13 Hardware Configurator

You can use the Hardware Configurator (HCON) to create detailed designs of the hardware required in your network. These designs add detail to the generic equipment models used by SP Guru Transport Planner. HCON is based on two major components:

- Hardware text files—You can use hardware text files to create detailed models of telecommunications equipment; these models are based on sets of devices (chassis, cards, and ports) and the relationships between the devices. You can extend the hardware file format to define additional device properties that are not modeled by HCON but are still important to the design. You can use the HCON file format to define a library of possible vendor-specific equipment models for each of the generic equipment types in SP Guru Transport Planner (such as DXC and OXC).
- Configuration algorithms—The intelligence provided by the HCON algorithms complements the intelligence of SP Guru Transport Planner design operations such as dimensioning and grooming. You can think of HCON as a “post-SP Guru Transport Planner” design operation that does a more in-depth design of the hardware based on the results of the original network design. For example, SP Guru Transport Planner calculates path routing and link and node capacity requirements; HCON uses this information to select the most suitable link and node equipment and configures the cards and ports on the equipment. HCON has different configuration algorithms that you can apply according to the type of equipment it needs to configure.

These building blocks provide a powerful method for doing in-depth hardware configuration studies of the different types of equipment modeled in SP Guru Transport Planner. You can use hardware text files to associate a hardware library with each of the equipment types in SP Guru Transport Planner. Then you can use the configuration algorithms to select the best combination of equipment to apply to the specific equipment types.

Network Design vs. Hardware Design

HCON is a “post-design” step in the network design workflow. This means that you must design the network in SP Guru Transport Planner before you assign the required equipment configurations. You can use the typical SP Guru Transport Planner design operations such as dimensioning, grooming, and ring design. After all traffic has been routed, and adequate network capacity has been added, the HCON algorithms can do a more in-depth configuration of the different devices.

Because there is a tight relationship between SP Guru Transport Planner equipment types (such as OXC, DXC, and ADM) and the specified equipment in the HCON file format, you must create the design in SP Guru Transport Planner with the correct SP Guru Transport Planner types and properties. For example:

- To design a network with a specific node type such as OADM, OXC, or IXC, set the desired node type in SP Guru Transport Planner. HCON does not decide which equipment type to use. However, HCON does decide which OXC model (or set of models) to use in a node, and which cards to deploy. The cards are set according to the port requirements in that node, which are a result of the network design in SP Guru Transport Planner. (The equipment type is specified in the device file using the WDMG:Type field.)

- Within SP Guru Transport Planner, a network is designed for a specific WDM line system type (LS type) or a combination of different LS types. SP Guru Transport Planner has an internal set of LS models and design algorithms that can select the lowest-cost LS type according to the cost factors and traffic requirements on a link. HCON does not determine which LS type to use. However, it does determine which link equipment matches the LS type and how to configure the link equipment. This means that when you design a network in SP Guru Transport Planner, you must ensure that the LS types used in the network match the link equipment specified in the device file. (The line system type of the node and link equipment is specified in the device file using the WDMG:LS field.)

- When you groom traffic to a specific bit rate or use SONET rings of a specific bit rate, you must ensure that the bit rate is supported by devices that are defined in the device file. (The bit rate of the SONET equipment is specified in the device file using the WDMG:Bit Rate field.)

These examples illustrate the difference between the network design in SP Guru Transport Planner and the hardware design in HCON:

- The network design makes high-level decisions such as which node type to use, how to route the existing traffic, and how much capacity is required to support the traffic (that is, what line systems and bit rates to use).

- The hardware design makes low-level decisions, such as which hardware devices to use for each SP Guru Transport Planner type (for example, which vendors and models for a DXC) and how each device should be configured.

Workflow Description

The following steps outline the general workflow for designing hardware in a network:

1) Create a baseline network and run the network design functions to accommodate traffic and install equipment in the network, as described in The SP Guru Transport Planner Workflow on page TrP-1-4.

2) Create a set of data files that specify the devices and cards that you want to use to equip your network. These file formats are described in Hardware File Formats on page TrP-13-4.

3) Import the device and card data into your scenario. This creates a hardware library that specifies the possible equipment you can deploy in your network. This step is described in Importing Hardware on page TrP-13-8.

4) Investigate the hardware library to verify that the data was imported correctly and specify the equipment that you want to be considered for the next hardware configuration run. This step is described in Managing Hardware on page TrP-13-9.

5) Configure the equipment currently deployed in your network. This means that you apply device and card data to the nodes and links currently deployed in the network. This step is described in Configuring Hardware on page TrP-13-11.

6) View the results of the configuration. SP Guru Transport Planner provides several mechanisms for viewing hardware data:

   a) A hardware browser, similar to the Node or Link Browser (see Hardware Browser on page TrP-13-16)

   b) An Upgrade History window, which provides an overview of the equipment added to the network during previous configuration runs (see Viewing the Upgrade History on page TrP-13-22)

   c) A hardware web report (see Hardware Web Report on page TrP-13-24)

You can undo hardware design operations using the Strip Hardware operation (Hardware > Strip Hardware, described in Stripping Hardware on page TrP-13-22). Thus you can design the hardware in your network by going through repeated iterations, in which each successive design builds on previous solutions and refines your hardware configurations until you arrive at an optimal design solution.

Hardware File Formats

You must create .csv files that specify the candidate equipment that SP Guru Transport Planner will process. Normally, there are two files: one that specifies the devices and one that specifies the cards. You can define different devices or cards in one file or in multiple files (for example, one device file per vendor or SP Guru Transport Planner type).

The devices are related to the different equipment types used in SP Guru Transport Planner. You must ensure that the correct SP Guru Transport Planner type is used in SP Guru Transport Planner and that the device file lists equipment that matches the SP Guru Transport Planner type. Each device has a number of slots of a specific type. The card file defines which cards fit in which slot type.

Table 13-1 Equipment Types Used in SP Guru Transport Planner

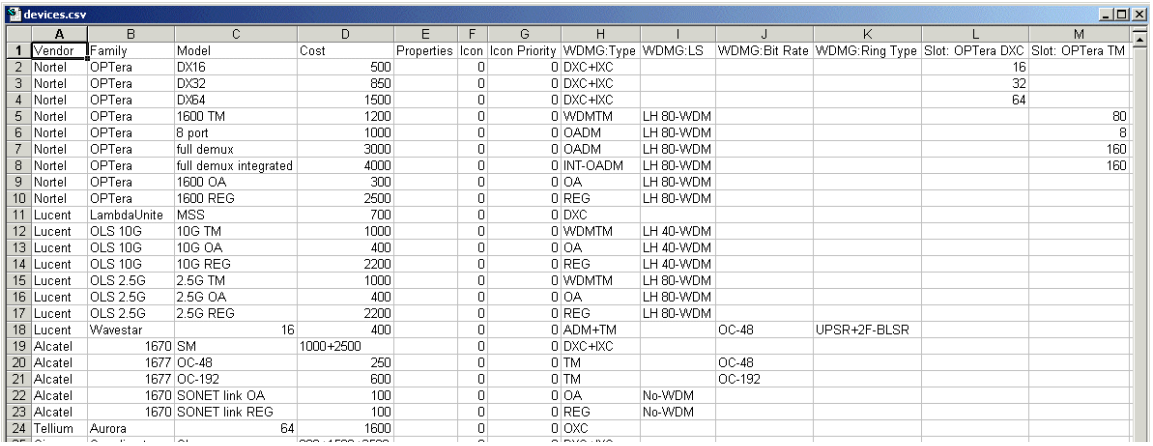
Abbreviation	Equipment Type
TM	SONET/ SDH Terminal Multiplexer
DXC	SONET/ SDH Digital Cross-Connect
ADM	SONET/ SDH Add/Drop Multiplexer
IXC	Integrated Optical/Digital Cross-Connect
OXC	Optical Cross-Connect
OXCT	Optical Cross-Connect—Transparent
WP-OXC	Transparent Wavelength Plane OXC
INT-OXC	WP-OXC with Integrated Fiber Ports
OADM	Optical Add/Drop Multiplexer
INT-OADM	OADM with Integrated Fiber Ports
PP	Patch Panel
WDMTM	WDM Terminal Multiplexer
OA	Optical Amplifier
REG	Regenerator
End of Table 13-1	

All equipment is considered node equipment, except the last three types (WDMTM, OA, and REG); these form a WDM line system (LS) and are considered part of the link equipment. You must define these three devices separately in the file; however, HCON optimizes and configures the three devices together as one device: LS.

Device File Format

Figure 13-1 shows the file format used to define HCON devices. For information about specific fields, see Table 13-2.

Figure 13-1 Device File Format



devices.csv

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Vendor	Family	Model	Cost	Properties	Icon	Icon Priority	WDMG:Type	WDMG:LS	WDMG:Bit Rate	WDMG:Ring Type	Slot: OPTera DXC	Slot: OPTera TM
2	Nortel	OPTera	DX16	500		0	0	DXC+IXC				16	
3	Nortel	OPTera	DX32	850		0	0	DXC+IXC				32	
4	Nortel	OPTera	DX64	1500		0	0	DXC+IXC				64	
5	Nortel	OPTera	1600 TM	1200		0	0	WDMTM	LH 80-WDM				80
6	Nortel	OPTera	8 port	1000		0	0	OADM	LH 80-WDM				8
7	Nortel	OPTera	full demux	3000		0	0	OADM	LH 80-WDM				160
8	Nortel	OPTera	full demux integrated	4000		0	0	INT-OADM	LH 80-WDM				160
9	Nortel	OPTera	1600 OA	300		0	0	OA	LH 80-WDM				
10	Nortel	OPTera	1600 REG	2500		0	0	REG	LH 80-WDM				
11	Lucent	LambdaUnite	MSS	700		0	0	DXC					
12	Lucent	OLS 10G	10G TM	1000		0	0	WDMTM	LH 40-WDM				
13	Lucent	OLS 10G	10G OA	400		0	0	OA	LH 40-WDM				
14	Lucent	OLS 10G	10G REG	2200		0	0	REG	LH 40-WDM				
15	Lucent	OLS 2.5G	2.5G TM	1000		0	0	WDMTM	LH 80-WDM				
16	Lucent	OLS 2.5G	2.5G OA	400		0	0	OA	LH 80-WDM				
17	Lucent	OLS 2.5G	2.5G REG	2200		0	0	REG	LH 80-WDM				
18	Lucent	Wavestar	16	400		0	0	ADM+TM		OC-48	UPSR+2F-BLSR		
19	Alcatel	1670	SM	1000+2500		0	0	DXC+IXC					
20	Alcatel	1677	OC-48	250		0	0	TM		OC-48			
21	Alcatel	1677	OC-192	600		0	0	TM		OC-192			
22	Alcatel	1670	SONET link OA	100		0	0	OA	No-WDM				
23	Alcatel	1670	SONET link REG	100		0	0	REG	No-WDM				
24	Tellium	Aurora	64	1600		0	0	OXC					

Table 13-2 Device File Format

Field	Description
Vendor Family Model	Identifies a unique device. You must specify these fields according to the following requirements: • You can specify multiple product families for each vendor and multiple device models for each family. • A valid configuration for a SP Guru Transport Planner type must consist of device models from the same vendor and family. For example, the DXC configuration in a node can consist of multiple devices of the same family (Nortel OPTera DX16 and DX32) but not of devices of different families (a Nortel OPTera DX16 and a Lucent LambdaUnite MSS). • A valid node configuration can contain different families and models for different SP Guru Transport Planner types (for example, a Nortel OPTera DX16 for the DXC and a Lucent Wavestar 16 for the ADMs in the same node). • A valid line system configuration contains WDMTM, OA, and REG devices of the same vendor and family.
Cost	Base cost of the device. This field can contain multiple values, separated by the '+' character, to model modular devices (see Compound Values on page TrP-13-6).
Properties	This field can contain auxiliary parameters such as “floorspace” or “power” (that is, power consumption)
Icon Icon Priority	Specifies the icons to represent the device in the SP Guru Transport Planner user interface

Table 13-2 Device File Format (Continued)

Field	Description
WDMG:Type	Specifies the SP Guru Transport Planner equipment type(s) that the device supports. A device can support multiple SP Guru Transport Planner equipment types. For example, you can use a specific switch as a DXC, IXC or MSSP. Each field can also contain multiple types, separated by a '+' sign (see Compound Values). **Note—**Take care filling out the values for the four “WDMG:” fields in the device file, because the names must match the names used in SP Guru Transport Planner exactly.
WDMG:LS	Specifies the corresponding line system in SP Guru Transport Planner. This field is needed for WDMTM, OADM, INT-OADM, WP-OXC, INT-OXC, OA, and REG devices only.
WDMG:Bit Rate	Specifies the aggregation bit rate for a SONET/SDH device. This field is needed for ADM and TM devices only.
WDMG:Ring Type	Specifies the SONET/SDH ring type(s) the device supports (such as UPSR, 2F-BLSR or 4F-BLSR). This field is needed for ADM devices only. Each field can also contain multiple values, separated by a '+' sign (see Compound Values).
Slot:<*slot_id*>	The final fields define the different slot types. Each field specifies the number of slots of type <*slot_id*> per device model. These fields start with the string “Slot:” followed by the name of the slot type. The slot type can have an arbitrary name. The cards that fit into a certain slot are specified in the card file, by referring to the name of the slot type. Each field can also contain multiple values, separated by a '+' sign to model modular devices (see Compound Values). A device contains a number of slots of a specific type. Different devices can use the same slot type. Multiple device models of the same vendor and family should always use the same slot type because these devices use the same set of cards.
End of Table 13-2	

Compound Values

A *compound value* is a series of values separated by ‘+’ characters. You can specify compound values for the following fields in a device file:

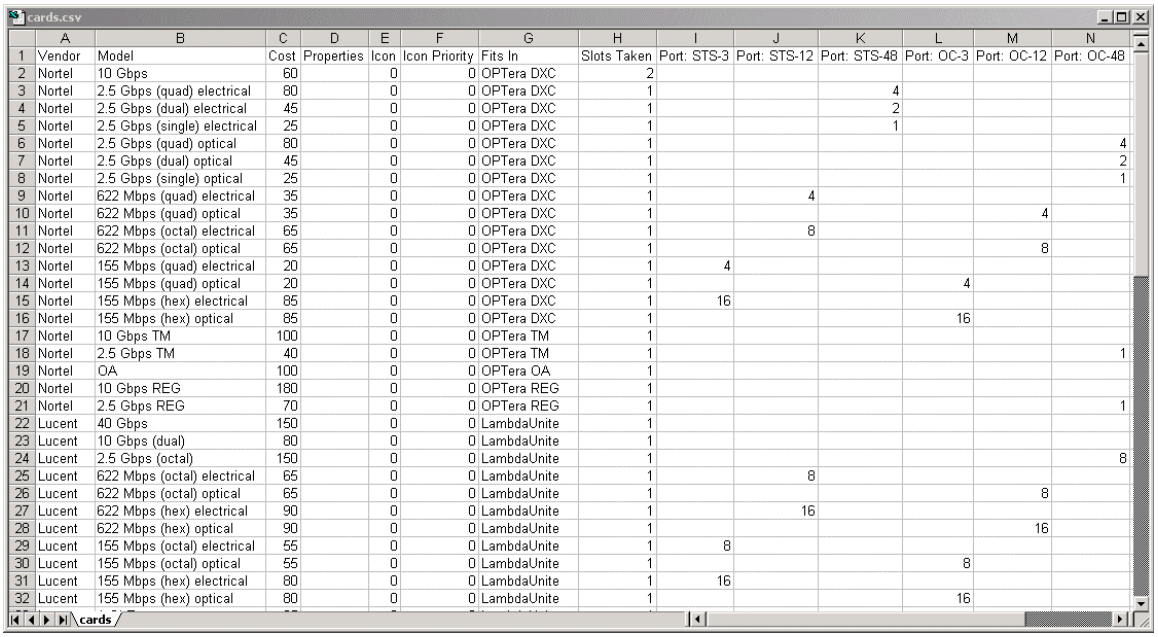
- Cost and Slot—Specifies modular equipment, having costs c1, c2, c3 and containing slots s1, s2, s3. Modular equipment is “in-service” upgradeable—that is, a device with s1 slots can be upgraded to a device with s2 slots at an extra cost of (c2 - c1).
- WDMG:Type—Specifies multiple SP Guru Transport Planner types that the device supports
- WDMG:Ring Type—Specifies multiple SONET/SDH ring types that the device supports

Card File Format

You can specify a card file according to a single terminology—for example, SONET—and use the same card file for both your SONET and SDH network designs. Therefore, when you use SONET input files for an SDH network, the SONET interfaces are translated to the matching SDH interfaces.

Figure 13-2 shows the file format used to define HCON devices. For information about specific fields, see Table 13-3.

Figure 13-2 Card File Format



cards.csv

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Vendor	Model	Cost	Properties	Icon	Icon Priority	Fits In	Slots Taken	Port: STS-3	Port: STS-12	Port: STS-48	Port: OC-3	Port: OC-12	Port: OC-48
2	Nortel	10 Gbps	60		0	0	OPTera DXC	2						
3	Nortel	2.5 Gbps (quad) electrical	80		0	0	OPTera DXC	1			4			
4	Nortel	2.5 Gbps (dual) electrical	45		0	0	OPTera DXC	1			2			
5	Nortel	2.5 Gbps (single) electrical	25		0	0	OPTera DXC	1			1			
6	Nortel	2.5 Gbps (quad) optical	80		0	0	OPTera DXC	1						4
7	Nortel	2.5 Gbps (dual) optical	45		0	0	OPTera DXC	1						2
8	Nortel	2.5 Gbps (single) optical	25		0	0	OPTera DXC	1						1
9	Nortel	622 Mbps (quad) electrical	35		0	0	OPTera DXC	1		4				
10	Nortel	622 Mbps (quad) optical	35		0	0	OPTera DXC	1					4	
11	Nortel	622 Mbps (octal) electrical	65		0	0	OPTera DXC	1		8				
12	Nortel	622 Mbps (octal) optical	65		0	0	OPTera DXC	1					8	
13	Nortel	155 Mbps (quad) electrical	20		0	0	OPTera DXC	1	4					
14	Nortel	155 Mbps (quad) optical	20		0	0	OPTera DXC	1				4		
15	Nortel	155 Mbps (hex) electrical	85		0	0	OPTera DXC	1	16					
16	Nortel	155 Mbps (hex) optical	85		0	0	OPTera DXC	1				16		
17	Nortel	10 Gbps TM	100		0	0	OPTera TM	1						
18	Nortel	2.5 Gbps TM	40		0	0	OPTera TM	1						1
19	Nortel	OA	100		0	0	OPTera OA	1						
20	Nortel	10 Gbps REG	180		0	0	OPTera REG	1						
21	Nortel	2.5 Gbps REG	70		0	0	OPTera REG	1						1
22	Lucent	40 Gbps	150		0	0	LambdaUnite	1						
23	Lucent	10 Gbps (dual)	80		0	0	LambdaUnite	1						
24	Lucent	2.5 Gbps (octal)	150		0	0	LambdaUnite	1						8
25	Lucent	622 Mbps (octal) electrical	65		0	0	LambdaUnite	1		8				
26	Lucent	622 Mbps (octal) optical	65		0	0	LambdaUnite	1					8	
27	Lucent	622 Mbps (hex) electrical	90		0	0	LambdaUnite	1		16				
28	Lucent	622 Mbps (hex) optical	90		0	0	LambdaUnite	1					16	
29	Lucent	155 Mbps (octal) electrical	55		0	0	LambdaUnite	1	8					
30	Lucent	155 Mbps (octal) optical	55		0	0	LambdaUnite	1				8		
31	Lucent	155 Mbps (hex) electrical	80		0	0	LambdaUnite	1	16					
32	Lucent	155 Mbps (hex) optical	80		0	0	LambdaUnite	1				16		

cards

Table 13-3 Card File Format

Field	Description
Vendor Model	Defines a unique card
Cost	Cost of the card
Properties	Used to specify optional parameters.
Icon Icon Priority	Specifies the icons used to represent the card in the SP Guru Transport Planner user interface

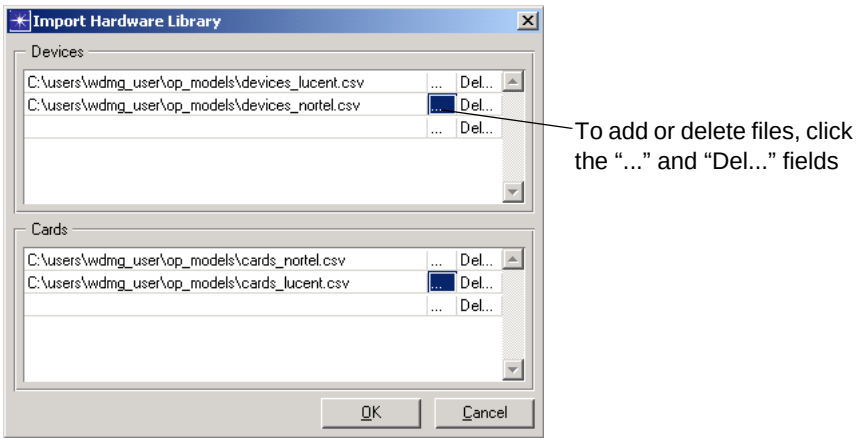
Table 13-3 Card File Format (Continued)

Field	Description
Fits In	Relates the cards to the devices; that is, it defines which cards fit in a specific slot type (as defined in the devices file by a unique slot id) that corresponds to a product family.
Slots Taken	Defines the number of slots the card takes in the pool of device slots
Port: <*client_interface*>	Specifies the number of ports of the client interface supported by the card. The client interfaces are STS-x and OC-y for SONET, with x and y the matching values that correspond to the SONET multiplexing hierarchy (x = 1, 3, 12, 48; y = 3, 12, 48, 192, and so on). For SDH, the client interfaces are STM-x_E and STM-y for the Electrical and Optical interfaces. The x and y values correspond to the SDH multiplexing hierarchy (x, y = 1, 4, 16, 64, 256…).
End of Table 13-3	

Importing Hardware

You can import device and card data using the Import Hardware Library dialog box (Hardware > Import Hardware Library). You can specify the data files in the Devices and Cards tables; for information about these file formats, see Hardware File Formats on page TrP-13-4. After you specify the data files, click OK to import the data and populate the equipment database.

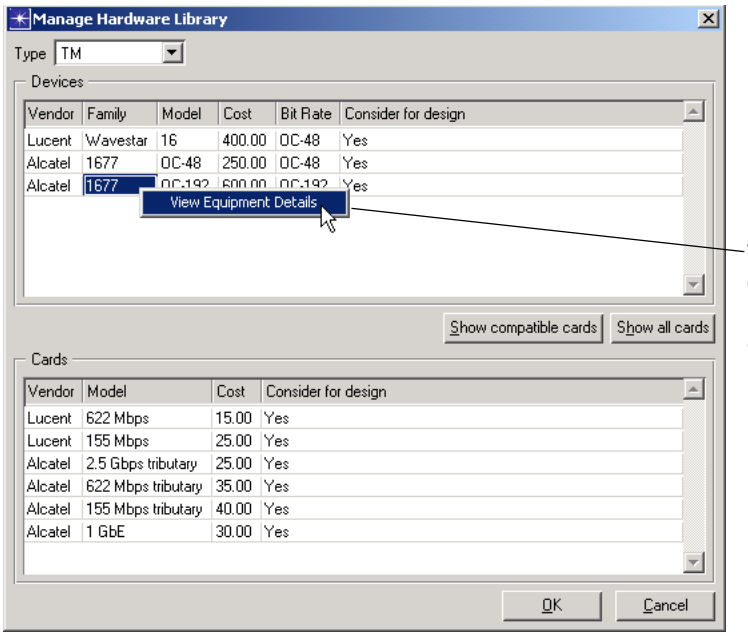
Figure 13-3 Import Hardware Library Dialog Box



Managing Hardware

You can verify a hardware import, and inspect the devices and cards in your equipment database, using the Manage Hardware Library dialog box (Hardware > Manage Hardware Library). You can also specify which devices and cards you want to be considered by the next hardware design run. To import new equipment, you must use the Import Hardware Library dialog box; for more information, see Importing Hardware on page TrP-13-8.

Figure 13-4 Manage Hardware Library Dialog Box



To see details about a device, right-click in the Devices or Cards table and choose View Equipment Details

Table 13-4 Manage Hardware Library

Item	Description
Type	Set this menu to see devices and cards for a specific SP Guru Transport Planner equipment type such as DXC, OXC, or OADM.
Devices	Shows the main properties for the devices of the selected SP Guru Transport Planner type. You can set the “Consider for design” field to specify whether the next hardware design run considers a specific device for use in the design. To see details about a device, right-click on the device in this table and choose View Equipment Details.

Table 13-4 Manage Hardware Library (Continued)

Item	Description
Show compatible cards	To see only the cards that are compatible with a specific device, select the device in the Devices table and click “Show compatible cards.”
Show all cards	Click this button to see all cards for all devices of the selected SP Guru Transport Planner equipment type.
Cards	Shows the main properties of the cards that are compatible with the devices of the selected SP Guru Transport Planner type. You can set the “Consider for design” field to specify whether the next hardware design run considers a specific card for use in the design. To see details about a card, right-click on the card in this table and choose View Equipment Details.
End of Table 13-4	

Configuring Hardware

You can configure SP Guru Transport Planner equipment using the Configure Hardware dialog box (Hardware > Configure Hardware). You can specify two sets of options in this dialog box:

- A configuration option for each SP Guru Transport Planner equipment type (described in Table 13-6 Configuration Options on page TrP-13-13)
- Interconnection options, which specify the amount of capacity reserved for interconnecting devices (described in Table 13-7 Interconnection Options Dialog Box on page TrP-13-15)

After you specify the configuration and interconnection options, click Configure. When the configuration run finishes, the Hardware Configurator Report window shows the number of valid and invalid configurations that were made for each SP Guru Transport Planner type during the run. To investigate the configuration results in more detail, use the hardware browser. This browser provides an overview of all the equipment in the network; for more information, see Hardware Browser on page TrP-13-16.

The configuration algorithm optimizes and configures each equipment type separately. The only exception is for WDM line systems (LS) on fibers: in this case, the algorithm configures WDM terminal multiplexers (WDM TM), optical amplifiers (OA) and regenerators (REG) simultaneously. You can also configure OADMs, INT-OADMs, WP-OXCs, and INT-OXCs together with the LS.

Figure 13-5 Configure Hardware Dialog Box

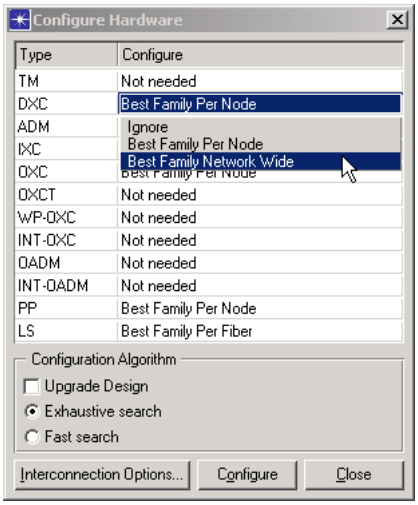


Table 13-5 Configure Hardware Dialog Box

Item	Description
Configure button	Configure the hardware using the specified options
Configure fields in table	Click in a field in this column to specify a configuration option for the corresponding equipment type (see Table 13-6 Configuration Options on page TrP-13-13)
Exhaustive Search Fast Search	You can choose whether you want to do an Exhaustive Search or a Fast Search among all possible configurations for all SP Guru Transport Planner types. • If Exhaustive Search is selected, all possible product families are evaluated for each SP Guru Transport Planner type, and an optimized configuration is created for each product family. • If Fast Search is selected, a faster and less optimal configuration algorithm is applied.
Interconnection Options	Specify the capacity reserved for interconnecting devices (see Interconnection Options Dialog Box on page TrP-13-14)
Type	The SP Guru Transport Planner equipment type to configure
Upgrade Design	Using the Configuration Algorithm settings, you can specify whether you want to do an Upgrade Design. • If Upgrade Design is selected, the configuration algorithm starts from the existing configuration and adds new devices and cards if required—for example, if some additional traffic has been routed. The added devices and cards are of the same product family as the current devices (of a specific SP Guru Transport Planner type in a node or on a link). • If Upgrade Design is not selected, the algorithm discards the current configuration and creates a new configuration without considering any history. Each design and the hardware added during the design is marked as a *design run*. You can run multiple design runs to upgrade and refine your hardware, and use the Hardware Browser or Show Upgrade History dialog to view the hardware added in the different design runs (as described in Hardware Browser on page TrP-13-16 and Viewing the Upgrade History on page TrP-13-22). If you do not do an upgrade design, there is one design run only.
End of Table 13-5	

Configuration Options

To configure an equipment type, click on the equipment in the Configure field and choose the correct option from the menu. Table 13-6 lists the available configuration options.

Table 13-6 Configuration Options

Option	Description
Best Family Network Wide	Choose the same product family for all devices of this type. Evaluate all possible product families and configure all devices. Select the family with the lowest cost over the entire network.
Best Family Per Bit Rate	This option is available for ADM and TM devices only, and is similar to the "Optimize Per LS Type" option. The algorithm chooses the most cost-effective product family per bit rate for all devices of this type in the network.
Best Family Per Fiber	This option is valid for WDM line systems (LS) only. The algorithm chooses the most cost-effective product family per fiber. Therefore, a 40-wavelength WDM system might be configured using a different product family on different fibers.
Best Family Per LS Type	This option is available for OADM, INT-OADM, WP-OXC, INT-OXC devices only. The algorithm chooses the cost-optimal product family for all devices of this type per line system type. For example, all 40-wavelength WDM systems in the network will be configured using the same product family; all 80-wavelength WDM systems will be configured with another product family, which is the same for all systems used, but might be different from the one used for the 40-wavelength system.
Best Family Per Node	Choose the most cost-effective product family for each node with a device of this type, independent of the other nodes. This means that different nodes of the same type might be configured with devices from different vendors and product families. However all devices of the same SP Guru Transport Planner type within one node are of the same product family, according to the SP Guru Transport Planner type. If you are running an upgrade design, this is the default option because upgrade design will upgrade the existing product families in each node.
Best Family Per Node Per Bit Rate	This option is a combination of "Best Family Per Node" and "Best Family per Bit Rate." The algorithm chooses the most cost-effective product family per bit rate and per node. Therefore, devices of a different bit rate in a node can have a different product family, and devices of the same bit rate in different nodes can also have a different product family. Devices of the same bit rate within a node should use the same product family.
Best Family Per Node Per LS Type	This option is available for OADM, INT-OADM, WP-OXC, and INT-OXC only. It is a combination of "Best Family Per Node" and "Best Family per LS Type." The algorithm chooses the most cost-effective product family per LS Type and per node. Therefore, devices of a different LS Type in a node can have a different product family, and devices of the same LS Type in different nodes can also have a different product family. Devices of the same LS Type within a node should use the same product family.
Best Family Per Tier	This option is valid for WDM line systems (LS) only. The algorithm optimizes the DCL links and OCH links separately in a two-tier network. It chooses the best product family for all DCL links (network wide) and the best product family for all OCH links (network wide).

Table 13-6 Configuration Options (Continued)

Option	Description
Not Needed	Indicates that no devices of this equipment type are present in the network.
Ignore	Do not configure this SP Guru Transport Planner type.
Same Family As LS	This option is available for OADMs, INT-OADMs, WP-OXCs and INT-OXCs only. The algorithm chooses the same product family for these devices as for the WDM line systems. Therefore, HCON runs a combined design on these different types and selects the most cost-effective family for all types.
End of Table 13-6	

Interconnection Options Dialog Box

You can use the Interconnection Options dialog box to specify the amount of capacity reserved for interconnecting devices, in cases where the configuration algorithm results in a solution with multiple devices from one SP Guru Transport Planner type. These options are relevant for the SP Guru Transport Planner node types only: DXC, IXC, OXC, OXCT, WP-OXC, and INT-OXC.

If one device is used to configure a SP Guru Transport Planner type, all cards that reside on the same device and all ports on the different cards can be interconnected. If multiple devices are needed, this interconnection is not possible and some interconnection capacity might be required to interconnect ports on different devices.

Figure 13-6 Interconnection Options Dialog Box

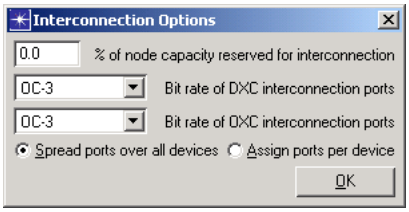


Table 13-7 Interconnection Options Dialog Box

Option	Description
% of node capacity reserved for interconnection	Specifies the amount of interconnection capacity as a percentage of the total traffic switched in that node. For example, if a node switches 100 Gbps of traffic and 10 percent of the node capacity is reserved for interconnection, this means 10 Gbps of extra interconnection capacity is provided.
Assign ports per device	Assigns the calculated number of interconnection ports per device. For example, if four interconnection ports are required for two devices, these four interconnection ports are assigned on each device.
Bit rate of DXC interconnection ports	Specifies the bit rate of the ports used to establish the interconnection capacity on the DXCs and the IXCs. For example, if a DXC requires 10 Gbps of interconnection capacity, and the bit rate of the interconnection ports is OC-48 (2.5 Gbps), four such interconnection ports are required.
Bit rate of OXC interconnection ports	Specifies the bit rate of the ports used to establish the interconnection capacity on the OXCs, WP-OXCs, and INT-OXCs.
Spread ports over all devices	Spreads the calculated number of interconnection ports evenly over all devices. For example, if four interconnection ports are required for two devices, two interconnection ports are assigned per device.
End of Table 13-7	

Hardware Browser

The Hardware Browser (Hardware > Open Hardware Browser) shows information about all the equipment in the network.

Figure 13-7 Hardware Browser Controls

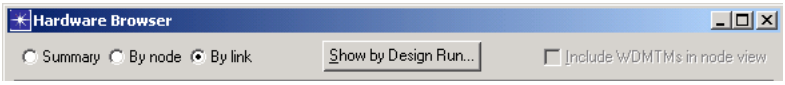


Table 13-8 Hardware Browser Controls

Item	Description
Summary	View hardware by summary (see Summary View)
By node	View hardware by node (see Nodes View on page TrP-13-18)
By link	View hardware by link (see Links View on page TrP-13-20)
Show by Design Run	By default, all equipment of the different design runs is shown in the hardware browser. Select this option if you want to show only the equipment of a specified design run, or only the equipment up to a specified design run.
Include WDMTMs in node view	Add the installed WDM Terminal Multiplexers to the node view. If this option is not selected, the WDM Terminal Multiplexers are shown in the link view only. This option is available in the “By node” view only.
End of Table 13-8	

Summary View

The Summary view shows the total amount of equipment in the network using a tree structure. Table 13-9 on page TrP-13-17 lists the fields that are shown in the Summary view.

Figure 13-8 Hardware Browser (Summary View)

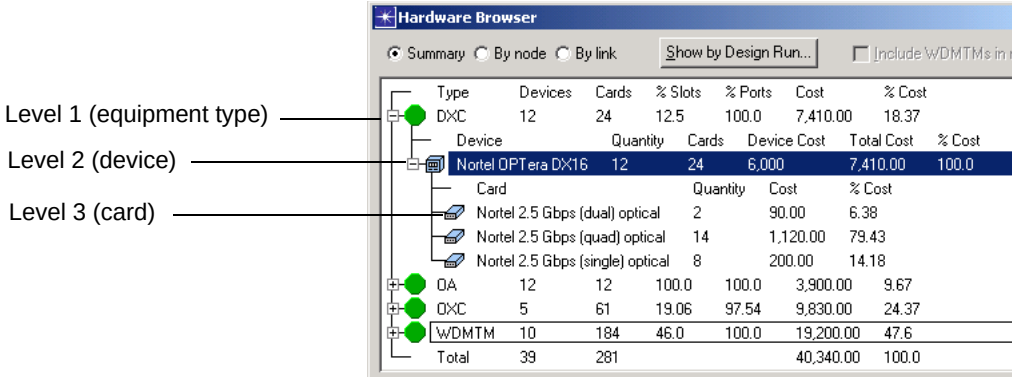


Table 13-9 Hardware Browser (Summary): Treeview

Level	Object	Fields	Comments
1	Equipment Type	The browser shows the following information for each equipment type: • Type—SP Guru Transport Planner equipment type • Devices—Number of devices of this type in the network • Cards—Number of cards in all devices of this type • % Slots—Slot utilization on devices of this type • % Ports—Port utilization on the cards • Cost—Total cost of all devices and cards of this equipment type • % Cost—Cost of the equipment type as a percentage of the total network cost	
2	Device	The browser shows the following information for each device: • Device—Device type • Quantity—Number of devices of this type in the network • Cards—Number of cards on devices of this type • Device Cost—Cost of all devices of this type • Total Cost—Total cost of all devices of this type and their cards • % Cost—Cost of this device type as a percentage of the total cost of all devices of the equipment type	
3	Card	The browser shows the following information for each card: • Card—Card type • Quantity—Number of cards of this type in all devices of the specified type • Cost—Total cost of all cards of this type • % Cost—Cost of this card type as a percentage of the cost of all cards for the specified device type	
End of Table 13-9			

Nodes View

The By Node view shows the total amount of equipment in the nodes using a tree structure. The SP Guru Transport Planner types considered in a node are: TM, DXC, ADM, IXC, OXC, OXCT, WP-OXC, INT-OXC, OADM, INT-OADM and PP. Table 13-10 on page TrP-13-19 lists the fields that are shown in the Nodes view.

Figure 13-9 Hardware Browser (Nodes View)

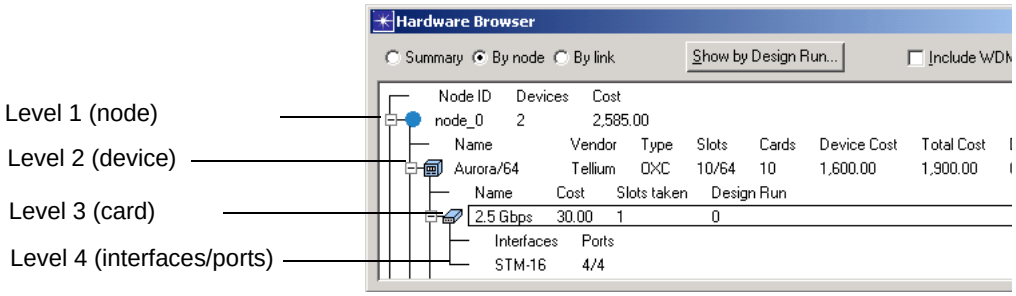


Table 13-10 Hardware Browser (By Node): Treeview

Level	Object	Fields	Comments
1	Node	The browser shows the following information for each node: • Node ID—Name of the node • Devices—Number of devices in the node • Cost—Cost per node	Use the “Include WDMTMs in node view” option to add the installed WDM Terminal Multiplexers to the node view. If this option is not selected, the WDM Terminal Multiplexers are shown in the link view only. To export or import data for a device via a CSV file, right-click on a node and choose Export Devices or Import Devices.
2	Device	The browser shows the following information for each device: • Name—Device name (Family name/Model name) • Vendor—Device vendor • Type—Equipment type of device • Slots—Number of slots taken • Cards—Total number of cards in device • Device Cost—Device cost (not including cards) • Total Cost—Total device cost (including cards) • Design Run—Design run during which the device was added	
3	Card	The browser shows the following information for each card: • Name—Card name (Model name) • Cost—Card cost • Slots taken—Number of slots taken by card • Design Run—Design run during which the card was added	If the device configuration is invalid, this level shows the reason why.
4	Interfaces/ports	The browser shows the following information for each card: • Interfaces—Name of the interface type • Ports—Number of ports used/ total number of ports of the interface type on the card	
End of Table 13-10			

Links View

The By Link view shows the total amount of equipment on each link. The SP Guru Transport Planner types considered on a link are WDMTM, OA, and REG. Table 13-11 on page TrP-13-21 lists the fields that are shown in the links.

Figure 13-10 Hardware Browser (Links View)

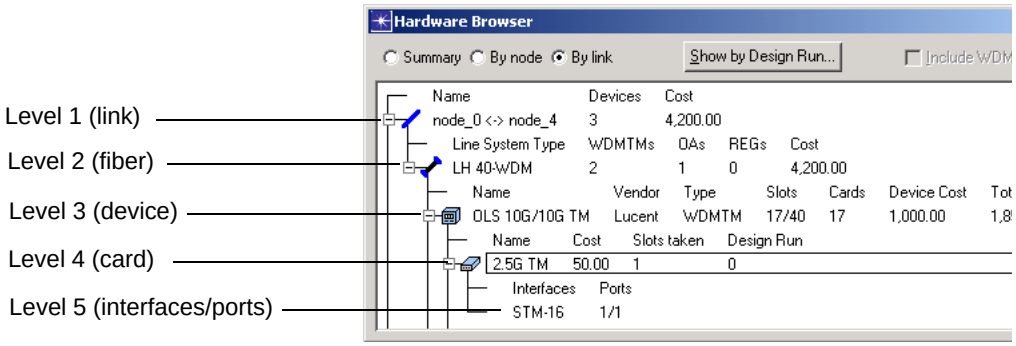


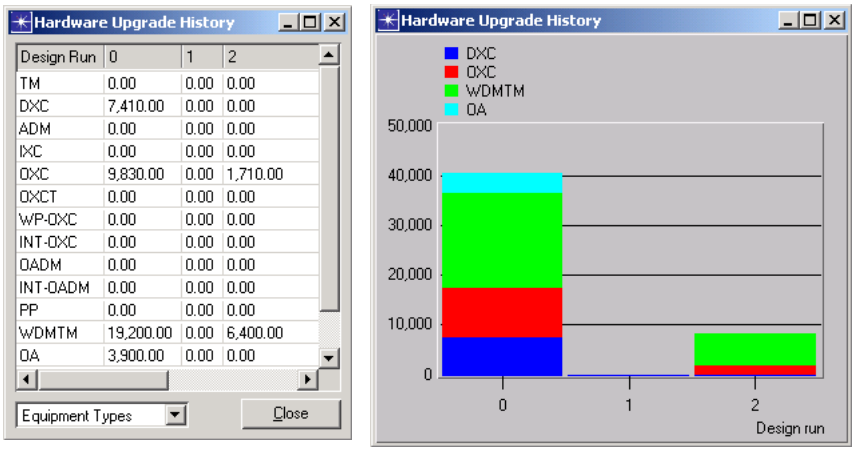
Table 13-11 Hardware Browser (By Link): Treeview

Level	Object	Fields	Comments
1	Link	The browser shows the following information for each link: • Name—Link name • Devices—Number of devices used by link • Cost—Total link cost	To export or import device configuration of a link via a CSV file, right-click on the link and choose Export Devices or Import Devices.
2	Fiber	The browser shows the following information for each fiber: • Line System Type—Name of the line system type • WDMTMs—Number of WDM terminal multiplexers used by link • OAs—Number of optical amplifiers used by link • REGs—Number of regenerators used by link • Cost—Cost per fiber	If the device configuration is invalid, this level shows the reason why.
3	Device	The browser shows the following information for each device: • Name—Device name (Family name/Model name) • Vendor—Device vendor • Type—Equipment type of device • Slots—Number of slots taken • Cards—Total number of cards in device • Device Cost—Device cost (not including cards) • Total Cost—Total device cost (including cards) • Design run—Design run during which the device was added	
4	Card	The browser shows the following information for each card: • Name—Card name • Cost—Card cost • Slots taken—Number of slots taken by card • Design run—Design run during which the card was added	
5	Interfaces/ports	The browser shows the following information for each card: • Interfaces—Name of the interface type • Ports—Number of ports used/ total number of ports of that interface type on the card	
End of Table 13-11			

Viewing the Upgrade History

You can see the equipment added during different design runs using the Show Upgrade History dialog box (Hardware > Show Upgrade History).

Figure 13-11 Hardware Upgrade History



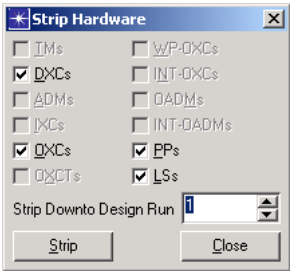
The table consists of multiple columns that show the equipment added during each design run. You can select three different views in the menu:

- Equipment Types—Show the cost of the equipment per SP Guru Transport Planner type for each design run
- Device Types—Show the cost of the different device types per design run
- Card Types—Shows the cost of the different card types per design run

Stripping Hardware

You can remove installed devices and cards from the network using the Strip Hardware dialog box (Hardware > Strip Hardware). You can set the “Strip Down to Design Run” menu to strip only equipment that was added after the specified design run. Select all the equipment types that you want to remove, then click Strip to remove all the devices and cards for the selected equipment types and design runs.

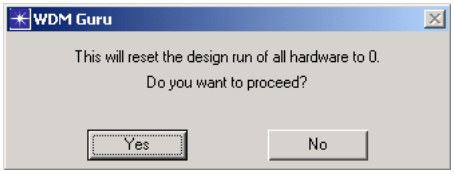
Figure 13-12 Strip Hardware Dialog Box



Resetting the Design Run

You can reset the design run number of each card and device in the network to 0. Select Hardware > Reset Design Run and click "Yes" in the dialog box that appears.

Figure 13-13 Resetting a Design Run



Hardware Web Report

To generate a web report of installed hardware, choose Hardware > Generate Web Report. This report describes in detail the hardware installed in your network, and is organized into four sections as listed in Table 13-12.

Table 13-12 Hardware Configurator Web Report

Section	Description
Unconfigurable Devices	This report lists the devices on the nodes and links for which no valid configuration could be found. This report shows the equipment type of the devices and the reason why no configuration could be found.
Summary	This report gives a network-wide view of the number of devices and cards per SP Guru Transport Planner type and the associated costs. This report has the following detail reports: • Equipment installed (specific equipment type)—Click on a SP Guru Transport Planner equipment type to see the specific devices and cards used for that equipment type (for example, OXC). • Equipment (all equipment types)—Click Total to see an overview of all device and card types installed. **Note—**Highlighted rows indicate the SP Guru Transport Planner types for which invalid configurations were found.
Summary by Node	At the top level, this report consists of a table that gives a per-node view of the number of devices for each SP Guru Transport Planner type. The SP Guru Transport Planner types in a node are: TM, DXC, ADM, IXC, OXC, OXCT, WP-OXC, INT-OXC, OADM, INT-OADM, and PP. This report has the following detail reports: • Node summary—Click on a node to see a summary of all devices in that node. • Equipment installed per node (specific equipment type)—Click on an element in the table to see all devices and cards installed in the node of the SP Guru Transport Planner type indicated by the column label. • Equipment installed per node (all equipment types)—Click on the element in the Total column to show all devices and cards used in that node.
Summary by Link	At the top level, this gives a per-link view of the number of devices for each SP Guru Transport Planner type. The SP Guru Transport Planner types on a link are: WDMTM, OA, and REG. This report has the following detail reports: • Link summary—Click on a link to show a summary of all devices on that link. • Equipment installed per link (specific equipment type)—Click on an element in the table to inspect all devices and cards installed on the link of the type indicated by the column label. • Equipment installed per link (all equipment types)—Click on the element in the Total column to show all devices and cards used on that link.
End of Table 13-12	