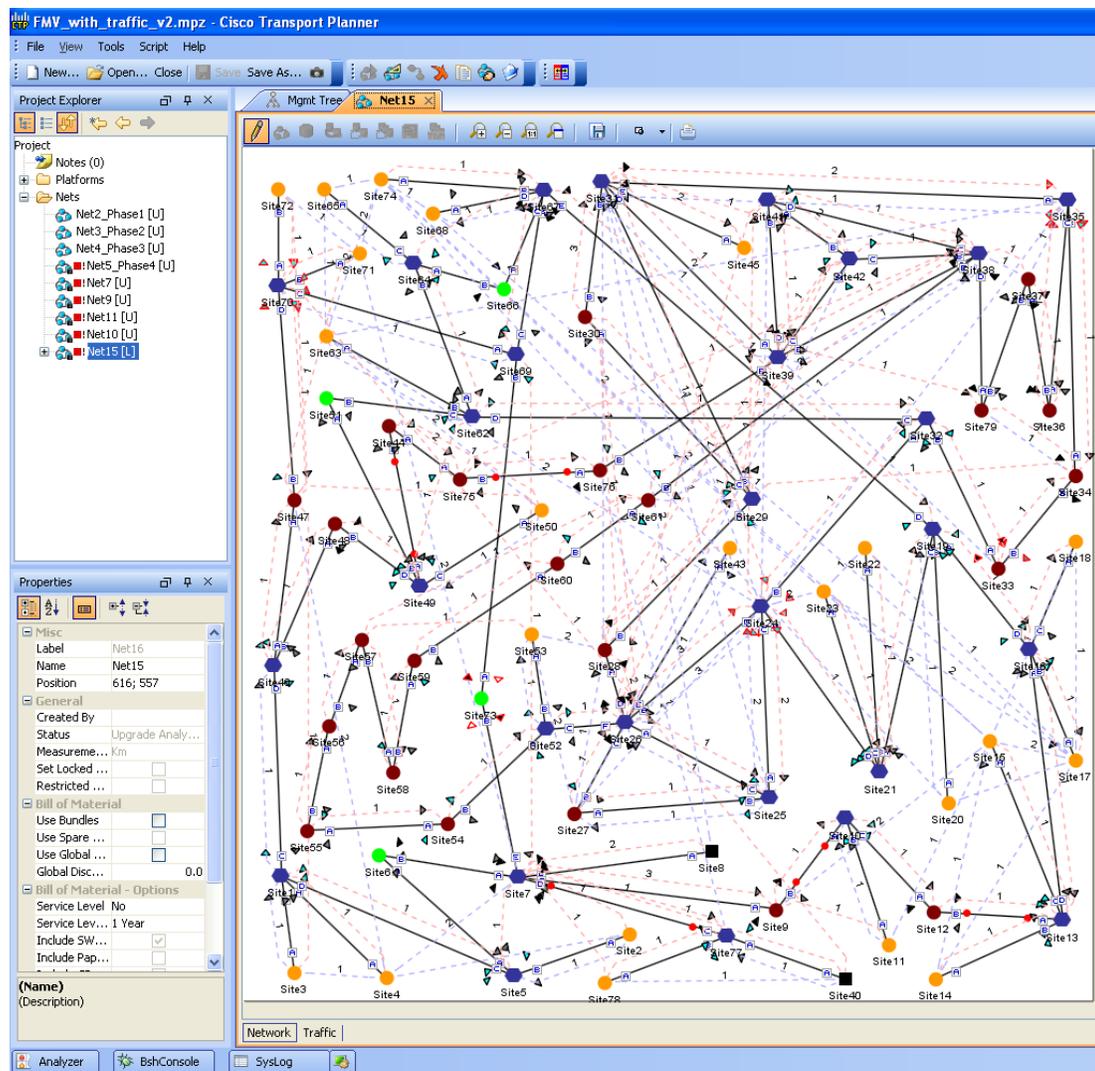


# Cisco Transport Planner: Optical Network Design Tool for Cisco ONS 15454 MSTP

## Product Overview

The Cisco® ONS 15454 Multiservice Transport Platform (MSTP) is the industry benchmark for dense wavelength-division multiplexing (DWDM) solutions, offering a comprehensive approach for designing, provisioning, and maintaining an optical network with the help of the Cisco Transport Planner network design tool and the complete flexibility of multidegree reconfigurable optical add/drop multiplexer (ROADM) technology. The Cisco Transport Planner software that facilitates the design of the DWDM optical network is a crucial module of the Cisco ONS 15454 MSTP. Figure 1 shows the GUI for Cisco Transport Planner Release 9.2.1.

**Figure 1.** Cisco Transport Planner Release 9.2.1 GUI



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## Features and Benefits

The Cisco Transport Planner is a fully comprehensive DWDM network design and design management tool (for example, delta planning, rack layout definition, and cabling procedure) that allows Cisco ONS 15454 MSTP customers to concentrate on service definition and availability while radically simplifying the process of comparing alternative service-delivery and investment scenarios. Cisco Transport Planner uses the latest in optical transport technologies from the Cisco Optical portfolio, featuring the Cisco ONS 15454 MSTP with fully integrated multidegree ROADM technology, to help engineer the optimal DWDM infrastructure capable of any-to-any service delivery for linear, ring, multiring, and mesh networks. The output from Cisco Transport Planner provides content beneficial to both the design and deployment phases, including system performance reporting, bill-of-materials (BoM) generation, graphical layouts of racks and shelf configurations, optical connections between nodes, and downloadable provisioning and configuration settings for each optical node.

The benefits of designing with Cisco Transport Planner extend beyond deployment to the in-service phase supported by MSTP features that significantly reduce the operating expenses (OpEx) traditionally associated with wavelength-division multiplexing (WDM) networks and optical add/drop multiplexers (OADMs) by automating labor-intensive operations. The intelligent DWDM functions of the Cisco ONS 15454 MSTP dynamically monitor and adjust wavelength power and signal conditions to help ensure optimal compliance with service-level agreements (SLAs), giving providers proactive control over a customer's service experience.

## Challenge

Designing DWDM networks has always been a complex task because of the intrinsic nature of optical transmission, which is based on analog technology despite the transport of digital signals. Many different parameters must be accounted for because of linear and nonlinear effects. Linear effects include noise accumulation, optical power budget, and chromatic dispersion effects; nonlinear effects include cross-phase modulation, self-phase modulation, and four-wave mixing. Metro and metro-regional DWDM networks, which usually require many add/drop locations, have an additional layer of complexity because the same network supports different optical paths that must use the same common optical units (such as optical amplifiers and dispersion compensation units).

The design and optimization of a DWDM network is an interactive process that requires consideration of all the constraints of the system:

- Distance and insertion loss of the network spans
- Type and number of services required in each network location

Based on these constraints, a DWDM network design should optimize the hardware placement in the different network nodes to minimize the cost of the design. When fixed OADM units are used for capacity add/drop in the different sites of the network, the design needs to optimize the numbers and types of units used in each node to reduce overall network cost.

ROADM in DWDM networks is expected to provide complete flexibility in the traffic pattern. The network design tool needs to account for and support this flexibility to verify and support the different optical paths existing in the network.

## Solution

The Cisco ONS 15454 MSTP offers a complete solution for designing, provisioning, and maintaining an optical DWDM network, including:

- Cisco Transport Planner: This Java-based application helps users model and design DWDM networks based on the Cisco ONS 15454 MSTP.
- DWDM units: A complete set of DWDM transport and aggregation units helps deliver simple, fast, and intelligent optical capabilities.
- Intelligent optical transmission software: Each network element can automatically support transport functions in the DWDM domain similar to those in the SONET, SDH, and data domains, defining what is now considered next-generation DWDM transport.
- Cisco Transport Controller: You can use this integrated tool to support installation and provisioning at the network level.

These benefits surpass those that are available from a simple hardware-based solution. The Cisco ONS 15454 MSTP solution can help you design, maintain, and optimize your DWDM network to maximize network performance and save on operational costs.

### Cisco Transport Planner Product Overview and Applications

The Cisco Transport Planner tool supports you from the design phase to the deployment phase of a DWDM network. This tool was originally developed to help create BoMs for customer-specific designs. Release 9.2.1 of this tool has evolved significantly from the original, simpler version, to support the new and advanced functions provided by the Cisco ONS 15454 MSTP.

Key features and functions of Cisco Transport Planner Release 9.2.1 include:

- GUI-based tool to optimize DWDM layer design: You normally have the availability of different locations in the network besides those where traffic add/drop is required. The Cisco Transport Planner helps you determine the type and quantity of equipment to be used not only for the locations where add/drop is required but also for all the other locations. The tool accounts for the network topology, the fiber types and lengths, and current and future traffic demand.
- Any-to-any, fully flexible network design: Taking advantage of the availability of ROADM units in the Cisco ONS 15454 MSTP, the Cisco Transport Planner can help you design a DWDM network with complete flexibility in terms of both source-destination patterns and interfaces and services.
- ROADM optimization: Taking advantage of the availability of multiple ROADM solutions in the Cisco ONS 15454 MSTP, Cisco Transport Planner automatically optimizes the number of channels (for example, 32 channels vs. 40 channels) and the configuration (for example, degree-2 vs. multidegree) of the ROADMs in the network. Cisco Transport Planner can also manage the scalability requirements and enable an in-service upgrade to add new directions and new traffic patterns to an existing design.
- The licensing of the Single Module ROADM (SMR) and 80 channel Wavelength Cross Connect (80-WXC) cards has drastically reduced their prices and allows you to adopt a pay-as-you-grow approach, where in “bundles” of 10 wavelengths each are purchased on a need-to-have basis instead of procuring a complete ROADM card initially. Depending on the traffic matrix and the wavelength routing some locations will dictate a complete ROADM card, while at some you could optimize the cost by having a ROADM with fewer wavelengths activated. The Cisco Transport Planner (Release 9.2.1) has in built intelligence to choose the

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right option for you – either a complete ROADM card or a ROADM card with a bundle of wavelengths licensed.

- The optical networking industry is moving towards Wavelength Switched Optical Networks (WSON), where an intelligent “control plane” operates over a fully flexible data plane (or physical layer), to provide you dynamic optical network that is robust to failures and is intelligent in re-optimizing the network as and when possible. The flexibility of the physical layer is accomplished by having “omni-directional” and “colorless” ROADM architectures in the network. The ability to decouple the wavelength from the path is the “omni-directional” feature. Consequently, the omni-directional demand can be launched or received in or from any direction in a certain node. The ability to decouple the wavelength from the service is termed as the “colorless” feature. Consequently, the user can tune to a different wavelength (or color) to overcome possible wavelength routing or assignment constraints. Individually and together these two features provide an enormous flexibility and resilience against failures. The Cisco Transport Planner (Release 9.2.1) allows you to design networks with both these features.

Cisco Transport Planner provides flexible design options by controlling which and how many of the nodes are equipped with ROADM. In addition, you can determine the nodes in the network that are equipped with multidegree ROADM functions. You can also select the traffic and connectivity types to be used to route traffic among the nodes, for an any-to-any design, which can also be supported in multiring and mesh networks—giving you complete control to accommodate different network scenarios and minimize the overall cost of the design.

- Complete set of DWDM interface options: The Cisco ONS 15454 MSTP is the transport DWDM platform for all Cisco units and platforms equipped with a DWDM interface—fixed and tunable. Cisco Transport Planner can support the design of networks where the optical signals are coming from any of the available Cisco devices. You simply select the client service type or force the specific unit to be used for any given service. The flexibility of the platform and the Cisco Transport Planner can help you evaluate the cost of various options.
- Custom-defined DWDM interfaces: The Cisco ONS 15454 MSTP manages direct interconnection of DWDM interfaces to help reduce capital expenditures (CapEx) associated with interfacing different equipment through gray optics. From the network design perspective, Cisco Transport Planner can also accommodate third-party DWDM interfaces by allowing you to input interface-specific parameters and then using this interface in the network design.
- Support for network design changes: One of the most useful services the Cisco Transport Planner gives Cisco ONS 15454 MSTP users is to assist them in the evaluation and definition of changes requested to scale and evolve an existing network (delta planning). Although delta planning clearly helps when fixed OADM units are used for the design, it allows you to add and remove ROADM nodes from a design, add new services to the network, and change the flexibility associated with an existing or a planning design. Delta planning also gives you a complete set of reporting features to help determine what needs to be changed and where, at both the node and network levels.
- Detailed system performances results report: For each of the services defined at the network level, the Cisco Transport Planner provides the relevant optical parameters required to understand whether or not the traffic could be supported. The tool gives you a quick indication of the results based on color-coded icons as well as the opportunity to view comprehensive reports. Reporting on overall latency for service types that may be affected by this parameter is available as well.
- Complete node and network BoM: Overall cost is one of the most critical parameters to control when designing optical networks. Cisco Transport Planner can synchronize the price of each item from the

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Cisco.com website and, based on this information, can generate a complete BoM for the network and for each node in the design. You can use this information to evaluate different scenarios, using multiple options and constraints for the network design. Cisco Transport Planner also supports custom pricing lists that you can save, export, and exchange with other users.

- Comprehensive support from design to installation: Cisco Transport Planner supports both the design and the commissioning phases of a DWDM network. The tool provides a graphical layout of the racks, shelves, and units of each network location, so this information can be available during the planning or installation of the network. In addition, Cisco Transport Planner provides a complete list of the optical path cords that have to be installed between the different units to allow the proper signal flow at the node and network levels. You can also use Cisco Transport Planner to support situations in the field when the fiber parameters may differ from those considered in the original design. In this case, it is possible to run the tool in “install mode”, which validates the design against the new fiber data without changing the overall BoM.
- Automatic data exchange between design and Cisco ONS 15454 MSTP: You can use Cisco Transport Planner to accelerate the installation and commissioning phase of the Cisco ONS 15454 MSTP in the field. The tool can generate provisioning files, which you then can use to configure the relevant optical parameters at the node level. In addition, you can use the same file to preprovision the individual cards in the nodes of the network, allowing you to make sure the installation in the field has been properly done, even before the first DWDM wavelength is provisioned across the nodes of the network.

The direct data exchange between Cisco Transport Planner and the Cisco ONS 15454 MSTP is an important function, which allows a very simple approach to DWDM network design and deployment. All the relevant design parameters used by Cisco Transport Planner to configure and validate the optical connections in the network can provide the Cisco ONS 15454 MSTP with required reference levels. Each network node then automatically uses these references to support the following intelligent optical transmission features:

- Automatic node setup: This feature automatically sets and maintains all the optical paths available in a DWDM node. Provided directly by the node controller unit, this automatic control requires neither human intervention nor the use of management interfaces.
- Automatic power control: This feature operates at two different levels in the network so it can react to both catastrophic (fast) events and (slow) degrades. Catastrophic events are managed directly at the optical amplifiers level to help ensure the fastest reaction possible to a sudden change in the number of channels passing through the units. Degrades (such as additional fiber loss or aging) are managed at the network level as an additional automatic system reaction to changes in the network operating conditions. The DWDM nodes exchange power-levels data and can adjust amplifier gain if the measured optical power level differs too much from the expected value. This multilayered control mechanism helps assure that the optical network is always operating optimally, despite changes at the physical layer.
- Wavelength path provisioning: This feature allows the Cisco ONS 15454 MSTP to manage DWDM connections the same way the Cisco ONS 15454 Multiservice Provisioning Platform (MSPP) manages SONET, SDH, and data circuits. You can create Optical Channel Network Connections (OCHNCs) as well as Optical Channel Client Connections (OCHCCs) and then manage them as MSPP circuits. One of the primary advantages of wavelength path provisioning is that all ROADMs in the optical path are automatically set and maintained upon circuit creation, without ever requiring manual operation. OCHNCs are normally used to provision optical circuits when DWDM interfaces are not part of the Cisco ONS 15454 MSTP. An example of this provisioning is when Layer 2 or Layer 3 line cards are directly interfaced with the Cisco ONS 15454 MSTP. OCHCCs are normally used to provision optical circuits between the near- and the far-end

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client port of Cisco ONS 15454 MSTP Transponder or Muxponder units. In this case you can manage every client service, even if the service is aggregated with other services and transported across the network as part of a higher-bit-rate optical channel trail (OCH-Trail).

With its multiservice capability, innovative optical technology, automatic optical power management, and MSPP-like ease of use, the Cisco ONS 15454 MSTP transforms how DWDM networks are built and managed. Combining multiple services and intelligent DWDM, the Cisco ONS 15454 MSTP significantly reduces both CapEx and OpEx for today's optical networks.

#### Availability

Cisco Customers can obtain a copy of the latest (or any desired) version of the Cisco Transport Planner (CTP) software design tool if they have a signed and valid Non-Disclosure Agreement (NDA) in place with Cisco. CTP can be obtained only by a Cisco employee representing the Customer (usually an Account Manager or a System Engineer) who possesses the following details – the name of the customer, a sales order number including ONS 15454 MSTP units, NDA number, the name and email addresses of the users who would be using the tool. Once in possession of a copy of the software tool, this Cisco employee then delivers it to the customer with the installation and usage instructions.

#### Warranty Information

Warranty information is available on Cisco.com at the [Product Warranties](#) page.



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