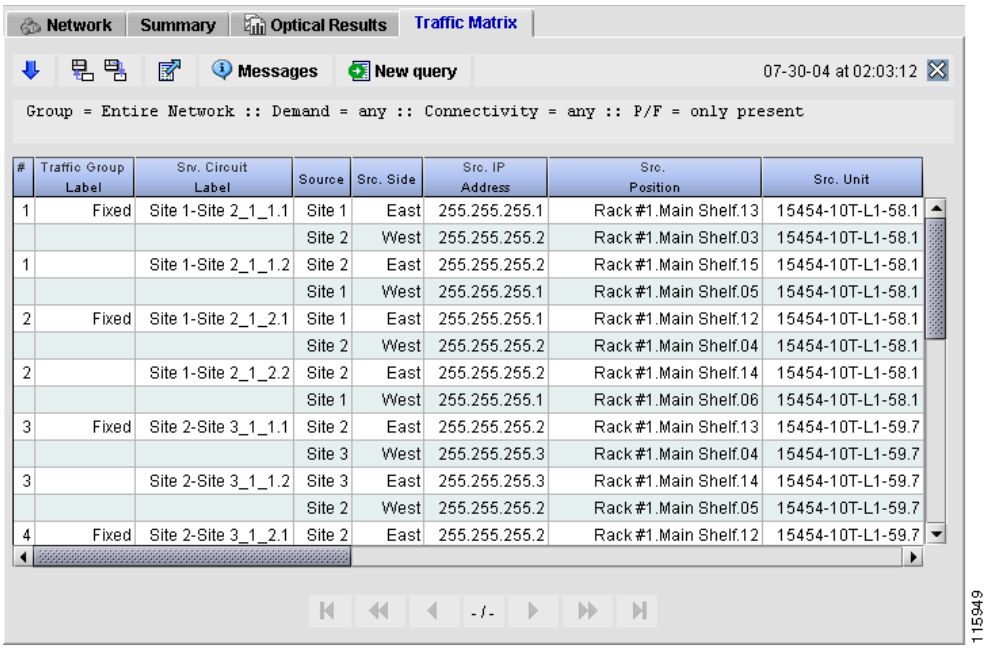
The Traffic Matrix window displays information about the external connections on the client side.

Note When opened from the menu, the Traffic Matrix appears blank until after you run a query from the Traffic Matrix tab. See Step 6 of "2.4.2 Viewing the Optical Results Tab" section on page 2-33 for information on running a query.

Step 1 Create or open an analyzed network.

Step 2 Select **Reports > Traffic Matrix**. The Traffic Matrix window appears (Figure 2-37). The query runs automatically, displaying information based on the selected item in the tree view. You can also view the traffic matrix for a specific demand by right-clicking the desired traffic demand in the tree view

Figure 2-37 Traffic Matrix Window



#	Traffic Group Label	Srv. Circuit Label	Source	Src. Side	Src. IP Address	Src. Position	Src. Unit
1	Fixed	Site 1-Site 2_1_1.1	Site 1	East	255.255.255.1	Rack#1.Main Shelf.13	15454-10T-L1-58.1
			Site 2	West	255.255.255.2	Rack#1.Main Shelf.03	15454-10T-L1-58.1
1		Site 1-Site 2_1_1.2	Site 2	East	255.255.255.2	Rack#1.Main Shelf.15	15454-10T-L1-58.1
			Site 1	West	255.255.255.1	Rack#1.Main Shelf.05	15454-10T-L1-58.1
2	Fixed	Site 1-Site 2_1_2.1	Site 1	East	255.255.255.1	Rack#1.Main Shelf.12	15454-10T-L1-58.1
			Site 2	West	255.255.255.2	Rack#1.Main Shelf.04	15454-10T-L1-58.1
2		Site 1-Site 2_1_2.2	Site 2	East	255.255.255.2	Rack#1.Main Shelf.14	15454-10T-L1-58.1
			Site 1	West	255.255.255.1	Rack#1.Main Shelf.06	15454-10T-L1-58.1
3	Fixed	Site 2-Site 3_1_1.1	Site 2	East	255.255.255.2	Rack#1.Main Shelf.13	15454-10T-L1-59.7
			Site 3	West	255.255.255.3	Rack#1.Main Shelf.04	15454-10T-L1-59.7
3		Site 2-Site 3_1_1.2	Site 3	East	255.255.255.3	Rack#1.Main Shelf.14	15454-10T-L1-59.7
			Site 2	West	255.255.255.2	Rack#1.Main Shelf.05	15454-10T-L1-59.7
4	Fixed	Site 2-Site 3_1_2.1	Site 2	East	255.255.255.2	Rack#1.Main Shelf.12	15454-10T-L1-59.7

Table 2-10 describes the information in the Traffic Matrix window.

Table 2-10 Traffic Matrix Columns

Column Name	Description
Traffic Group Label	Displays the traffic group name for ROADM and P-Ring traffic. Displays the predefined string "Fixed" for fixed traffic.
Srv. Circuit Label	Displays the service circuit label.
Source	Displays the source site name.
Src. Side	Displays the source side of the site (east or west).
Src. IP Address	Displays the IP address of the source site.
Src. Position	Displays the source rack and shelf position.
Src. Unit	Displays the source card (unit) name.
Src. Port	Displays the source port.
Destination	Displays the destination site name.
Dest. Side	Displays the destination side of the site (east or west).
Dest. IP Address	Displays the IP address of the destination site.
Dest. Position	Displays the destination rack and shelf position.
Dest. Unit	Displays the destination card (unit) name.
Dest. Port	Displays the destination port.
Cl. Service Type	Displays the client service type.
Protection Type	Displays the current protection scheme.

Table 2-10 Traffic Matrix Columns (continued)

Column Name	Description
Wavelength	Displays the wavelength.
Op. Bypass Site Name	Displays the name of the optical bypass site.
DWDM Interface Type	Displays the DWDM interface type (transponder or line card).
DWDM Card Type	Displays the DWDM card type (10G MR TXP w/FEC or 10G MR TXP w/o FEC).

Step 3 Click **Shrink Header** to hide the text that appears above the table rows.

Step 4 Click **Export Report** to save the information to an external file. The Save Table window appears, allowing you to enter or select an HTML or text file name.

Step 5 Click **Messages** to view the Analyzer Messages window (Figure 2-33).

Step 6 Click **Dock View to Bottom Area** to position the tab below the Network tab. Click it again to return to the previous view.

Step 7 Click **Undock View on Desktop** to detach the tab and view it as a stand-alone window.

Step 8 Click **Dock View to Center Area** to return to the previous view.

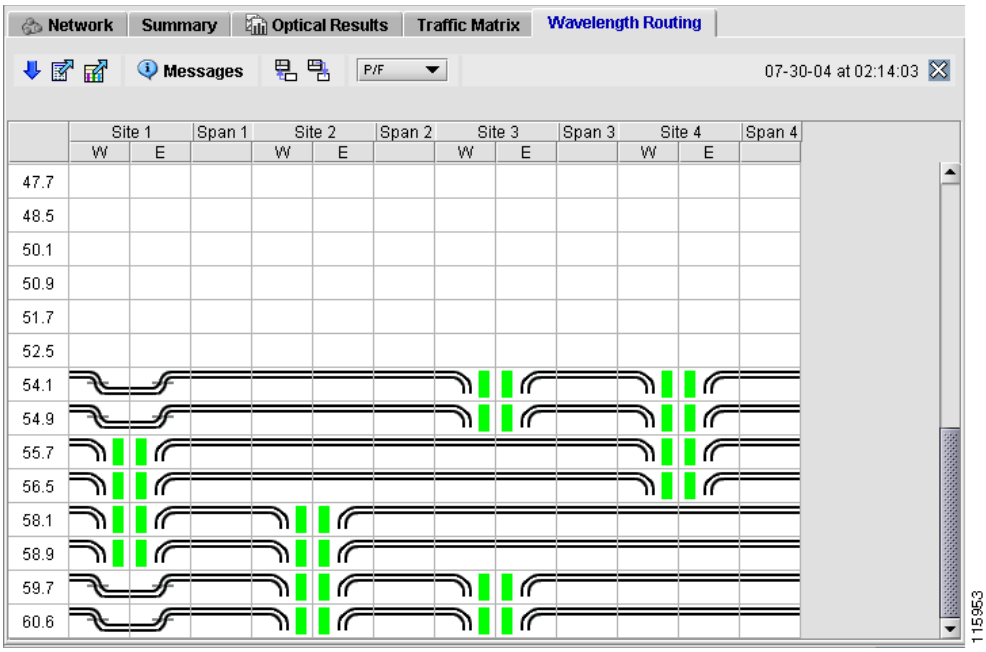
2.5.8 Viewing the Wavelength Routing

The Wavelength Routing Map allows you to view a graphical traffic display of all the present and forecast, fixed and protected ring routed circuits in the network.

Step 1 Create or open an analyzed network.

Step 2 Select **Reports > Wavelength Routing** from the menu. Alternatively, you can open the Wavelength Routing window by clicking **View Reports** and selecting Wavelength Routing from the drop-down. The Wavelength Routing tab appears (Figure 2-38).

Figure 2-38 Wavelength Routing Tab



Each row represents a wavelength. The Wavelength Routing tab displays all the wavelengths, not just the wavelengths used by the network design. Each column represents the sites and each bidirectional span. The site columns are subdivided into two other columns, which represent the east and west side of the site.

Each bidirectional routed channel is represented by a line starting from the source site to the destination site through the sites and spans traversed by the channel. Protected circuits are represented by two distinct routes.

Step 3 Place the cursor over the different sections of the map to display tool tip information about the routed circuits. The tool tips display the circuit label, service circuit type, protection type, and the DWDM card type.

Step 4 Click **Shrink Header** to hide the text that appears above the table rows.

Step 5 Click **Export Report** to save the information to an external file. The Save Table window appears, allowing you to enter or select an HTML or text file name.

Step 6 Click **Export Report As Image** to save the information in the map to an external image file.

Step 7 Click **Messages** to view the Analyzer Messages window (Figure 2-33).

Step 8 Click **Dock View to Bottom Area** to position the tab below the Network tab. Click it again to return to the previous view.

Step 9 Click **Undock View on Desktop** to detach the tab and view it as a stand-alone window.

Step 10 Click **Dock View to Center Area** to return to the previous view.

2.5.9 Viewing the Link Availability

MetroPlanner provides the ability to view a link availability table listing an availability value (as a percentage) for each circuit in the network. MetroPlanner defines the value globally for the circuit, and factors in both paths for protected circuits. For BLSR/MSP-Ring-type ring protection, link availability is provided for each individual service circuit.

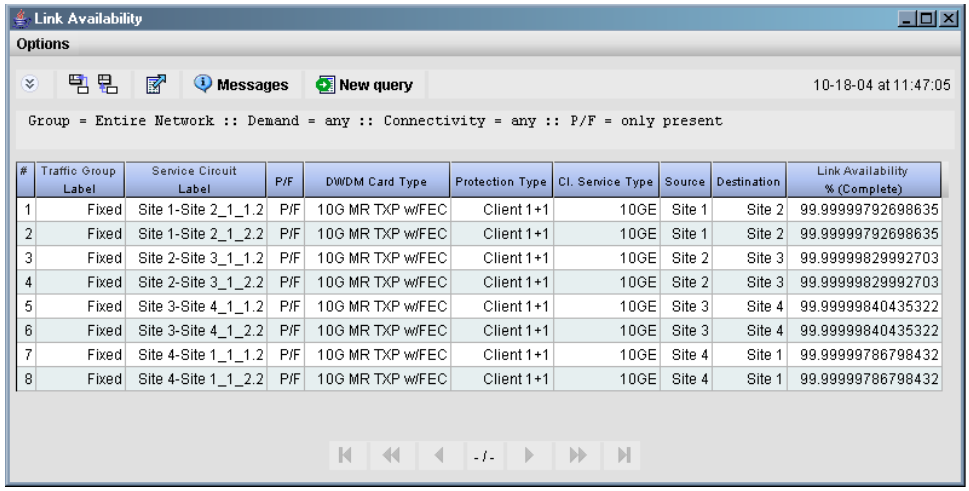
Step 1 Create or open an analyzed network.

Step 2 Select **Reports > Link Availability**. Alternatively, click **View Report** and select Link Availability from the list, or right-click an item in the tree view and select Link Availability.

Note Opening the Link Availability window via right-click displays all the circuits in the subtree in the window.

The Link Availability tab appears (Figure 2-39).

Figure 2-39 Link Availability Tab



#	Traffic Group Label	Service Circuit Label	P/F	DWDM Card Type	Protection Type	Cl. Service Type	Source	Destination	Link Availability % (Complete)
1	Fixed	Site 1-Site 2_1_1.2	P/F	10G MR TXP w/FEC	Client 1+1	10GE	Site 1	Site 2	99.99999792698635
2	Fixed	Site 1-Site 2_1_2.2	P/F	10G MR TXP w/FEC	Client 1+1	10GE	Site 1	Site 2	99.99999792698635
3	Fixed	Site 2-Site 3_1_1.2	P/F	10G MR TXP w/FEC	Client 1+1	10GE	Site 2	Site 3	99.99999829992703
4	Fixed	Site 2-Site 3_1_2.2	P/F	10G MR TXP w/FEC	Client 1+1	10GE	Site 2	Site 3	99.99999829992703
5	Fixed	Site 3-Site 4_1_1.2	P/F	10G MR TXP w/FEC	Client 1+1	10GE	Site 3	Site 4	99.99999840435322
6	Fixed	Site 3-Site 4_1_2.2	P/F	10G MR TXP w/FEC	Client 1+1	10GE	Site 3	Site 4	99.99999840435322
7	Fixed	Site 4-Site 1_1_1.2	P/F	10G MR TXP w/FEC	Client 1+1	10GE	Site 4	Site 1	99.99999786798432
8	Fixed	Site 4-Site 1_1_2.2	P/F	10G MR TXP w/FEC	Client 1+1	10GE	Site 4	Site 1	99.99999786798432

Table 2-11 describes the information in the Link Availability tab.

Table 2-11 Link Availability Tab Columns

Column Name	Description
Traffic Group Label	Displays the traffic group name for ROADM and P-Ring traffic. For fixed traffic, it displays the predefined string “Fixed”.
Service Circuit Label	Displays the service circuit label.
Source	Displays the service circuit source site name.
Destination	Displays the service circuit destination site name.
Protection Type	Displays the service circuit protection type.

Table 2-11 Link Availability Tab Columns (continued)

Column Name	Description
DWDM Card Type	Displays the client DWDM card type.
Link Availability% Complete	Displays the link availability, in percentage complete.

Step 3 Click **Shrink Header** to hide the text that appears above the table rows.

Step 4 Click **Export Report** to save the information to an external file. The Save Table window appears, allowing you to enter or select an HTML or text file name.

Step 5 Click **Messages** to view the Analyzer Messages window (Figure 2-33).

Step 6 Click **Dock View to Bottom Area** to position the tab below the Network tab. Click it again to return to the previous view.

Step 7 Click **Undock View on Desktop** to detach the tab and view it as a stand-alone window.

Step 8 Click **Dock View to Center Area** to return to the previous view.

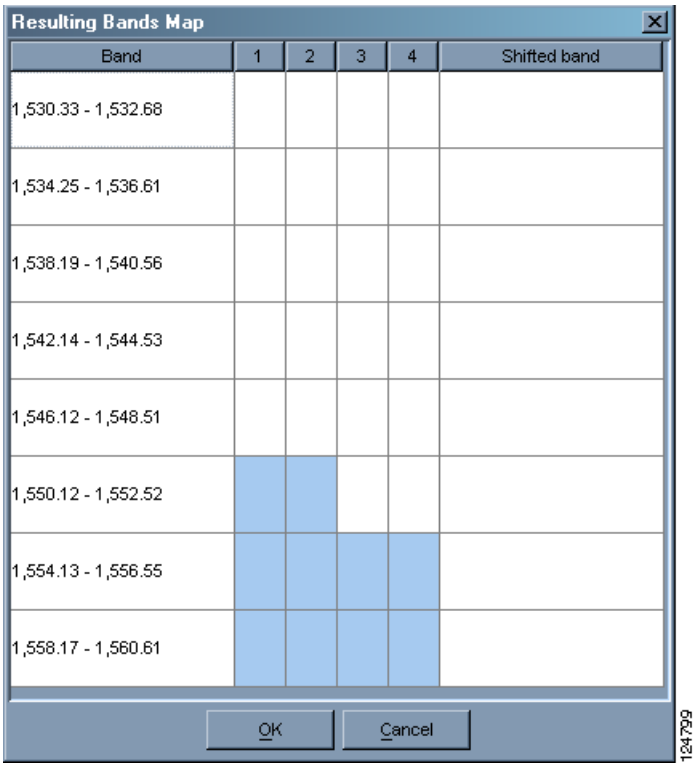
2.5.10 Modifying the Filter Wavelengths

After analyzing the network, you can force channels to any one of the wavelength bands supported by the ONS 15454.

Step 1 Create or open an analyzed network.

Step 2 Choose **Network > Bands Shifting** from the menu bar. The Resulting Bands Map window will display (Figure 2-40).

Figure 2-40 Resulting Bands Map Window



The Resulting Bands Map window shows which wavelengths are in use in which bands. A used wavelength is indicated by light blue shading in the cell.

Step 3 To switch the wavelengths to any available band, click on the drop down list in the Shifted Band column to the right of the wavelength.

Step 4 Select a wavelength from the drop-down list. The new wavelength then appears in the Shifted Band column.

Note The drop-down list only appears after you click in the cell.

Step 5 After switching bands, click **OK** to close the window, or click **Cancel** to close the window without saving any changes.

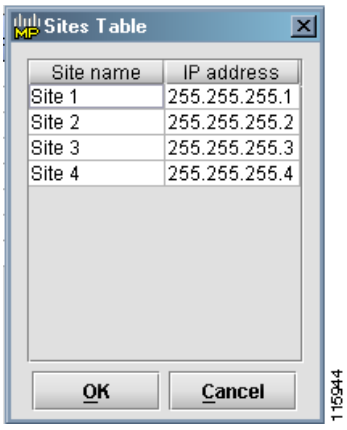
2.5.11 Viewing the Sites Table

The Sites Table displays a list of the sites in the network and their IP addresses.

Step 1 Create or open a network design.

Step 2 Select **Network > Sites Table**. The Sites Table appears (Figure 2-41).

Figure 2-41 Sites Table



Step 3 To copy the information in the window, right-click any row and select **Copy Table**.

Step 4 To export the information to an external file, right-click any row and select **Export Table**. A Save Table window appears, allowing you to enter or select a file name for the exported information. You can save site table files as either HTML or text files.

Step 5 Click **Save**.

Step 6 Click **OK** or **Cancel** to close the Sites Table window.

2.5.12 Viewing the Span Table

The Span table displays a list of the spans in the network.

Step 1 Create or open a network design.

Step 2 Select **Network > Span Table**. The Fibres Dialog window appears (Figure 2-20).

Step 3 Click **OK** to close the window.

2.5.13 Arranging Sites in the Network View

After creating a network, you can use MetroPlanner to automatically arrange the sites into several configurations. MetroPlanner offers six different configurations.

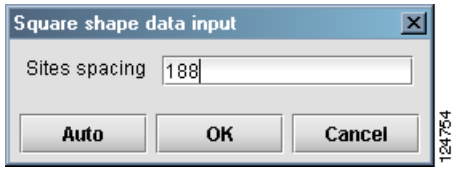
2.5.13.1 Using the Square Configuration

The square configuration displays the network in a square format.

Step 1 Create or open a network design.

Step 2 Select **Network > Arrange Sites > Square**. The Square Shape Data Input window appears (Figure 2-42).

Figure 2-42 Square Shape Data Input Window

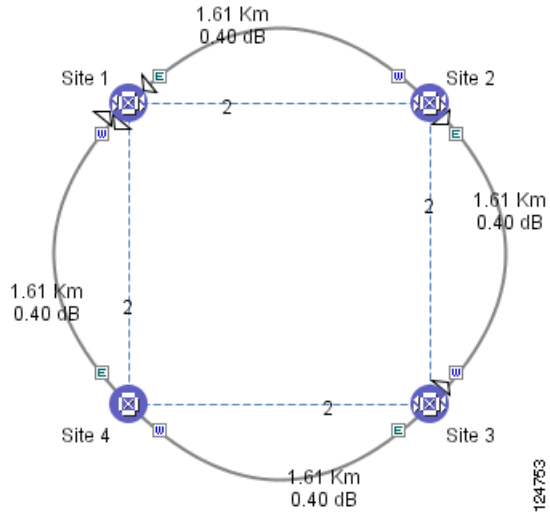


Step 3 Enter a number indicating the amount of space to place between the sites in the Sites Spacing field. Higher numbers create larger spaces between sites.

Alternatively, click Auto to allow MetroPlanner to automatically place the sites at a predetermined distance from each other.

Step 4 Click **OK** to create the spacing, or click **Cancel** to close the window without applying the square configuration. Refer to Figure 2-43.

Figure 2-43 Example of a Square Configuration



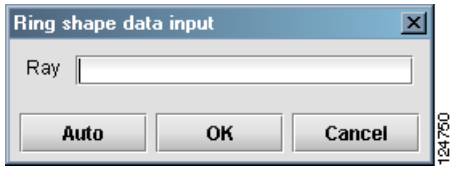
2.5.13.2 Using the Ring Configuration

The ring configuration displays the network in a circular, or ring format.

Step 1 Create or open a network design.

Step 2 Select **Network > Arrange Sites > Ring**. The Ring Shape Data Input window appears (Figure 2-44).

Figure 2-44 Ring Shape Data Input Window

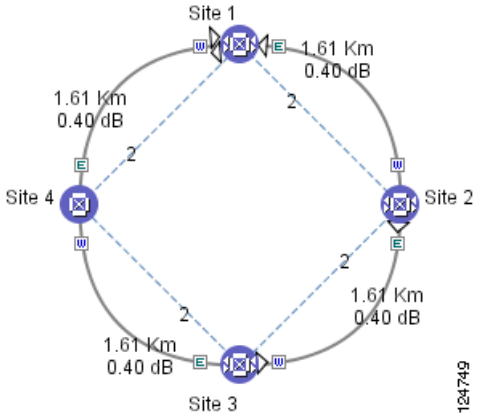


Step 3 Enter a number indicating the radius of the ring in the Ray field. A higher numbers creates a larger ring.

Alternatively, click Auto to allow MetroPlanner to automatically create a ring at a predetermined size.

Step 4 Click **OK** to create the ring, or click **Cancel** to close the window without applying the ring configuration. Refer to Figure 2-45.

Figure 2-45 Ring Configuration Example



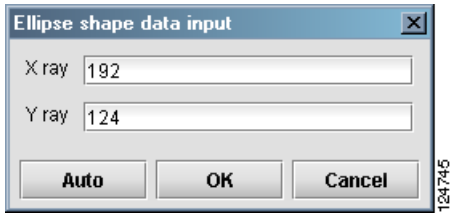
2.5.13.3 Using the Ellipse Configuration

The ellipse configuration displays the network in a oval, or ellipse format.

Step 1 Create or open a network design.

Step 2 Select **Network > Arrange Sites > Ellipse**. The Ellipse Shape Data Input window appears (Figure 2-46).

Figure 2-46 Ellipse Shape Data Input Window



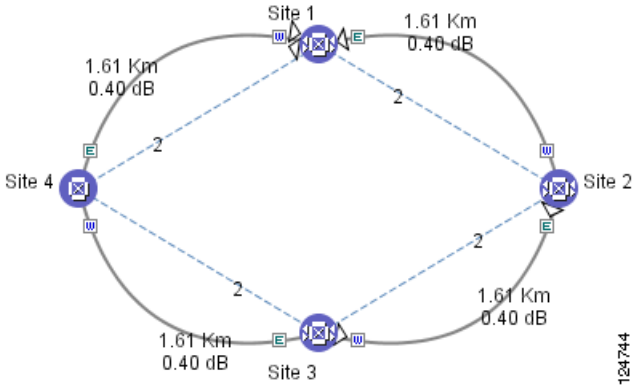
Step 3 Enter a number indicating the length of the ellipse in the X Ray field. Higher numbers create longer ellipses.

Step 4 Enter a number indicating the height of the ellipse in the Y Ray field. Higher numbers create wider ellipses.

Alternatively, click Auto to allow MetroPlanner to automatically create an ellipse of a predetermined size.

Step 5 Click **OK** to create the spacing, or click **Cancel** to close the window without applying the ellipse configuration. Refer to Figure 2-47.

Figure 2-47 Ellipse Configuration Example



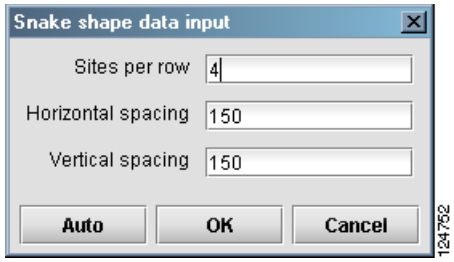
2.5.13.4 Using the Snake Configuration

The snake configuration displays the network in a serpentine, linear format.

Step 1 Create or open a network design.

Step 2 Select **Network > Arrange Sites > Snake**. The Snake Shape Data Input window appears (Figure 2-48).

Figure 2-48 Snake Shape Data Input Window



Step 3 Enter a number indicating the number of sites to appear in each row in the Sites Per Row field.

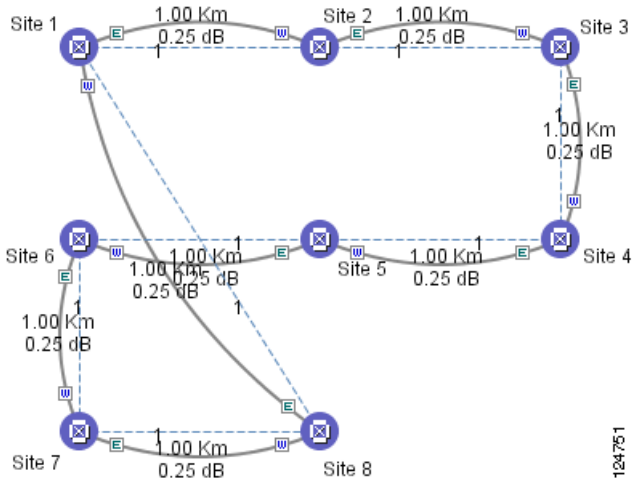
Step 4 Enter a number indicating the amount of space required between each site in the Horizontal Spacing field. Higher numbers create wider spaces between sites.

Step 5 Enter a number indicating the amount of space required between each row in the Vertical Spacing field. Higher numbers create wider spaces between rows.

Alternatively, click Auto to allow MetroPlanner to automatically create a snake configuration of a predetermined layout.

Step 6 Click **OK** to create the spacing, or click **Cancel** to close the window without applying the snake configuration. Refer to Figure 2-49.

Figure 2-49 Snake Configuration Example



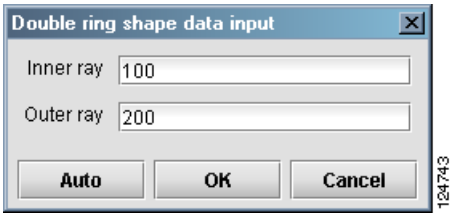
2.5.13.5 Using the Double Ring Configuration

The double ring configuration displays the network in a dual ring format.

Step 1 Create or open a network design.

Step 2 Select **Network > Arrange Sites > Double Ring**. The Double Ring Shape Data Input window appears (Figure 2-50).

Figure 2-50 Double Ring Shape Data Input Window



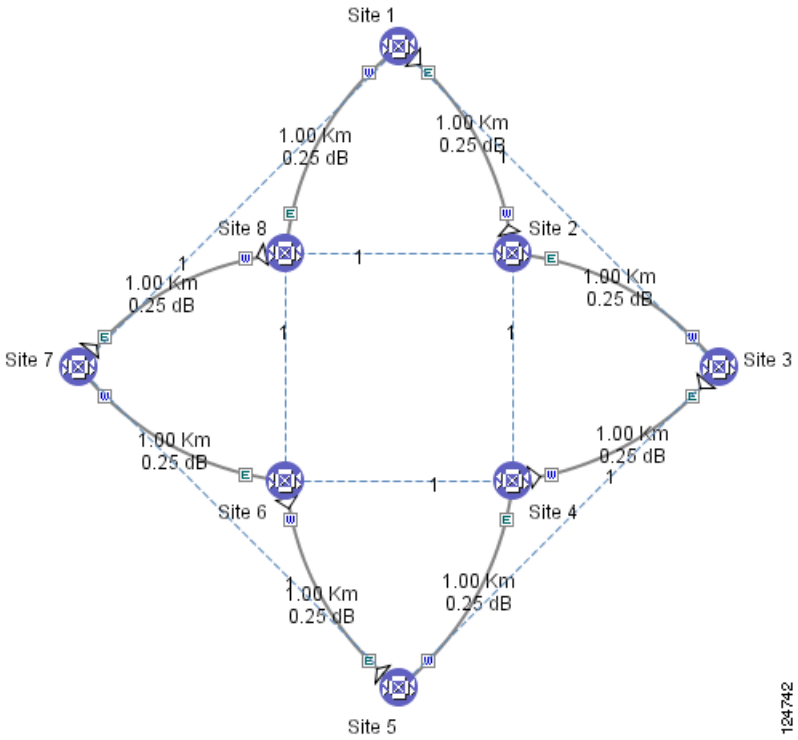
Step 3 Enter a number indicating the radius of the inner ring in the Inner Ray field. Higher numbers create bigger rings.

Step 4 Enter a number indicating the radius of the outer ring in the Outer Ray field. Higher numbers create bigger rings.

Alternatively, click Auto to allow MetroPlanner to automatically create a double ring configuration of a predetermined size.

Step 5 Click **OK** to create the spacing, or click **Cancel** to close the window without applying the double ring configuration. Refer to Figure 2-51.

Figure 2-51 Double Ring Configuration Example



2.5.13.6 Using the Fit to Window Configuration

Use the Fit to Window configuration to adjust any existing configuration so that it fills the MetroPlanner window.

Step 1 Create or open a network design.

Step 2 Select **Network > Arrange Sites > Fit to Window**. The configuration expands or contracts to fit within the MetroPlanner window.

2.6 Saving and Loading Network Designs

MetroPlanner provides the capability to save network designs for future reference.

Step 1 To save a network design to disk, click **Save**. If the design has not yet been saved to a file, a File dialog box appears, asking you to select a file path and specify a file name. MetroPlanner saves network designs with the extension "cmn".

Step 2 To load a network design from disk, click **Open**. The Select Network File dialog box appears, asking you to select a file path and specify a file name.

Note Network designs that were created in releases of MetroPlanner prior to Release 2.3 are incompatible with MetroPlanner R2.5.

Step 3 To save the existing design with a new name, choose **File > Save As**. A File dialog box appears, asking you to select a file path and specify a file name.

2.7 Completing the Network Design

After creating, analyzing, and modifying the network design, you must prepare the design for installation at a customer site.

2.7.1 Freezing and Unfreezing the Network Layout

When the network design is in Install status, you can freeze and unfreeze the network layout, or the individual sites in the layout. Freezing a site forces the presence or absence of all preamplifiers, boosters, add/drop filters, and DCU units required by the site/network as a result of running the Network Analyzer previously.

The Install status refers to the current state of the network design. Network designs have several states, as follows.

- Design—The initial status for any new network design. You can add, delete, or change any aspect of the network design.
- Design-Analyzed—The status of the network design after you run the Network Analyzer. All the result tables are available and updated. You cannot change any aspect of the network design. You can also modify BOM aspects, such as global discounts and spare part management.
- Install—The status of the network after clicking **Install Mode**. Moving into the Install state from the Design-Analyzed state automatically freezes all the sites in the design. You cannot modify any aspect of the network design except the span parameters and (on unfrozen sites) amplifier forcing. You can modify the BOM. All routed circuits are fixed, and cannot be changed while in this state.
- Installed-Analyzed—The status of the network after running the Network Analyzer on a network in the Install state. MetroPlanner updates the results tables. You cannot modify any aspect of the network design except the span parameters and the amplifier forcing. All routed circuits are fixed, and cannot be changed while in this state.

MetroPlanner saves the state of the network along with the network itself.

Step 1 Create or open a network design.

Step 2 Click **Install Mode** to move the design into the Install state. All the sites in the network automatically freeze. Frozen sites are indicated by a closed padlock on the site (Figure 2-52).

Figure 2-52 Frozen Site Example

Step 3 To unfreeze all the sites in the network, select **Network > Install > Layout Unfreezing**. The padlock disappears.

Step 4 To unfreeze an individual site, right-click the frozen site and select **Network > Install > Site Layout Un-Freezing**.

Step 5 To freeze the entire network, select **Network > Install > Layout Freezing**.

2.7.2 Viewing Internal Connections

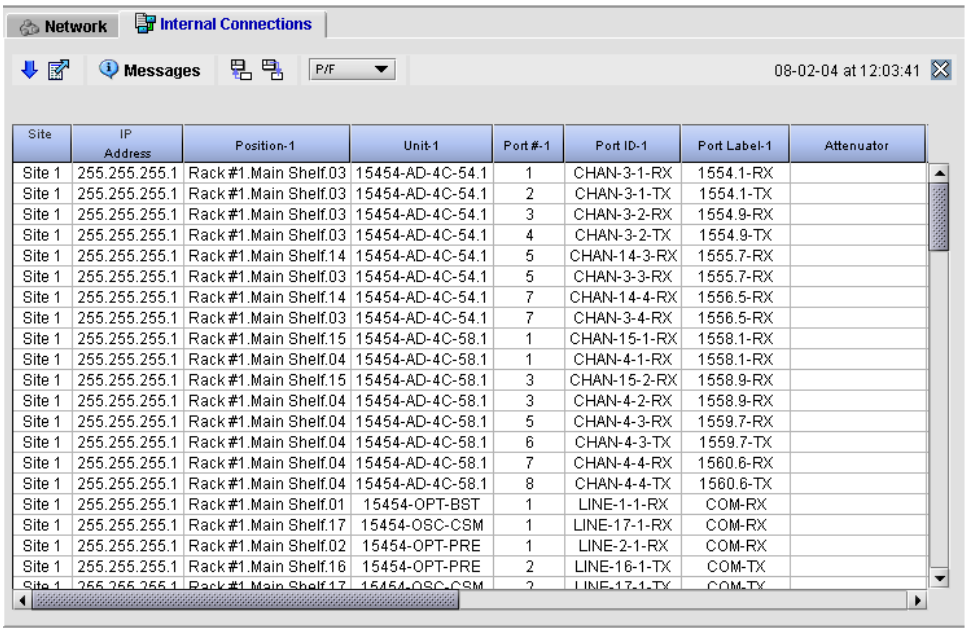
You can view the network internal connections after the network has been analyzed, and when it is in the Install state. You can also view the patch cord connections between transponders and Y-Cable Protection FlexLayer modules. The Y-Cable Protection FlexLayer position is defined using the rack and shelf number resulting from the layout position, and the slots are numbered from left to right on each of the four FlexLayer modules that can be placed in a shelf.

Step 1 Create or open a network design.

Step 2 Analyze the network.

Step 3 Select **Reports > Internal Connections** from the menu. The Internal Connections tab appears (Figure 2-53).

Figure 2-53 Internal Connections Tab



Site	IP Address	Position-1	Unit-1	Port #-1	Port ID-1	Port Label-1	Attenuator
Site 1	255.255.255.1	Rack #1.Main Shelf.03	15454-AD-4C-54.1	1	CHAN-3-1-RX	1554.1-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.03	15454-AD-4C-54.1	2	CHAN-3-1-TX	1554.1-TX	
Site 1	255.255.255.1	Rack #1.Main Shelf.03	15454-AD-4C-54.1	3	CHAN-3-2-RX	1554.9-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.03	15454-AD-4C-54.1	4	CHAN-3-2-TX	1554.9-TX	
Site 1	255.255.255.1	Rack #1.Main Shelf.14	15454-AD-4C-54.1	5	CHAN-14-3-RX	1555.7-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.03	15454-AD-4C-54.1	5	CHAN-3-3-RX	1555.7-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.14	15454-AD-4C-54.1	7	CHAN-14-4-RX	1556.5-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.03	15454-AD-4C-54.1	7	CHAN-3-4-RX	1556.5-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.15	15454-AD-4C-58.1	1	CHAN-15-1-RX	1558.1-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.04	15454-AD-4C-58.1	1	CHAN-4-1-RX	1558.1-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.15	15454-AD-4C-58.1	3	CHAN-15-2-RX	1558.9-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.04	15454-AD-4C-58.1	3	CHAN-4-2-RX	1558.9-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.04	15454-AD-4C-58.1	5	CHAN-4-3-RX	1559.7-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.04	15454-AD-4C-58.1	6	CHAN-4-3-TX	1559.7-TX	
Site 1	255.255.255.1	Rack #1.Main Shelf.04	15454-AD-4C-58.1	7	CHAN-4-4-RX	1560.6-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.04	15454-AD-4C-58.1	8	CHAN-4-4-TX	1560.6-TX	
Site 1	255.255.255.1	Rack #1.Main Shelf.01	15454-OPT-BST	1	LINE-1-1-RX	COM-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.17	15454-OSC-CSM	1	LINE-17-1-RX	COM-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.02	15454-OPT-PRE	1	LINE-2-1-RX	COM-RX	
Site 1	255.255.255.1	Rack #1.Main Shelf.16	15454-OPT-PRE	2	LINE-16-1-TX	COM-TX	
Site 1	255.255.255.1	Rack #1.Main Shelf.17	15454-OSC-CSM	2	LINE-17-1-TX	COM-TX	

Table 2-12 lists the columns in the Internal Connections tab and their descriptions. Click on the columns to sort the table information by the selected column.

Table 2-12 Internal Connections Tab Columns

Column Name	Description
Site	Displays the name of the site.
IP Address	Displays the site IP address.
Position-1	Displays the rack, shelf, and slot position of the unit (card) from which the patch cord originates.
Unit-1	Displays the name of the unit (card).
Port #-1	Displays the port number from which the patch cord originates.
Port ID-1	Displays the port ID.
Port Label-1	Displays the name of the port.
Attenuator	When indicated, it is the PID of the bulk attenuator to be equipped on this connection. It also reports information for when an internal attenuator must be placed, between the DC-TX and DC-RX ports on the preamplifier when no DCU is equipped.
Position-2	Displays the rack, shelf, and slot position of the unit (card) where the patch cord terminates.
Unit-2	Displays the name of the unit (card).
Port #-2	Displays the port number where the patch cord terminates.
Port ID-2	Displays the port ID.
Port Label-2	Displays the name of the port.

Table 2-12 Internal Connections Tab Columns (continued)

Column Name	Description
Manually Set	Defines when the internal connection must be manually set by means of the local craft terminal (CTC). The allowed values are: • No—This connection is automatically set on the site by the TL1 agent software. • Yes—This connection must be manually set using CTC (or TL1). • Remove—This connection must be manually removed using CTC (or TL1). **Note** Every connection listed in the report must be connected with patch cords, except for connections marked "Remove".
P/F	Displays whether the connection relates to a present or forecast circuit.

Step 4 Click **Shrink Header** to hide the text that appears above the table rows.

Step 5 Click **Export Report** to save the information to an external file. The Save Table window appears, allowing you to enter or select an HTML or text file name.

Step 6 Click **Messages** to view the Analyzer Messages window (Figure 2-33).

Step 7 Click **Dock View to Bottom Area** to position the tab below the Network tab. Click it again to return to the previous view.

Step 8 Click **Undock View on Desktop** to detach the tab and view it as a stand-alone window.

Step 9 Click **Dock View to Center Area** to return to the previous view.

2.7.3 Viewing Installation Parameters

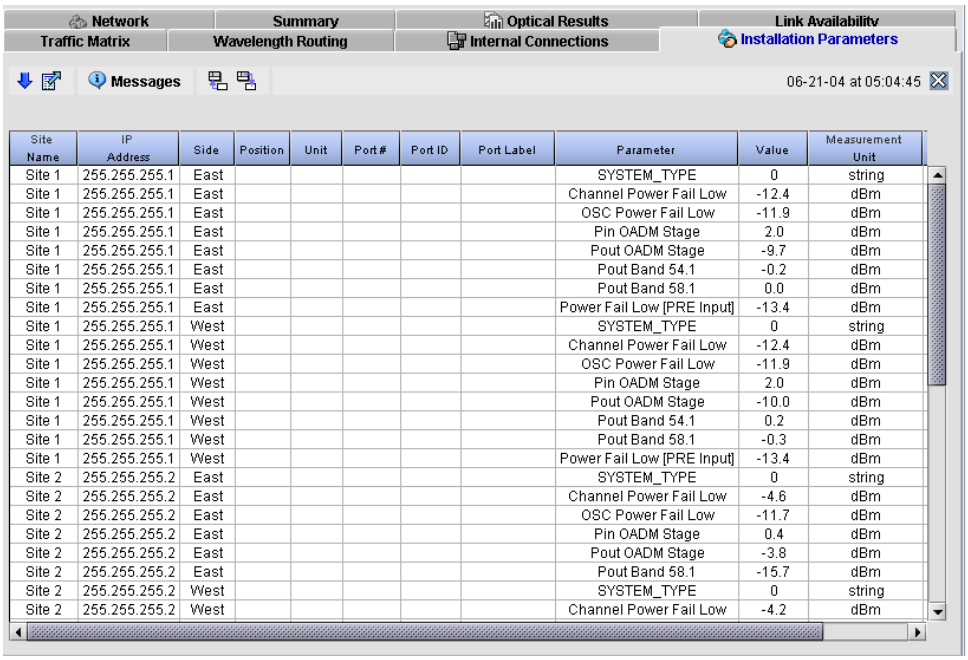
You can view the installation parameters of networks after the network has been analyzed, and when it is in the Install state. The network installation parameters report the parameter values to be set (provisioned) at installation time on each site in the network.

Step 1 Create or open a network design.

Step 2 Click **Install Mode** to move the design into the Install state.

Step 3 Select **Reports > Installation Parameters** from the menu. The Installation Parameters tab appears (Figure 2-54).

Figure 2-54 Installation Parameters Tab



Site Name	IP Address	Side	Position	Unit	Port #	Port ID	Port Label	Parameter	Value	Measurement Unit
Site 1	255.255.255.1	East						SYSTEM_TYPE	0	string
Site 1	255.255.255.1	East						Channel Power Fail Low	-12.4	dBm
Site 1	255.255.255.1	East						OSC Power Fail Low	-11.9	dBm
Site 1	255.255.255.1	East						Pin OADM Stage	2.0	dBm
Site 1	255.255.255.1	East						Pout OADM Stage	-9.7	dBm
Site 1	255.255.255.1	East						Pout Band 54.1	-0.2	dBm
Site 1	255.255.255.1	East						Pout Band 58.1	0.0	dBm
Site 1	255.255.255.1	East						Power Fail Low [PRE Input]	-13.4	dBm
Site 1	255.255.255.1	West						SYSTEM_TYPE	0	string
Site 1	255.255.255.1	West						Channel Power Fail Low	-12.4	dBm
Site 1	255.255.255.1	West						OSC Power Fail Low	-11.9	dBm
Site 1	255.255.255.1	West						Pin OADM Stage	2.0	dBm
Site 1	255.255.255.1	West						Pout OADM Stage	-10.0	dBm
Site 1	255.255.255.1	West						Pout Band 54.1	0.2	dBm
Site 1	255.255.255.1	West						Pout Band 58.1	-0.3	dBm
Site 1	255.255.255.1	West						Power Fail Low [PRE Input]	-13.4	dBm
Site 2	255.255.255.2	East						SYSTEM_TYPE	0	string
Site 2	255.255.255.2	East						Channel Power Fail Low	-4.6	dBm
Site 2	255.255.255.2	East						OSC Power Fail Low	-11.7	dBm
Site 2	255.255.255.2	East						Pin OADM Stage	0.4	dBm
Site 2	255.255.255.2	East						Pout OADM Stage	-3.8	dBm
Site 2	255.255.255.2	East						Pout Band 58.1	-15.7	dBm
Site 2	255.255.255.2	West						SYSTEM_TYPE	0	string
Site 2	255.255.255.2	West						Channel Power Fail Low	-4.2	dBm

Table 2-13 lists the columns in the Installation Parameters tab and their descriptions.

Table 2-13 Installation Parameters Tab Columns

Column Name	Description
Site Name	Displays the name of the site.
IP Address	Displays the site IP address.
Side	Indicates the side of the site from which the parameter originates (east or west).
Position	Displays the rack, shelf, and slot position of the unit (card) from which the parameter originates.
Unit	Displays the name of the unit (card).
Port #	Displays the port number (IDL port identifier) of the parameter.
Port ID	Displays the port ID (TL1 identifier).
Port Label	Displays the name of the port as displayed on the front panel of the unit.
Parameter	Displays the name of the parameter.
Value	Displays the value to be set for the installation parameter.

Table 2-13 Installation Parameters Tab Columns (continued)

Column Name	Description
Measurement Unit	Displays the unit of measure for the parameter.
Manual Set	Defines when the installation parameter must be manually set by means of the local craft terminal (CTC). The allowed values are: • No—This parameter is automatically set on the site using the assisted configuration file. • Yes—This parameter must be manually set using CTC (or TL1). • Troubleshooting—This parameters is used to check if the measured value in the specified point is the expected value.

The installation parameters vary, depending on whether they apply to the network, system, or site.

Step 4 Click **Shrink Header** to hide the text that appears above the table rows.

Step 5 Click **Export Report** to save the information to an external file. The Save Table window appears, allowing you to enter or select an HTML or text file name.

Step 6 Click **Messages** to view the Analyzer Messages window (Figure 2-33).

Step 7 Click **Dock View to Bottom Area** to position the tab below the Network tab. Click it again to return to the previous view.

Step 8 Click **Undock View on Desktop** to detach the tab and view it as a stand-alone window.

Step 9 Click **Dock View to Center Area** to return to the previous view.

2.7.4 Saving the Installation Assisted Configuration File

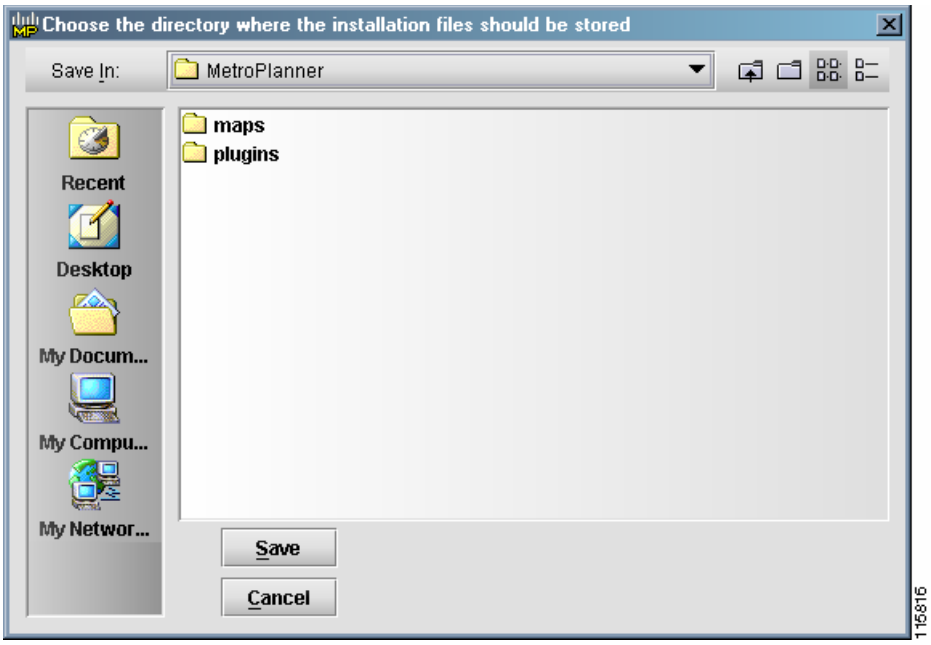
After MetroPlanner calculates the installation parameters, it can create a separated ASCII configuration file for each site in the network. This file can be directly imported to a site using the NE Update feature in Cisco Transport Controller (CTC). MetroPlanner generates one text file for each site in the network in the MetroPlanner installation folder. Each file is named with the site name string by default.

Step 1 Create or open a network design.

Step 2 Click **Install Mode** to move the design into the Install state.

Step 3 Select **Network > Install > Assisted Conf Setup**. The Assisted Configuration Setup Save File window appears (Figure 2-55).

Figure 2-55 Assisted Configuration Setup Save File Window



Step 4 Click **Save** to save the file to disk.

Step 5 To change the directory, choose a new directory from the list, or use the drop-down list to select a directory.

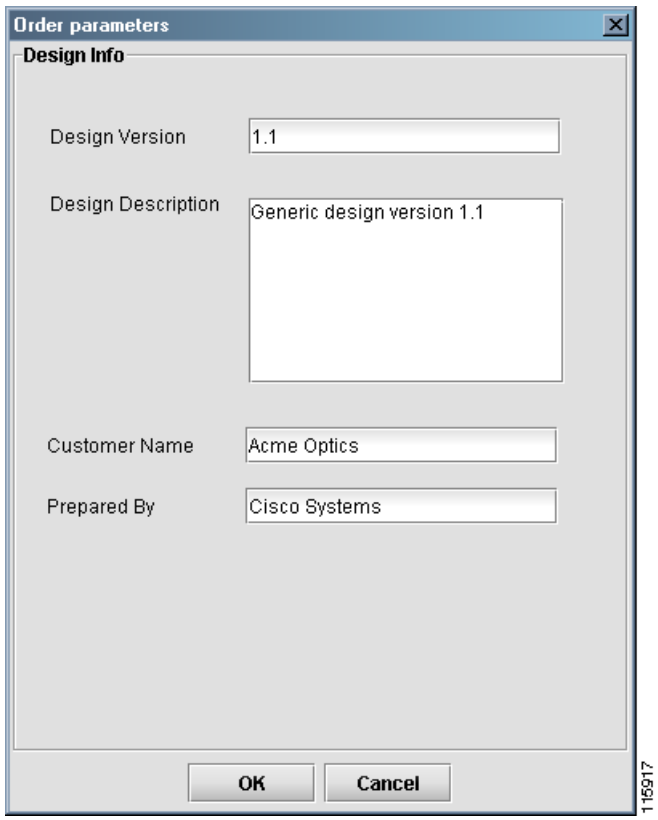
Step 6 Click **Cancel** to close the window without saving a configuration setup file.

2.8 Ordering the Equipment

MetroPlanner provides features to help you order your Cisco ONS 15454 DWDM equipment. After you complete the network design, you must create a unique order code (also referred to as an order description). This allows the order to be placed via Cisco.com. The following steps describe the process for creating an order code.

Step 1 Choose **Options > Order Parameters**. The Order Parameters window appears (Figure 2-56).

Figure 2-56 Order Parameters Window



Step 2 Enter the version of the design in the Design Version field.

Step 3 Enter the description in the Design Description field.

Step 4 Enter the name of the customer in the Customer Name field.

Step 5 Enter the name of the designer in the Prepared By field.

Step 6 Click **OK**. Click **Cancel** to close the window without saving any changes.

2.9 Generating a BOM

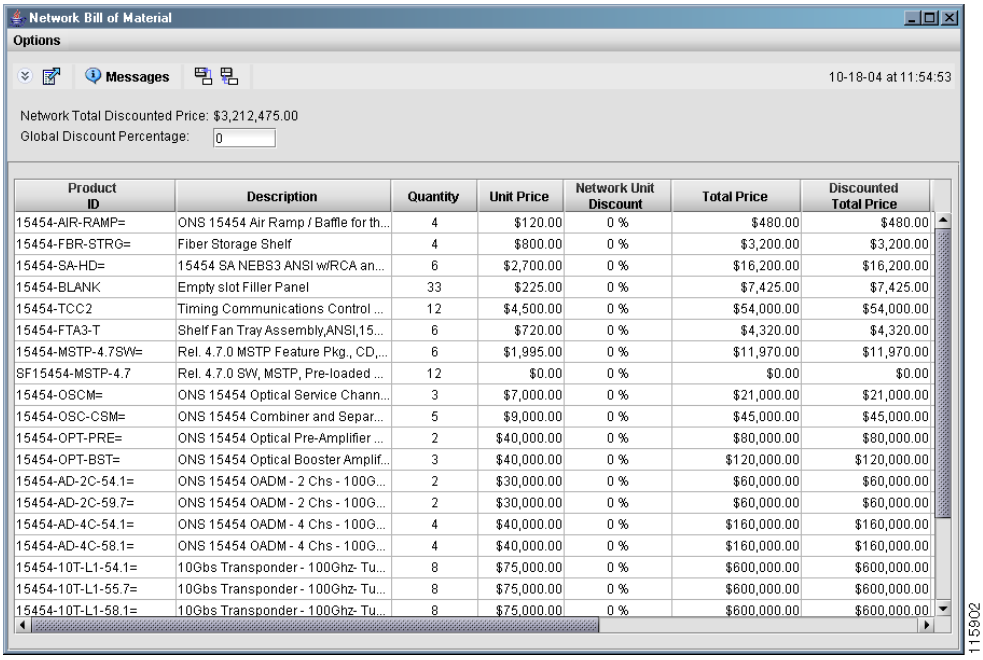
You can generate a BOM after you have successfully analyzed your network design.

2.9.1 Generating a Network BOM

Use the following steps to generate a BOM for the network.

Step 1 Choose **Reports > Network Bill Of Material** to generate a BOM for the entire network. The Network BOM window (Figure 2-57) appears.

Figure 2-57 Network BOM Window



Product ID	Description	Quantity	Unit Price	Network Unit Discount	Total Price	Discounted Total Price
15454-AIR-RAMP=	ONS 15454 Air Ramp / Baffle for th...	4	$120.00	0 %	$480.00	$480.00
15454-FBR-STRG=	Fiber Storage Shelf	4	$800.00	0 %	$3,200.00	$3,200.00
15454-SA-HD=	15454 SA NEBS3 ANSI w/RCA an...	6	$2,700.00	0 %	$16,200.00	$16,200.00
15454-BLANK	Empty slot Filler Panel	33	$225.00	0 %	$7,425.00	$7,425.00
15454-TCC2	Timing Communications Control ...	12	$4,500.00	0 %	$54,000.00	$54,000.00
15454-FTA3-T	Shelf Fan Tray Assembly,ANSI,15...	6	$720.00	0 %	$4,320.00	$4,320.00
15454-MSTP-4.7SW=	Rel. 4.7.0 MSTP Feature Pkg., CD,...	6	$1,995.00	0 %	$11,970.00	$11,970.00
SF15454-MSTP-4.7	Rel. 4.7.0 SW, MSTP, Pre-loaded ...	12	$0.00	0 %	$0.00	$0.00
15454-OSCM=	ONS 15454 Optical Service Chann...	3	$7,000.00	0 %	$21,000.00	$21,000.00
15454-OSC-CSM=	ONS 15454 Combiner and Separ...	5	$9,000.00	0 %	$45,000.00	$45,000.00
15454-OPT-PRE=	ONS 15454 Optical Pre-Amplifier ...	2	$40,000.00	0 %	$80,000.00	$80,000.00
15454-OPT-BST=	ONS 15454 Optical Booster Amplif...	3	$40,000.00	0 %	$120,000.00	$120,000.00
15454-AD-2C-54.1=	ONS 15454 OADM - 2 Chs - 100G...	2	$30,000.00	0 %	$60,000.00	$60,000.00
15454-AD-2C-59.7=	ONS 15454 OADM - 2 Chs - 100G...	2	$30,000.00	0 %	$60,000.00	$60,000.00
15454-AD-4C-54.1=	ONS 15454 OADM - 4 Chs - 100G...	4	$40,000.00	0 %	$160,000.00	$160,000.00
15454-AD-4C-58.1=	ONS 15454 OADM - 4 Chs - 100G...	4	$40,000.00	0 %	$160,000.00	$160,000.00
15454-10T-L1-54.1=	10Gbs Transponder - 100Ghz- Tu...	8	$75,000.00	0 %	$600,000.00	$600,000.00
15454-10T-L1-55.7=	10Gbs Transponder - 100Ghz- Tu...	8	$75,000.00	0 %	$600,000.00	$600,000.00
15454-10T-L1-58.1=	10Gbs Transponder - 100Ghz- Tu...	8	$75,000.00	0 %	$600,000.00	$600,000.00

Step 2 To change the global discount for the entire network, enter a new global discount in the form of a percentage in the Global Discount Percentage field. The field shows the percentage from the Global Discount Percentage option in the Default Project Options window. The global discount is applied to all components in the BOM.

Step 3 To change the global discount percentage for an individual network component, click the Network Unit Discount cell of the component you wish to change, and enter a new discount percentage.

Table 2-14 describes the columns.

Table 2-14 BOM Window Columns

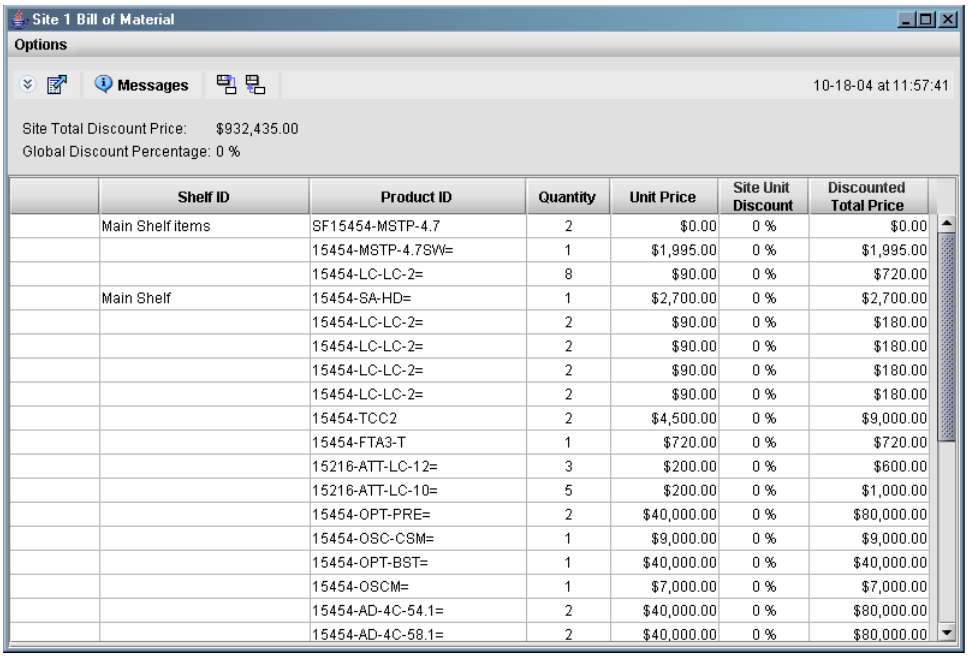
Column Label	Description
Shelf ID	Displays the ID string of the shelf (for site BOMs only).
Product ID	Displays the ID string of the product.
Description	Displays a description of the product.
Quantity	Displays the number of specific products in the BOM.
Unit Price	Displays the price per unit.
Network/Site Unit Discount	Displays the per unit discount amount that you assigned in the Global Discount Percentage field. If you leave the field blank, the discount amount is zero.
Total Price	Displays the total price of the products before applying the discount.
Discounted Total Price	Displays the total price of the products after applying the discount.
Site	Displays the number of products to be assigned to a particular site. The number of Site columns is the same as the number of sites in the network.

2.9.2 Generating a Site BOM

Use the following steps to generate a BOM for a site.

Step 1 Right-click on a site and select **Generate Site BOM**. The Site BOM window (Figure 2-58) appears.

Figure 2-58 Site BOM Window



	Shelf ID	Product ID	Quantity	Unit Price	Site Unit Discount	Discounted Total Price
	Main Shelf items	SF15454-MSTP-4.7	2	$0.00	0 %	$0.00
		15454-MSTP-4.7SW=	1	$1,995.00	0 %	$1,995.00
		15454-LC-LC-2=	8	$90.00	0 %	$720.00
	Main Shelf	15454-SA-HD=	1	$2,700.00	0 %	$2,700.00
		15454-LC-LC-2=	2	$90.00	0 %	$180.00
		15454-LC-LC-2=	2	$90.00	0 %	$180.00
		15454-LC-LC-2=	2	$90.00	0 %	$180.00
		15454-LC-LC-2=	2	$90.00	0 %	$180.00
		15454-TCC2	2	$4,500.00	0 %	$9,000.00
		15454-FTA3-T	1	$720.00	0 %	$720.00
		15216-ATT-LC-12=	3	$200.00	0 %	$600.00
		15216-ATT-LC-10=	5	$200.00	0 %	$1,000.00
		15454-OPT-PRE=	2	$40,000.00	0 %	$80,000.00
		15454-OSC-CSM=	1	$9,000.00	0 %	$9,000.00
		15454-OPT-BST=	1	$40,000.00	0 %	$40,000.00
		15454-OSCM=	1	$7,000.00	0 %	$7,000.00
		15454-AD-4C-54.1=	2	$40,000.00	0 %	$80,000.00
		15454-AD-4C-58.1=	2	$40,000.00	0 %	$80,000.00

Step 2 To change the discount percentage for a site component, click the Site Unit Discount cell of the component you wish to change, and enter a new discount percentage.

Table 2-14 describes the columns.

2.9.3 Exporting a BOM

MetroPlanner allows you to export the BOM to an external file (such as an HTML or text file).

Step 1 Click **Export**. The Save Table dialog box appears.

Step 2 Navigate to the destination folder and select or type the file name. MetroPlanner creates an HTML or text file containing the BOM.

Step 3 Click **Save**. To cancel saving the BOM, click **Cancel**.

2.9.4 Importing a BOM to an Excel Spreadsheet

You can import a BOM that has been exported to a text file into a Microsoft Excel spreadsheet. For information about creating BOM text files, see the "2.9.3 Exporting a BOM" section.

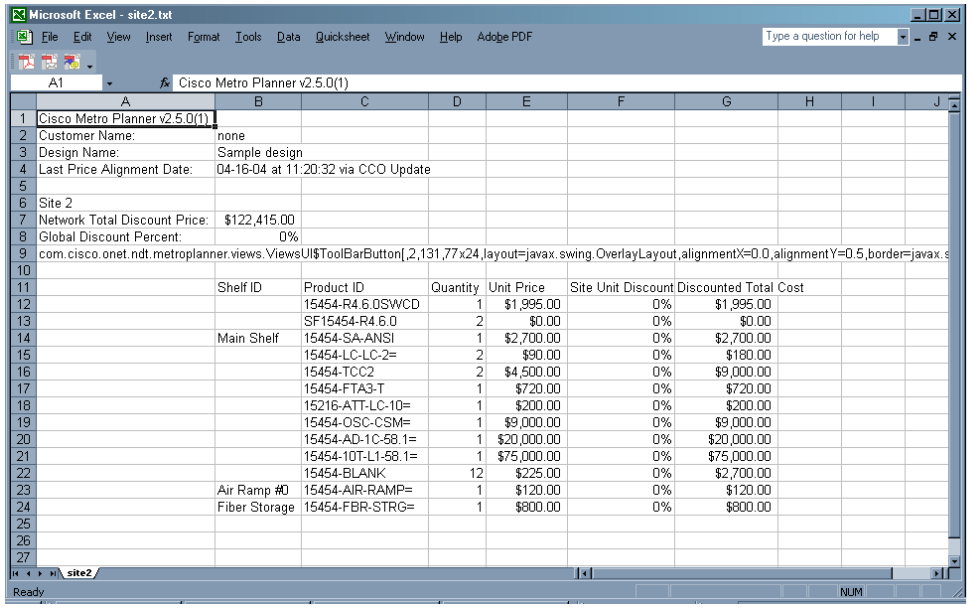
Step 1 Launch the MicroSoft Excel application.

Step 2 Select **File > Open**.

Step 3 Select the saved BOM file.

Step 4 The BOM information appears in the Excel spreadsheet (Figure 2-59).

Figure 2-59 BOM in Microsoft Excel Example



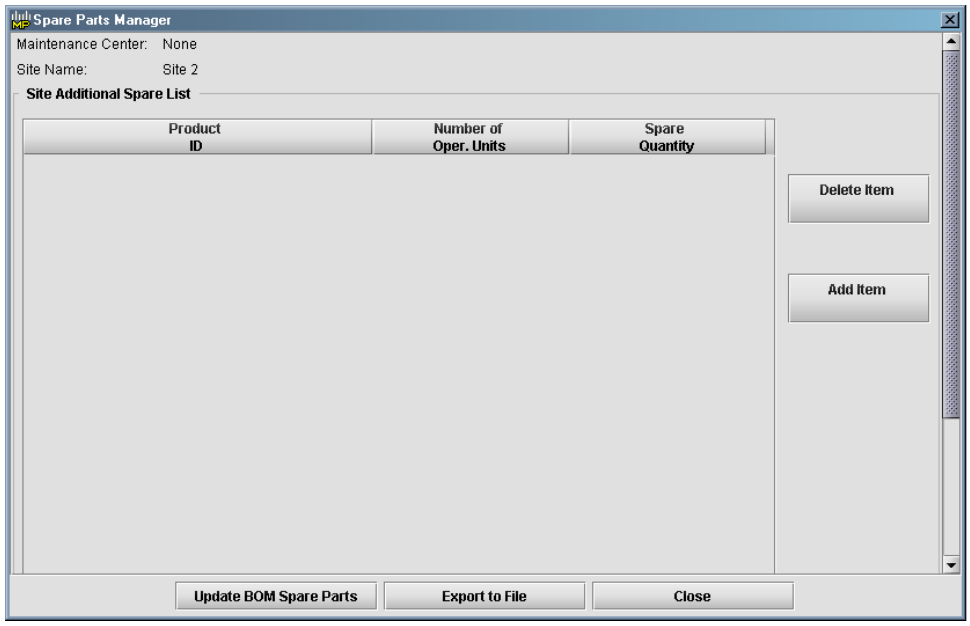
Step 5 To improve the formatting, increase the column widths.

2.9.5 Managing Network Spare Parts

After you generate the BOM, use the Spare Parts Manager to determine the spare parts required by the network.

Step 1 Select **Tools > Spares Management > Network Spare Parts**. The Spare Parts Manager window appears (Figure 2-60). To open the Spare Parts Manager window for a site, right-click the site and select **Manage Site Spare Part** from the shortcut menu.

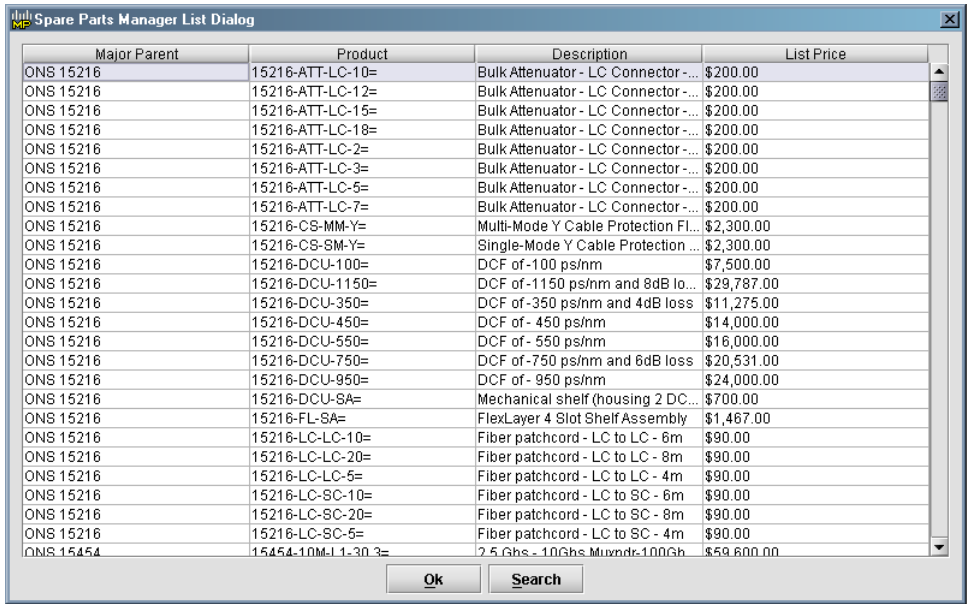
Figure 2-60 Spare Parts Manager Window



Step 2 Click **Add Item** to add an item to the Network (Site) Additional Spare List area. An empty row appears in the area.

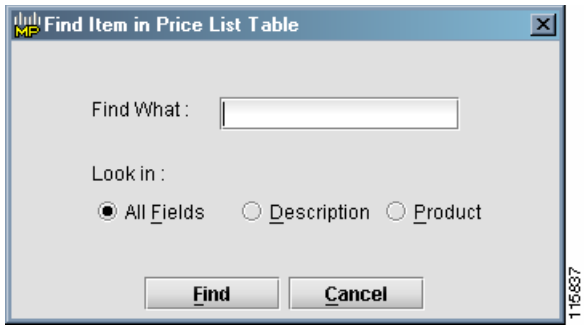
Step 3 Click the new row. The Spare Parts Manager List Dialog window (Figure 2-61) appears.

Figure 2-61 Spare Parts Manager List Dialog Window



Step 4 Select a product and click **OK**, or click **Search** to open the Find Item in Price List Table window (Figure 2-62).

Figure 2-62 Find Item in Price List Table Window



If you selected a product, it appears as a row in the Network (Site) Additional Spare List area. If you clicked search, complete the following substeps:

a. Enter a search criteria in the Find What field.

b. Select All Fields, Description, or Product from the Look In area.

c. Click **Find**, or click **Cancel** to close the window without performing a search. The Spare Parts Manager List Dialog window appears, with the item highlighted.

d. Select the product and click **OK**. The product appears as a row in the Network (Site) Additional Spare List area.

Step 5 To delete the item, select the row and click **Delete Item**.

Step 6 Click **Update BOM Spare Parts** to add the spare parts to the BOM. The BOM tab opens in the main window, displaying the spare parts in the lower portion of the tab.

Step 7 Click **Export to File** to save the list of spare parts to an external HTML or text file.

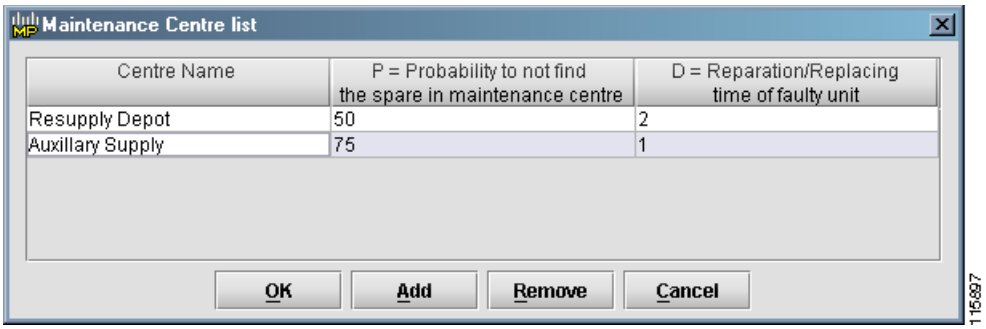
Step 8 Click **Close** to close the Spare Parts Manager window.

2.9.6 Establishing Maintenance Centers

You can identify maintenance centers that will supply your network with spare parts in the event of a failure. This feature helps your customer determine the quantity of spares that should be purchased, depending on their maintenance centers and their availability.

Step 1 Select **Tools > Spares Management > Maintenance Center List**. The Maintenance Center List window appears (Figure 2-63).

Figure 2-63 Maintenance Centre List Window



Step 2 Click **Add** to add a maintenance center. A new row appears in the window.

Step 3 Enter the center name in the Centre Name field.

Step 4 Select the probability of finding the spare part in the selected maintenace center (represented by a percentage) from the Probability field. Probabilities are 50%, 75%, 95%, and 99%.

Step 5 Enter the approximate time it takes to stock a maintenance center with a part (represented in months) in the Reparation/Replacing field.

Step 6 To remove a maintenance center, select a center and click **Remove**.

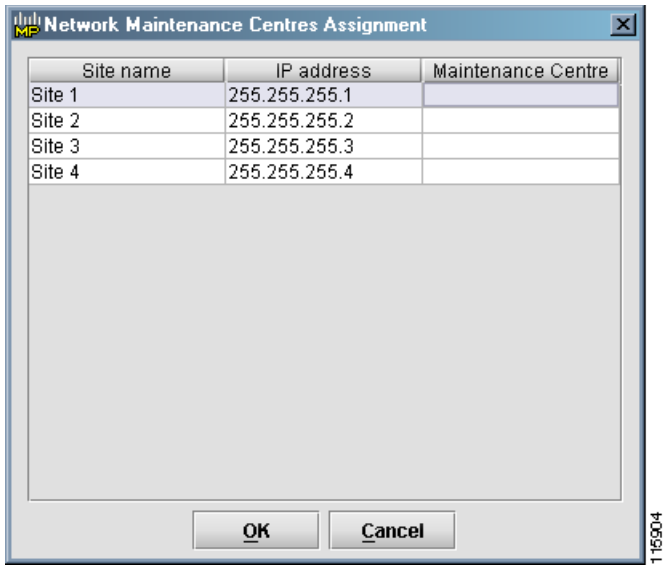
Step 7 Click **OK**.

2.9.7 Viewing Maintenance Center Assignments

After creating and assigning maintenance centers, you can use the Network Maintenance Centres Assignment window to view all the maintenance center assignments for each site in the network.

Step 1 Select **Tools > Spares Management > Maintenance Center Assignment**. The Network Maintenance Centres Assignment window appears (Figure 2-64).

Figure 2-64 Network Maintenance Centres Assignment Window



The window displays the site name, IP address, and assigned maintenance center of each site.

Step 2 To copy the information in the window, right-click any row and select **Copy Table**.

Step 3 To export the information to an external file, right-click any row and select **Export Table**. A Save Table window appears, allowing you to enter or select a file name for the exported information. You can save maintenance center assignment files as either HTML or text files.

Step 4 Click **Save**.

Step 5 Click **OK** to close the Network Maintenance Centres Assignment window.

Modeled Network Examples

This chapter provides examples of typical optical networks you can model using MetroPlanner.

This chapter contains the following sections:

3.1 Supported MetroPlanner Topologies

MetroPlanner 2.5 supports the following topologies:

- Bus (single span, point-to-point, and linear)
- Open (or hubbed) ring
- Closed (or meshed) ring

An example of each topology is given in this chapter.

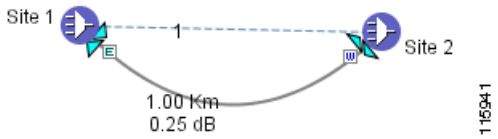
3.2 Bus Topologies

Bus topologies are comprised of three different types of topologies: single span, point-to-point, and linear.

3.2.1 Single-Span Topology

Figure 3-1 shows an example of a single-span topology. Single-span topologies are characterized by a single span link. The single-span configuration only supports two terminal sites (full terminal or flexible channel-count terminal) without any intermediate line amplifier or optical add/drop multiplexing (OADM) sites.

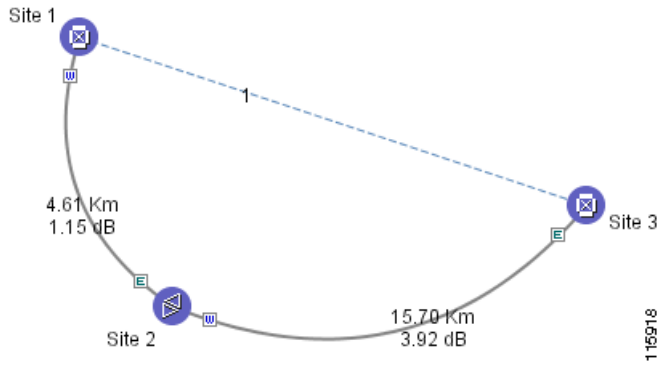
Figure 3-1 Single-Span Topology Example



3.2.2 Point-to-Point Topology

Figure 3-2 shows an example of a point-to-point topology. In a point-to-point topology, all the wavelengths are terminated at the same point in the chain. In the Point-to-Point configuration, no channels are added or dropped in intermediate sites.

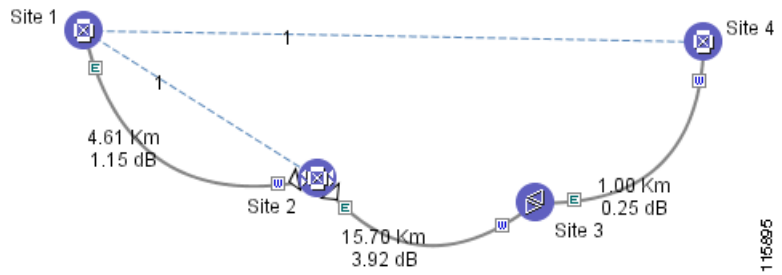
Figure 3-2 Bus Topology Example



3.2.3 Linear Topology

Figure 3-3 shows an example of a linear topology. Linear configurations are characterized by the presence of two terminal sites (full terminal or flexible channel-count terminal). Between the two terminal sites, OADM or line amplifiers nodes can be inserted. In a linear configuration, specific wavelengths are terminated at different points in the chain and only unprotected traffic can be provisioned.

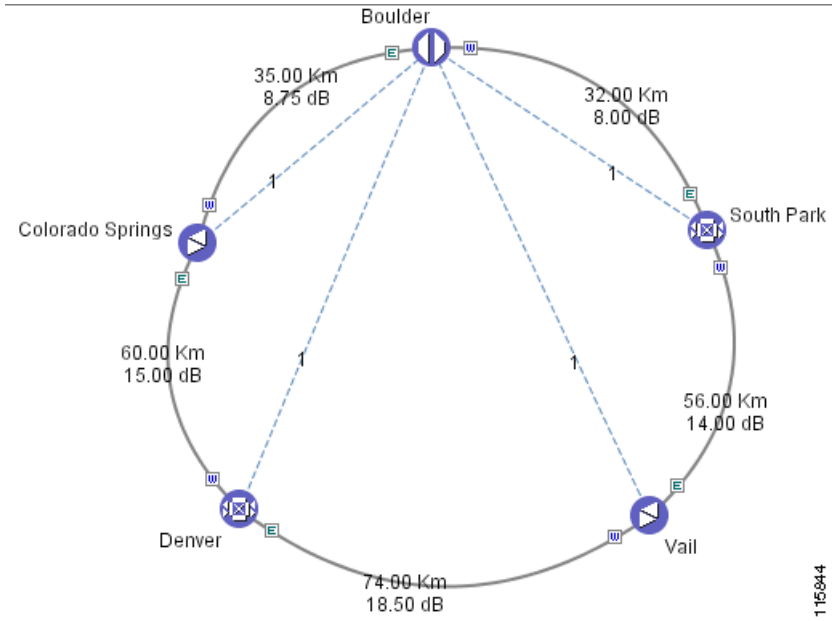
Figure 3-3 Linear Topology Example



3.3 Hubbed Ring Topology

Figure 3-4 shows an example of a hubbed ring topology. In this configuration, at least one of the sites must be a hub site, where all channels are terminated. In this diagram the hub is the Boulder site.

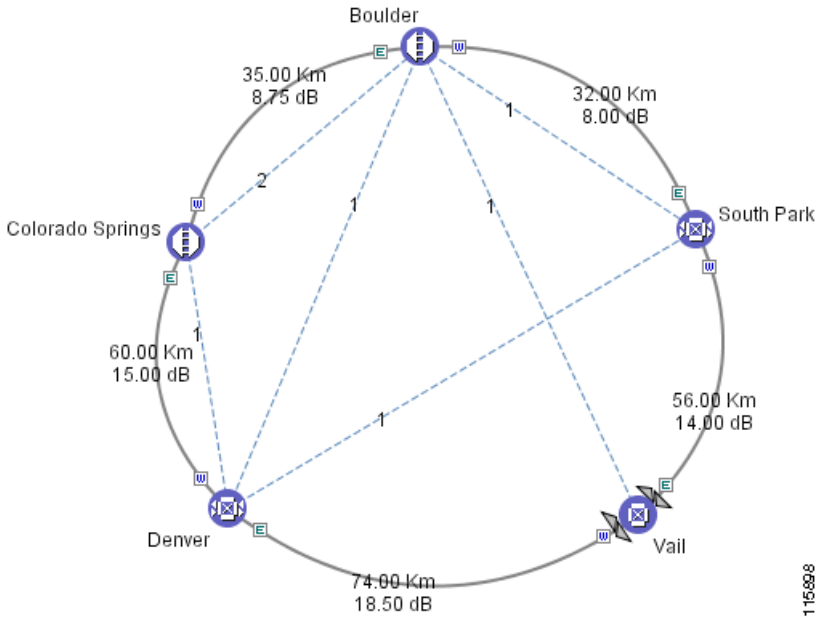
Figure 3-4 Hubbed Ring Topology Example



3.4 Meshed Topology

Figure 3-5 provides an example of a meshed ring topology. A meshed ring is characterized by the absence of a hub node.

Figure 3-5 Meshed Ring Topology Example



Card Types

This appendix provides a listing of card types and the corresponding Cisco card description (Table A-1).

Table A-1 Card Names and Protection

Product ID	Card Type	Protection Type	Card Name	Card Description
15454-O48E-1-xx.x (ANSI) 15454E-EL16HSxxxx (ETSI)	2.5-Gbps ELR ITU-T	Client 1+1	OC-48 ELR-xx.x (ANSI) STM16 EH-xx.x (ETSI)	OC48 ELR/STM16 EH 100 GHz - 15xx.xxnm
15454-MRP-L1-xx.x (ANSI Fiber-Switched) 15454E-MRP-1-xx.x (ETSI Fiber-Switched) 15454-MR-L1-xx.x (ANSI) 15454E-MR-1-xx.x (ETSI)	2.5G MR TXP w/FEC (ISC-1 Not Supported)	Client 1+1 Y-Cable Fiber-Switched	TXPP-MR-2.5G-xx.x[xx.x] (Fiber-Switched) TXP-MR-2.5G-xx.x[xx.x]	2.5-Gbps Multirate Transponder-Protected–100-GHz–Tunable xx.xx-xx.xx 2.5-Gbps Multirate Transponder–100-GHz–Tunable xx.xx-xx.xx
	2.5G MR TXP w/o FEC	Client 1+1 Y-Cable (No ISC-1) Fiber-Switched (No ISC-1)		
	2.5G MR TXP 2R Mode	Client 1+1 Y-Cable (No ETR/CLO) (No ISC-3) Fiber-Switched (No ETR/CLO) (No ISC-3)		

Table A-1 Card Names and Protection (continued)

Product ID	Card Type	Protection Type	Card Name	Card Description
15454-192L-1-xx.x (ANSI) 15454E-64L-xx.x (ETSI)	10-Gbps LR ITU-T	Client 1+1	OC-192 LR-xx.x (ANSI) STM-64 ELH-xx.x (ETSI)	OC192 LR/STM64 LH ITU 15xx.xx
15454-10T-L1-xx.x (ANSI) 15454E-10T-xx.x (ETSI)	10G MR TXP w/FEC 10G MR TXP w/o FEC	Client 1+1 Y-Cable	TXP-MR-10G-xx.x [xx.x]	10-Gbps Transponder–100-GHz–Tunable xx.xx-xx.xx
15454-10M-L1-xx.x (ANSI) 15454E-10M- xx.x (ETSI)	4x2.5-Gbps MXP w/FEC 4x2.5-Gbps MXP w/o FEC	Client 1+1 Y-Cable	MXP-2.5G-10G-xx.x[xx.x]	2.5-Gbps–10-Gbps Muxponder–100 GHz–Tunable xx.xx-xx.xx
15454-DMP-L1-xx.x (ANSI Fiber-Switched) 15454E-DMP-1-xx.x (ETSI Fiber-Switched) 15454-DM-L1-xx.x (ANSI) 15454E-DM-1-xx.x (ETSI)	2.5G Data MXP w/o FEC	Client 1+1 Y-Cable Fiber-Switched	MXPP_MR_2.5G-xx.x[xx.x] (Fiber-Switched) MXP_MR_2.5G-xx.x[xx.x]	2.5-Gbps Multirate Muxponder-Protected–100-GHz–Tunable 15xx.xx-15yy.yy 2.5-Gbps Multirate Muxponder-100GHz-Tunable 15xx.xx-15yy.yy
15454-10E-L1-xx.x (ANSI) 15454E-10E-1-xx.x (ETSI)	10G Enh MR TXP w/EFEC 10G Enh MR TXP w/FEC 10G Enh MR TXP w/o FEC	Client 1+1 Y-Cable	TXP_MR_10E-xx.x[xx.x]	10-Gbps Transponder–100-GHz–Enahnced–Tunable xx.xx-xx.xx
15454-10ME-xx.x (ANSI) 15454E-10ME-xx.x (ETSI)	4x2.5-Gbps Enh MXP w/EFEC 4x2.5-Gbps Enh MXP w/FEC	Client 1+1 Y-Cable	MXP_2.5G_10E-xx.x[xx.x]	10-Gbps Muxsponder–100-GHz–Enahnced FEC–Tunable xx.xx-xx.xx

Table A-1 Card Names and Protection (continued)

Product ID	Card Type	Protection Type	Card Name	Card Description
15454-GBIC-xx.x (ANSI) 15454E-GBIC-xx.x (ETSI)	GE Wavelength-Division Multi-plexing (WDM) Gigabit Interface Converter (GBIC)	Client 1+1	WDM GBIC xx.x	GBIC xx.x WDM 100GHz
15530-ITU2-xx10 (w/splitter) 15530-ITU2-xx20 (non-splitter)	10Gbps Aggregation (w / splitter) 10Gbps Aggregation	Client 1+1 Fiber-Switched/ Splitter	ONS 15530 Ch x 10-Gbps ITU Trunk Card MU w/ Splitter ONS 15530 Ch x 10-Gbps ITU Trunk Card MU w/o Splitter	ONS 15530 10-Gbps ITU Trunk Card with splitter ONS 15530 10-Gbps ITU Trunk Card wihtout splitter
15530-ITU3-xx10 (w/splitter) 15530-ITU3-xx20 (non-splitter)	2.5Gbps Aggregation (w / splitter) 2.5Gbps Aggregation	Client 1+1 Fiber-Switched/ Splitter	15530-ITU3-xx10 15530-ITU3-xx20	ONS 15530 Ch x/y 2.5-Gbps ITU Trunk Card MU w/ Splitter ONS 15530 Ch x/y 2.5-Gbps ITU Trunk Card MU w/o Splitter
15530-TSP1-xx11 (MM w/splitter) 15530-TSP1-xx12 (SM w/splitter) 15530-TSP1-xx21 (MM non-splitter) 15530-TSP1-xx22 (SM non-splitter)	MR MM Transponder (w / splitter) MR SM Transponder (w / splitter) MR MM Transponder MR SM Transponder	Client 1+1 Y-Cable Fiber-Switched/ Splitter	15530-TSP1-xx11 15530-TSP1-xx12 15530-TSP1-xx21 15530-TSP1-xx22	ONS 15530 Transponder Ch x/y - 1310nm MM SC w/ splitter ONS 15530 Transponder Ch x/y - 1310nm SM SC w/ splitter ONS 15530 Transponder Ch x/y - 1310nm MM SC w/o splitter ONS 15530 Transponder Ch x/y - 1310nm SM SC w/o splitter
15530-MSMP-xx12 (w/splitter) 15530-MSMP-xx22 (non-splitter)	Data Muxponder (w / splitter) Data Muxponder	Client 1+1 Fiber-Switched/ Splitter	15530-MSMP-xx12 15530-MSMP-xx22	MR Data Muxponder (w / splitter) MR Data Muxponder (w/o splitter)

Troubleshooting

This appendix lists system messages. It also describes problems you might encounter using MetroPlanner and their possible solutions. This chapter contains the following sections:

B.1 System Messages

Table B-1 displays a list of MetroPlanner system messages and severities.

Table B-1 Error Messages

Area	Severity	Message
General	Error	Resulting network design has channels with shortcoming in TX-RX (at least one channel with red alarm)
	Error	Process interrupted by user
Traffic Mapping	Error	Network not feasible. All solutions exceeds system capacity of 32 wavelengths
	Error	Maximum wavelength re-usage reached for channels with wavelength [wavelength]
	Error	Two protected services assigned to the same wavelength
	Error	Overlapped services assigned to the same wavelength
	Error	Can't route service with hitless: [service name]
	Error	Can't find alternate route for service: [service name] due to multiple HUB nodes along the path
	Error	Can't route service: [service name] through HUB node defined in site [Site Name]

Table B-1 Error Messages (continued)

Area	Severity	Message
Common (MetroCore MetroAccess)	Error	Span between site [Site Name] and [Site Name] is too long for OSC channel. Network unfeasible
	Error	Span between site [Site Name] and [Site Name] is too long for OSC channel. Try to remove PASS-THROUGH suggestion from site [Site Name]
	Error	Span between site [Site Name] and [Site Name] is too long for OSC channel. Try to unfreeze site [Site Name]
	Error (In case power in is below)	[West/East] channel power in [Site Name] is near or below the fail low threshold
	Error	Unfeasible Network design. [Site Name] should require usage of in-line attenuator
MetroCore	Error	[West/East] [PRE/BST] amplifier in [Site Name] is working with a gain over [Gain Limit] dB
	Error	Excessive span between [Site Name] and [Site Name]
	Error	Excessive span and too much channels between [Site Name] and [Site Name]
	Error	Dispersion compensation over limit. Try to unfreeze site [Site Name]
	Error	Dispersion compensation over limit. Try to unlock PRE in site [Site Name]
	Error	[PRE/BST] amplifier in [Site Name] [West/East] side is set to work in output power control mode
	Error	Dispersion compensation over limit. System needs custom design due to fibre before [Site Name]
MetroAccess	Error	Network not feasible: Exceeded 120 km
	Error	Network not feasible: Exceeded maximum amount of chromatic dispersion for at least one of the network connections
	Error	Network not feasible: Available amplification is not sufficient for the power budget requirements
	Error	Network not feasible: No valid solutions found, with at maximum 5 amplifiers per sub-network

Table B-1 Error Messages (continued)

Area	Severity	Message
General	Warning	Resulting Network design has some channel with shortcoming in TX-RX (at least one channel with yellow alarm)
	Warning	Resulting Network design has some channel with shortcoming in TX-RX (at least one channel with orange alarm)
	Warning	BOM does not contain any SFP module for the 2R Any Rate Client Service Type. Without SFP plug in, the board cannot work and it will be responsibility of the user adding the SFP as spare part
	Warning	In site [Site Name], multimode patch-cords between client port of transponder and Y-Cable module are not in BoM
Common	Warning (In case power in is near)	[West/East] channel power in [Site Name] is near or below the fail low threshold
MetroCore	Warning	In [Site Name], [Dir: CW/CCW] direction a fixed attenuator of [Att. Value] dB is needed
	Warning	In [Site Name], [Dir: CW/CCW] direction, before PRE amplifier, a fixed attenuator of [Att. Value] dB is needed
	Warning	VOA loops exhausted without stabilization...
	Warning	PMD warning on service [Service Name]
General	Info	The generated BOM does not include SONET/SDH units
Traffic Mapping	Info	No specific anti-ASE node is required for this traffic matrix requirement.
	Info	Additional OADM ports added in Node XX for Anti-ASE: some channels in Optical Bypass.

B.2 Traffic Mapping Troubleshooting

Traffic mapping troubleshooting encompasses problems that directly relate to network traffic.

B.2.1 Unfeasible Network

Symptom : Network not feasible. All the solutions exceed system capacity of 32, 16, or 8 wavelengths.

Table B-2 describes the potential causes of the symptom and the solution.

Table B-2 Unfeasible Network—System Capacity Exceeded

Possible Problem	Solution
Some span in the ring must carry more than 32 wavelengths to implement the traffic demands.	Remove all the forced routing direction on unprotected channels.
Some span in the ring must carry more than 16/8 wavelengths	Try changing the Project Options > Analyzer algorithm and check for feasibility.

Symptom : Network not feasible. Overlapped services assigned to the same wavelength.

Table B-3 describes the potential causes of the symptom and the solution.

Table B-3 Unfeasible Network—Overlapped Services

Possible Problem	Solution
Some unprotected channels with assigned wavelengths and directions overlap along the ring.	Remove pre-assigned directions and/or wavelengths on the specific channels.

B.2.2 Automatic Full-OADM NE Site Definition

Symptom : MetroPlanner automatically generated full optical add/drop multiplexing (OADM) nodes, even though they were not explicitly requested by the user.

Table B-4 describes the potential causes of the symptom and the solution.

Table B-4 Automatic Full-OADM Node Site Definition

Possible Problem	Solution
Full-OADM layout automatic definition can occur under the following circumstances: • Large capacity nodes (adding/dropping more than 12 wavelengths per side or more than 16 wavelengths in one side) are implemented using full-OADM node configuration for cost and layout efficiency. • Small capacity nodes requiring more than 4 OADM units in one side are implemented with full-OADM.	Avoid forcing wavelengths for connections from/to the node and forcing directions on unprotected channels (keep the default, which optimizes the routing and coloring processes). For a small capacity node, try to force the full-OADM site as Passive OADM (that has 5 slots available for *x* sides).

B.2.3 Unfeasible Unprotected Service Circuits

Symptom : Some circuit channels have negative optical signal-to-noise ratios (OSNRs) and/or power margins.

Table B-5 describes the potential cause of the symptom and the solution.

Table B-5 Unfeasible Unprotected Service Circuits

Possible Problem	Solution
The connection exceeds the optical target span budget.	Try to force the connection direction in order to route it on the other ring direction.

B.3 Amplifier and DCU Placement Troubleshooting

The amplifier and DCU placement algorithm is iterative and its convergence can depend on the initial state the optimizer is run against.

B.3.1 Unfeasible Service Circuits

Symptom : The user forced one or more nodes as Passive OADM, and some connections are unfeasible.

Table B-6 describes the potential cause of the symptom and the solutions.

Table B-6 Unfeasible Service Circuits

Possible Problem	Solution
You cannot make the passive OADM forced node passive (excessive loss) for performance reasons. MetroPlanner attempts to place an amplifier in the node, but cannot because the node was forced to be an passive OADM.	• Undo the forced passive OADM and allow the optimization process in the node. Then run the analyzer again. • Force an amplifier (such as a booster) in the previous node (if not already present). Then run the analyzer again. **Note** You should force the amplifier in both the clockwise and counterclockwise directions.

B.3.2 Exhausted VOA Loop

Symptom : MetroPlanner generates a warning stating that the system requires an inline bulk attenuator, but the exact value of the attenuator will not be given as an output.

Table B-7 describes the potential causes of the symptom and the possible solutions.

Table B-7 Exhausted VOA Loop

Possible Problem	Solution
The maximum number of amplifier and dispersion compensation unit (DCU) placement algorithm iterations has been reached.	There are two possible solutions: • If there are no channels with negative margins, disregard the warning and do nothing. • If at least one channel has negative margins, try one of the following actions: – Try to force the preamplifiers in the transmit (Tx) node of the failed channels and run the analyzer again. – Look at the system specification and determine whether the system is feasible. If so, find the path of the channel with the worst OSNR margin and force an amplifier in the first passive location starting from the Tx node and run the analyzer again.

B.3.3 Network Requires Custom Design

Symptom : MetroPlanner warns you that the system requires a custom design.

Table B-8 describes the potential cause of the symptom and the solution.

Table B-8 Network Requires Custom Design

Possible Problem	Solution
Network requires a custom design due to mixed fibers traversed by service <ServiceX>	Contact your Cisco representative to receive a custom network design.

B.3.4 Dispersion Check Warning

Symptom : MetroPlanner issues a dispersion check error.

Table B-9 describes the potential cause of the symptom and the solution.

Table B-9 Dispersion Check Warning

Possible Problem	Solution
MetroPlanner generates a dispersion check error for the following possible reasons: • You forced a site to a specific type, preventing the placement of a preamplifier. The analyzer requires a preamplifier on this site. • The dispersion check failed in a site where a preamplifier is already present.	Attempt to lock a preamplifier in the first previous free site in the path of the failed channel.
Dispersion check failed in Install mode where the dispersion of the previous span was modified.	Try unfreezing the first or the last preamplifier along the failing service.

B.3.5 Using 32 Channel DMX-O with Bulk Attenuators Option Disabled

Symptom : MetroPlanner generates the following message: “MetroPlanner tried to use the 32Chs DMX but this unit is not suitable in this network; try allowing the use of bulk attenuators or select the 32Chs DMX-O”.

Table B-10 describes the potential cause of the symptom and the solution.

Table B-10 Disabled Bulk Attenuators Option

Possible Problem	Solution
The user has disabled the use of bulk attenuators. The channels experience large power tilt.	• Enable the bulk attenuators at the 32 DMX output ports. • Try to lock amplifiers (boosters in line sites, for example) to reduce tilt. • Select 32 DMX-O.

B.3.6 The 32 Channel DMX Not Suitable due to Excessive Channel Tilt

Symptom : MetroPlanner generates the following message: “Due to excessive channel tilt, the 32Chs DMX is not suitable in this network; try unlocking an amplifier or select the 32Chs DMX-O”.

Table B-11 describes the potential cause of the symptom and the solution.

Table B-11 Excessive Channel Tilt

Possible Problem	Solution
The channel tilt cannot be recovered with the use of bulk attenuators at the DMX output, due to large channel power variations as the number of installed channels is varied.	• Try to lock amplifiers (boosters in line sites, for example) to reduce tilt. • Select 32 DMX-O.