1 Overview

SP Guru Transport Planner enables network designers to create robust and cost-effective Wavelength Division Multiplexing optical networks.
SP Guru Transport Planner's built-in network expertise provides capabilities for routing, grooming, and dimensioning networks to meet current and future traffic demands. You can create and test different "what-if" scenarios with varying topologies, traffic matrices, and configurations. Network managers can use SP Guru Transport Planner reporting features to compare the results of different scenarios, and thereby determine the most effective and least costly network designs to meet future demands. This chapter gives a brief introduction to many of these features, an overview of the design process, and references to additional information.

Product Features

Key features of SP Guru Transport Planner include:

- Layered network models—SP Guru Transport Planner creates four-layered network models compliant with ITU and ANSI recommendations. This enables you to create an explicit network model at four different layers: physical (buildings and cables), multiplexing (equipped fibers), optical-wavelength channeling and routing, and digital client (SONET/SDH traffic and routing).
- Optical network architectures—SP Guru Transport Planner includes two different modes for modeling different architectures:
  - — *Opaque* mode, for optical networks in which the OXC is surrounded by long-reach transponders interconnected to the WDM line systems. In these configurations, regeneration occurs at every intermediate node.
  - — *Transparent* mode, for optical networks with a transparent OXC. Wavelengths that transit through the node can either pass transparently through the OXC, or they can be regenerated (using regeneration equipment connected to the OXC) to overcome transmission limitations.
- Node models—With SP Guru Transport Planner, you can design a heterogeneous network with different node models (such as OXCs, DXCs, IXCs, and OADMs) assigned to the different nodes of your network
- Equipment models—SP Guru Transport Planner enables you to create generic equipment models for different types of WDM line systems and node equipment at the different layers. You can apply different cost models to line systems or node equipment so that the optimization algorithms select the most appropriate network equipment.

- Hardware configurator—In addition to using generic equipment models, you can also do a post-design step using the Hardware Configurator (HCON). This step enables you to create detailed models of hardware from different vendors and to configure the equipment down to the rack, card, and port level.

- Topology Design—SP Guru Transport Planner's graphical user interface enables you to create and modify network designs easily. You can create new designs from scratch using a simple drag-and-drop interface. To modify your topology at different layers, you can introduce nodes of different types, define cables between nodes, introduce cable splitters, define fiber routes, and equip fibers with WDM line systems or SONET/SDH systems.

- Traffic Modeling—You can create different traffic matrices—which are groups of connections—at both the optical layer (wavelength services) and the electric layer (SONET/SDH services). You can define SONET/SDH services at the higher-order path layer (also called the *digital client* or *DCL* layer) and at the lower-order path (LOP) layer. You can create traffic matrices that group connections with common characteristics (such as service class, bit rate, and protection strategy). Thus you can create different matrices for different types of connections and use these matrices to model different types of traffic. You can also use the traffic matrices to model traffic for different time frames and do a multi-stage design of your network.

- Resource and Service Tracking—You can track services and resources in your network by assigning them a custom user designation. You can also assign specific service identifiers to traffic and resources to reserve specific resources for specific services only.

- Import/Export—You can import all relevant network data from ASCII files that describe your network topology, traffic, equipment, etc. This enables you to create network designs quickly from existing data. You can also export information to reuse the data in future projects.

- Multiple scenarios per project—Each project can contain multiple scenarios. Each scenario contains a network that is independent of the other scenarios in the project. You can extract and compare network statistics (such as network cost and capacity) across multiple scenarios.

- Routing—SP Guru Transport Planner can route traffic at both the optical-channel and the digital-client layers. You can apply both unprotected and diverse-path protected routing algorithms. The routing algorithms consider the capacity limitations of the installed equipment in the network. You can define a set of routing constraints for specific traffic, which SP Guru Transport Planner will consider during the route calculations.

- Manual routing—In addition to routing an entire traffic matrix, you can also establish connections individually. You can inspect the candidate routes and metrics and then select the route to use for a specific connection.

- Network dimensioning—Given a traffic matrix, SP Guru Transport Planner dimensions the nodes and links to accommodate the specified traffic. Custom algorithms dimension the network to maximize throughput at the lowest possible cost.

- Physical link
  design—SP Guru Transport PlannerSP Guru Transport Planner designs the links (that is, it places amplification and regeneration sites along a link) based on the transmission characteristics of the different WDM line system types. This enables the dimensioning and other design algorithms to consider the cost of amplifiers and regenerators in their calculations.

- Protection and restoration—SP Guru Transport Planner can consider various protection mechanisms at the optical and electrical layers: dedicated path (1+1), shared path (N:M), end-to-end path restoration, and link-based restoration. You can design your network to reserve sufficient spare capacity for the resilience strategy of your choice. SP Guru Transport Planner can calculate the protection paths using the shared risk link group (SRLG) concept to protect against failures of shared resources at lower network layers.

- Transparent networks—With SP Guru Transport Planner, you can design and evaluate networks that have limited transparency reach and selective regeneration. This enables you to balance the amount of required regeneration and the maximum length of a transparent connection in your network.

- Grooming—SP Guru Transport Planner supports multi-layer design actions that efficiently groom lower-bit-rate services into higher-bit-rate services. You can use LOP-to-DCL traffic grooming to translate VT-level SONET connections (or VC-level SDH connections) into STS-level signals (or STM-level SDH signals). You can use DCL-to-OCH traffic grooming to map SONET (or SDH) traffic into wavelengths in a cost-efficient way; this operation balances the routing and switching cost optimally over the optical and electrical layers.

- SONET ring design—SP Guru Transport Planner supports SONET/SDH ring architectures. As part of the Digital Client Layer (DCL) infrastructure, you can specify SONET rings on top of the physical topology. You can route DCL traffic on these rings, upgrade the rings by adding stacked rings on top of them, or let the ring design operation determine the stacked rings to deploy.

- Availability calculations—Based on the failure rates specified for different network elements, and the recovery mechanism applied to a service, SP Guru Transport Planner can calculate the availability of service and calculate metrics such as expected loss of traffic.

- Failure analysis—You can also define your own failure scenarios within SP Guru Transport Planner. First you select the network elements that fail (such as cable cuts or OXC failures). Then SP Guru Transport Planner evaluates how these failures affect the traffic routed in the network and determines which connections are affected, lost, and recovered.

- Browsers—Browsers provide intuitive access to relevant node, link, and connection information at different layers. The tree structure allows you to expand or collapse branches to show or hide detail.
- Bill of Materials (BOM)—You can easily generate and view a comprehensive Bill of Materials that reports the line and node equipment at different areas in the network: tributary cards per bit rate, digital and optical cross-connects (DXCs and OXCs), OADMs, long- and short-reach transponders, in-line Optical Amplifiers (OAs), and regenerator equipment.
- Spreadsheet reports—You can export a wide variety of network data to comma separated value (CSV) files that can be opened and modified using a spreadsheet program such as Excel. These reports contain detailed information about node and link resources, connection routes, cost information, and so on.
- Batch console—You can use SP Guru Transport Planner's batch console to open scenarios and run network design operations automatically. The batch console supports all network design operations that appear in the user interface. This enables you to perform complex and lengthy network designs during an overnight run.

The SP Guru Transport Planner Workflow

The SP Guru Transport Planner workflow is divided into four main phases:

1) Creating Baseline Information—Physical topology, network properties, traffic matrices and cost parameters
2) Designing Your Network—Run dimensioning, routing, and grooming actions
3) Evaluating your Network—Analyze the amount of equipment installed, degree of node/line connectivity, wavelength usage, equipment and line costs, and so on
4) Hardware Configurator (*optional*)—Configure the installed hardware in detail (based on user-specified data files) to define equipment down to the rack, card, and port level

Creating Baseline Information

There are four sets of information you must apply before you begin designing your network:

1) A *physical topology* of your network
2) The *network properties*, such as transparency and SONET/SDH mode

3) One or more *traffic matrices*, which describe the traffic demands that your network must accommodate

4) *Cost parameters*, which SP Guru Transport Planner uses to determine the most cost-effective network design for a particular scenario

You can specify this information manually; you can also create data files and then import the data directly into a scenario . For more information, see References: Getting Started on page TrP-1-7.

Creating a Network Topology

Layered Network Design

SP Guru Transport Planner uses five different layers to model a network, as outlined (from highest layer to lowest) in Table 1-1.

Table 1-1 Network Layers in SP Guru Transport Planner

Abbrev	Layer	Description
LOP	Lower Order Path	SONET/SDH lower order tributaries—contains lower order traffic: virtual containers (VC) in SDH or virtual tributaries (VT) in SONET
DCL	Digital Client Layer	SONET/SDH higher order traffic layer—used to represent STM/STS-level trunks and connections
OCH	Optical Channel	Optical channel layer—optical line systems and optical cross-connects
OMS	Optical Multiplex Section	Fiber layer—equipped fibers
OTS	Optical Transmission	Physical layer—buildings and cables
End of Table 1-1		

Creating a Topology

The Project Editor window provides an environment for defining the topology of an optical network. A network model consists of *nodes* that communicate with each other using *links*. SP Guru Transport Planner provides a simple drag-and-drop interface for creating topologies. First you select a node or link model in a separate window (the *object palette*); then you click in the workspace to create network objects (nodes and links).

Each link and node object has its own set of properties. You can customize the properties of individual network objects. Depending on your design needs, you might want to add more lit fibers or equipment, for example, or change the model of a node (OXC, DXC, IXC, etc.). When you double-click on an object, an object browser appears; to edit an object's properties within the browser, you right-click on the object.

Typically you specify a meshed network topology. To add rings to the topology, you can select the nodes that are part of the ring, then specify the type and bit rate of the ring.

Generally, you build a network using a “bottom-to-top” approach: creating and customizing the topology in the lower (OTS and OMS) layers, then designing and analyzing the network in the upper (OCH, DCL, and LOP) layers.

Creating Traffic Matrices

After you create a topology, you create one or more *traffic matrices*. A traffic matrix describes the traffic levels between each node pair in your network. SP Guru Transport Planner includes a Traffic Matrix Editor that makes this process quick and easy.

You can think of a traffic matrix as a current or projected demand that your network must accommodate. Traffic matrices come in three varieties:

- LOP matrices, which represent SONET/SDH lower-order tributary demands (VT/VC-level)
- DCL matrices, which represent SONET/SDH demands (STS/STM-level)
- OCH matrices, which represent optical-channel demands.

Most network-design operations (routing, dimensioning, and so on) take one or more traffic matrices and derive the most optimal network configuration to support those matrices.

Network Properties

In the network properties you specify network-wide settings that apply to the entire design process:

- The transparency mode
- The node model
- Default parameters for WDM line systems and bit rates
- SDH or SONET mode

Cost Parameters

Cost is a primary factor in optical-network design: most designers strive for the most cost-effective solution that fits a set of assumptions, demands, and conditions. SP Guru Transport Planner has a generic cost model that enables you to define new equipment types (such as WDM link systems, DXCs, OXCs, IXCs, and so on) and to specify their costs. You can export and import different cost sets and apply them to different scenarios.

Importing Network Data

SP Guru Transport Planner can import link, node, traffic, and equipment data from ASCII comma-separated-value (.csv) files. You can edit your network data manually using a spreadsheet program such as Excel; then you can import different sets of data to create “mix-and-match” scenarios. For example, you can test multiple scenarios using the same nodes but multiple link settings that reflect varying budget projections in your organization.

References: Getting Started

Table 1-2 lists references to information about getting started with SP Guru Transport Planner.

Table 1-2 Getting Started

Topic	Reference
Creating a Network Topology	Defining a Network Topology on page TrP-3-9
Importing Data	Importing and Exporting Data on page TrP-5-1
Creating Traffic Matrices	Creating Network Traffic on page TrP-3-26
Network Properties	Network Properties on page TrP-3-23
Cost Parameters	Generic Link Costs on page TrP-3-41
End of Table 1-2	

Designing Your Network

After you set up your topology, traffic matrices, and cost parameters, you can start designing your network in earnest. There is no single, linear workflow in SP Guru Transport Planner; you can perform different functions depending on your particular goals. This section describes the major design operations in SP Guru Transport Planner, and provides references to further information.

The workflow for designing a network typically consists of two phases:

1) Topology Design—SP Guru Transport Planner includes design operations that operate on your physical topology and are independent of traffic, such as link design, setting up fiber routes, and creating DCL rings.

2) Setting Up Traffic—In this phase, you define the traffic that your network needs to support; then you run design operations that route the connections and utilize or upgrade the network capacity in the most optimal way.

Topology Design

Link Design

After you specify your topology, you should design the links of your network. Link design places the required regeneration and amplification sites along a link, depending on the transmission characteristics of the selected WDM line system. Link design is needed to ensure that dimensioning and other design operations consider the cost of amplification and regeneration sites. In transparent mode, link design is a prerequisite because it defines the existing in-line regeneration sites and drives the in-node regenerators required.

Route and Equip Fibers

Before you design your network, you can equip some fibers to reflect legacy capacity in your network. You can also define “express fibers” between non-adjacent nodes, by routing an entire fiber between these nodes.
SP Guru Transport Planner also supports the concept of “express layer design” which helps determine the most suitable express links to add.

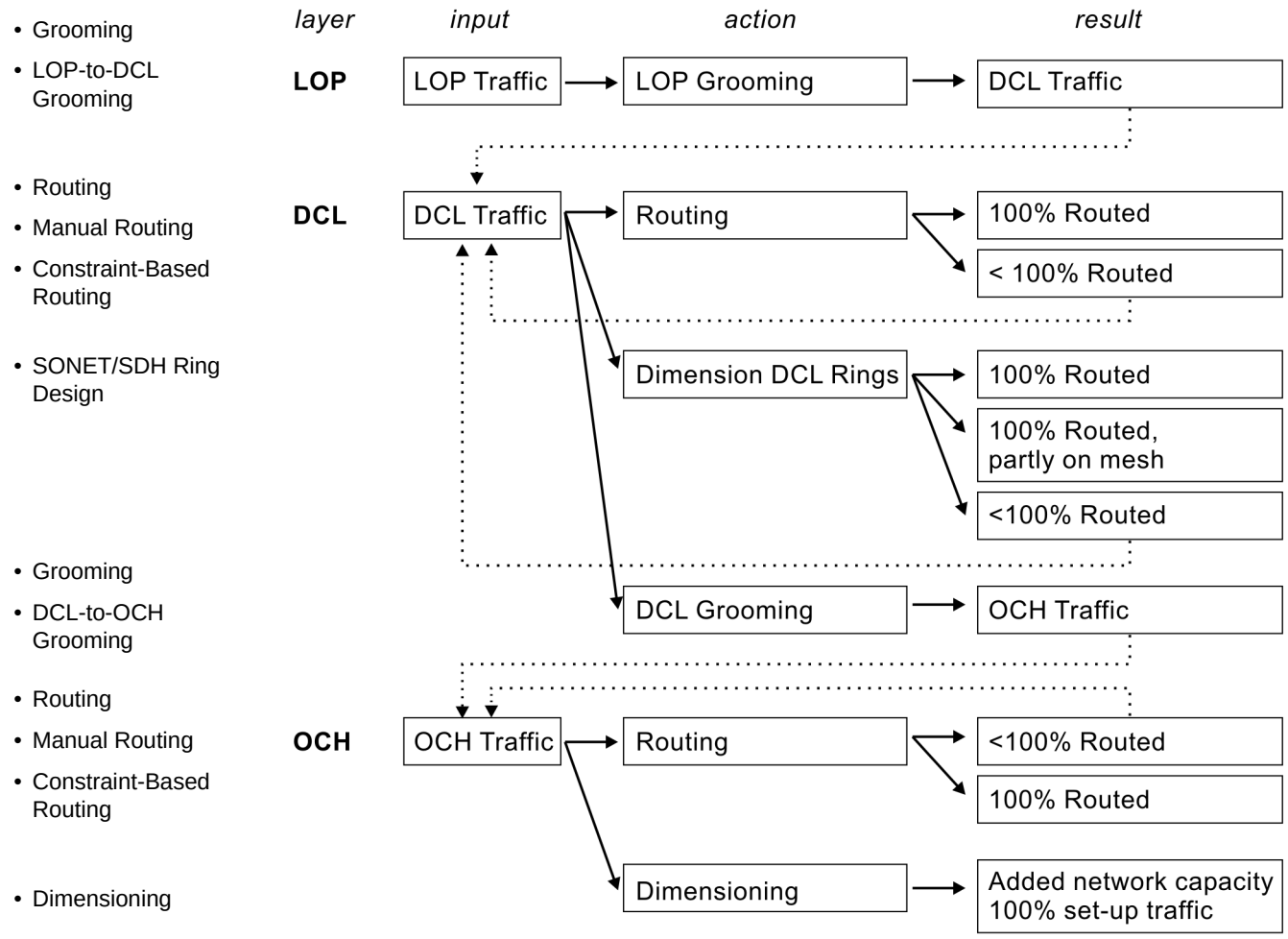
Creating DCL Rings

SP Guru Transport Planner supports protected ring architectures. You need to define the physical topology of the DCL rings. Then when you set up traffic, you can use ring dimensioning operations to add stacked rings on the defined topology, and/or route traffic over these rings.

Setting Up Traffic

This section describes the different design operations that can be used to set up traffic, as illustrated in Figure 1-1. For references to additional information, see References: Design Operations.

Figure 1-1 Setting Up Traffic: Logical Workflow



Dimensioning

In most cases, you will want to dimension your network—that is, to equip it with enough capacity to handle a specific level of traffic. Dimensioning can be done for different recovery strategies. The aim is to route all traffic at minimal cost. Dimensioning can consider multiple WDM line system types or SONET/SDH trunk bit rates and deploy the cost-optimal type on each link. In transparent network mode, dimensioning also adds regeneration equipment in the nodes when required to overcome transmission limitations.

In general, SP Guru Transport Planner does “upgrade” dimensioning: it upgrades the network capacity to accommodate the selected OCH traffic matrix, but does not change or remove existing facilities and traffic.

Routing

A routing operation takes one or more OCH or DCL traffic matrices and sets up connections in the corresponding network layer to route as much of the traffic as possible. Unlike dimensioning, routing uses only the existing capacity of the network, and does not create any additional capacity (for example, by equipping more fibers or by expanding the node sizes). Routing is possible for both DCL and OCH traffic matrices. Given the traffic matrices and existing network capacity, SP Guru Transport Planner uses special routing algorithms to maximize throughput at minimal cost. In transparent network mode, routing also assigns regenerators or wavelength converters to connections when required to overcome transmission limitations.

The routing operation has several options. You can turn node capacity limitations on or off. You can choose between an unprotected (shortest-path) or a protected (shortest-cycle) routing algorithm. With protection enabled, SP Guru Transport Planner calculates a working path and a disjoint protection path to accommodate a connection. Disjointness can be guaranteed down to the OTS layer. You can also specify how SP Guru Transport Planner calculates the lowest-cost path or cycle (routing cost), and the order in which it routes the connections (routing order).

Manual Routing

In addition to routing an entire traffic matrix, you can also establish connections in the network on a connection-per-connection basis. You can inspect the candidate routes and metrics and then select the route to use for a particular connection.

Constraint-Based Routing

You can add constraints to a connection; SP Guru Transport Planner will consider these constraints when it calculates routes. You can add two types of constraints:

- Routing constraints that specify limits on the hop count, fiber length, and delay of a route
- Topological restraints that force specific nodes to be included or not included in a route

Grooming

Grooming is a design operation in which the connections specified in a traffic matrix are grouped into higher-bit-rate connections in a lower network layer. You can think of grooming as a “top-down” approach to network dimensioning, in which traffic demands in one network layer are grouped into demands in the layer directly beneath, and are used to dimension that lower layer.

SP Guru Transport Planner supports two types of grooming: LOP-to-DCL grooming and DCL-to-OCH grooming.

LOP-to-DCL Grooming Grooming from LOP to DCL involves multiplexing lower-order tributaries (VT-1.5 in SONET, VC-11 in SDH) into higher-order containers in the DCL layer (STS-1 in SONET, STM-3 in SDH). This means that, after you groom an LOP traffic matrix, the LOP connections are supported by a traffic matrix of DCL connections. You can route the matrix on the DCL layer directly, or groom it into OCH-layer traffic (as described in the next section).

DCL-to-OCH Grooming DCL-to-OCH grooming multiplexes and encapsulates DCL traffic into OCH traffic (for example, STS-3 signals into an OC-48 optical channel). Grooming DCL traffic is a two-step process:

1) Translate the DCL traffic matrix into a cost-optimal OCH traffic matrix (in other words, design the logical DCL layer).

2) Dimension the OCH layer for the resulting OCH demand matrix.

The DCL-to-OCH grooming algorithms use the cost parameters you specify (in the Equipment Properties dialog box) to ensure that the resulting design results in the lowest possible network cost. You can specify different grooming algorithms and protection options to direct the grooming.

SONET/SDH Ring Design

SP Guru Transport Planner supports both ring and mesh SONET/SDH network architectures and combinations of both. You can create SONET/SDH rings using the Ring Browser. You can define SONET/SDH rings directly over dark fiber or supported by the wavelengths of the WDM line systems.
SP Guru Transport Planner supports both UPSR, 2F-BLSR, and 4F-BLSR rings.

You can route DCL traffic on these rings, and upgrade the rings by adding stacked rings on top of them or by applying the ring design algorithm.
SP Guru Transport Planner can also suggest new rings to add to your network.

Traffic Variations

The Traffic Variations operation evaluates your network's ability to support varying traffic levels for a specific OCH matrix. Therefore, you can test your network designs against projected increases in traffic and obtain hard data on your network's performance (routed capacity, connectivity, utilization, and so on) according to different traffic levels and protection strategies.

Batch Console

You can use the SP Guru Transport Planner batch console to automate lengthy or complex network designs by running a script instead of running design operations from the user interface. The batch console supports all network design operations that you can run from the user interface. You can define a batch script manually, using an ASCII text file, or record a batch script using the user interface. You can run a batch script at any time; for example, you can run a complex script at night so that you can see the finished design in the morning.

References: Design Operations

Table 1-3 lists references to information about the available design operations in SP Guru Transport Planner.

Table 1-3 Network Design Operations

Topic	Reference
Designing links	Link Design on page TrP-3-45
Fiber routing and express layer design	Fiber Routing on page TrP-3-21 Chapter 11 Optical Express Layer on page TrP-11-1
Ring design	Chapter 12 Ring Design on page TrP-12-1
Dimensioning	Dimensioning a Topology on page TrP-7-1
Routing	Routing on page TrP-6-1 Routing Results on page TrP-6-16
Transparent networks	Chapter 10 Transparent Networks on page TrP-10-1
Grooming	Chapter 8 Grooming DCL to OCH Traffic on page TrP-8-1 • End-to-End (ETE) Optimization Algorithm on page TrP-8-21 • Link-by-Link (LBL) Optimization Algorithm on page TrP-8-24 Chapter 9 Grooming LOP to DCL Traffic on page TrP-9-1
Traffic Variations	Traffic Variations on page TrP-6-21
Batch Console	Chapter 16 Batch Console on page TrP-16-1
End of Table 1-3	

Evaluating your Network

SP Guru Transport Planner includes several methods for evaluating the current state of your network, as described in the following sections.

Browsers

Browsers provide intuitive access to relevant node, link, and connection information at different network layers. A tree structure enables you to expand or collapse branches, showing or hiding detail. Browsers are layer-sensitive: the information displayed differs by selected layer. When you click on a certain element in a branch of a tree, the element expands and more detailed information displays. You can also edit certain information by right-clicking a selected item.

Bill of Materials

A Bill of Materials (or BOM) is a detailed report of all the equipment currently in your network. This report displays detailed information about your network: digital and optical switch fabrics, WDM terminal equipment, in-line regeneration and amplification, transponders required for opaque and transparent switch architectures, and so on.

Equipment/Line Failures and Availability

You can use the Evaluate Availability operation to predict your network's performance in the event of link or equipment failures. You can specify various protection strategies and restoration options as well as link/equipment failure and repair rates. For each connection, SP Guru Transport Planner reports detailed statistics on the connection's availability and expected loss of traffic per year. You can also derive failure probabilities and traffic-loss statistics for the network as a whole.

Failure Analysis

You can use the Failure Analysis mode in SP Guru Transport Planner to evaluate the impact of user-defined failures on the traffic routed in the network. You can select the elements to fail and evaluate the amount of affected, lost, and recovered traffic. You can work in different iterations, adding or repairing failures, and thereby study the impact of a sequential series of failures. You can also generate Failure Analysis reports for custom scenarios, in which you define the specific network elements to fail.

Comparing Scenarios

One project can contain multiple scenarios. You can compare network statistics between different scenarios in the project. SP Guru Transport Planner can show comparison results in both tabular and graph form.

Text or Spreadsheet Reports

After a network design operation, SP Guru Transport Planner can generate a text report that shows a detailed overview of the steps and results of the algorithm.

You can also generate text reports that show network, cost, node, link, and connection information by layer. The reports are generated in .csv format so they can be opened in a spreadsheet program such as Excel.

SP Guru Transport Planner can also generate web (HTML) versions of most reports. Web reports make it easy to distribute reports, because you can offer them on an Intranet or even the Internet.

Other Reporting Features

SP Guru Transport Planner also includes the following evaluation/reporting features:

- Wavelength Usage—You can view the available resources in the optical layer at any time. The Wavelength Usage window shows how many times a wavelength is provided in the network, and whether it carries traffic or not.
- OTS Link and node connectivity—The Node Connectivity and Link Connectivity windows show the degree of connectivity for each node pair and link. Both windows also show minimum, maximum, and average connectivity values for the entire network.
- Topology—The Topology windows show information about the topology in each of the five layers (LOP, DCL, OCH, OMS, OTS). These windows show information such as node and link connectivity, node ports, and the number of nodes for each type.
- Node costs—The Node Cost window shows the quantities, costs per unit, and total costs for various types of equipment currently installed in your network.
- Link costs—The Link Cost window shows the quantities, costs per unit, and total cost for the cables, fibers, optical amplifiers, regenerators and optical channels currently installed in your network.
- Network costs—The Network Cost window shows the total node, link, and network costs, as well as the link and node cost as a percentage of total network cost.
- Inspect Utilization—You can inspect the utilization of nodes and links at the different layers. SP Guru Transport Planner can color the nodes and links based on their utilization. The user can define thresholds values for this.
- Transparent Routing—You can extract routing details that correspond to the transparent network mode. This report shows the regeneration capacity per node, routes taken by the connection, actual regeneration points, etc.

- Shared risk link groups—This report provides an overview of the DCL links and their relationship with respect to the Shared Risk Link Group (SRLG) concept. Two DCL links are SRLGs if the links are supported by a common link in one of the lower layers.
- Restoration routes—This report provides an overview of how different link failures affect traffic that uses mesh restoration, and lists the actual restoration routes taken by that traffic.
- SONET/ SDH Rings—This report provides an overview of the SONET/SDH rings in the network and their utilization.
- Routing Details—This report provides an overview of all connections established in the network, the paths taken and the electrical and optical processing points in the network.
- Availability Report—This report contains information on the targeted and achieved availability of connections.
- Diversity Report—This report provides information about how diversely one or more traffic matrices are routed.
- Service Identifier Assignments Report—This report visualizes the Service Identifiers that are assigned to connections. You can also use this report to verify whether the DCL connections have been routed over wavelengths with matching Service Identifiers.
- Failure Analysis Report—You can select one or more failure types (such as cable cuts or entire node failures) and get a report listing the effects of each individual failure on the network traffic. For each traffic matrix (on every layer), you can see which connections will be lost, affected or remain unaffected by the failure. You can view the effects of both single and pair-wise failures.

References: Viewing Network Information

Table 1-4 lists references to information about the reporting and visualization features in SP Guru Transport Planner.

Table 1-4 Viewing Network Information

Topic	Reference
Node, Link, Connection, and Ring Browsers	Chapter 4 Viewing and Configuring Objects on page TrP-4-1
Failure Analysis and Availability Calculation	Chapter 14 Failure Evaluation on page TrP-14-1
Other reports	Chapter 15 Viewing Network Information on page TrP-15-1
End of Table 1-4	

Hardware Configurator

Hardware configuration is an optional step that you can do after you design your network. This step requires a network in which all traffic has been accommodated in the network using the network design features of SP Guru Transport Planner. HCON designs your installed hardware based on user-specified device and card files instead of the generic SP Guru Transport Planner equipment model. The resulting equipment model is much more detailed and enables you to model different vendors and families for a specific type of equipment (for example, for a DXC). HCON enables you to choose the most cost-effective vendor and equipment family for each equipment type and configures your installed equipment down to the rack, card, and port level. You can configure your hardware in multiple iterations; this means that you can upgrade an initial configuration to handle additional traffic in the network. You can generate HTML reports that describe the equipment configuration in each node and link.

For more information, see Chapter 13 Hardware Configurator on page TrP-13-1.