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# Coriant® TNMS Aware Wavelength Provisioning

*Integrating Optical Planning to Speed New Wavelength Activation and Reduce OpEx*

Service delivery speed is a key criterion for business and wholesale end-users when selecting connectivity services. This requirement puts network operators under constant pressure to accelerate service activation including the time it takes to plan and provision new wavelengths. However, the speed of wavelength activation has been slowed, especially in long haul networks, by the need to find and validate optical paths in dedicated offline planning tools in order to ensure optical performance accuracy. This issue becomes even more critical, extending to metro domains, as wavelength speeds evolve beyond 100G with higher baud rates and enhanced modulation. Furthermore, this current mode of operation results in high operational costs with the need to involve highly skilled planning tool experts or outsource this activity to the optical equipment vendor. To address these limitations, Coriant has integrated the Optical Performance Engine (OPE) component of Coriant Aware™ Technology into the Coriant® Transport Network Management System (TNMS) enabling fast and simple wavelength planning and provisioning.

## THE LIMITATIONS OF TRADITIONAL APPROACHES

Optical networks have traditionally been planned and managed by separate tools. Offline planning tools have been used for designing and optimizing the network and for finding and validating paths through the network for new wavelengths. Best-in-class planning tools such as Coriant's TransNet Network Planning Tool perform a sophisticated simulation of optical phenomena including linear and non-linear impairments, ensuring accurate results that maximize reach and capacity while minimizing risk. A network management system (NMS) such as TNMS performs network lifecycle tasks including commissioning, service provisioning, fault management, and maintenance. Today's operational models for new wavelength planning and provisioning typically fall into one of three categories.

	A. Planning Tool-Centric	B. Hybrid	C. Planning Lite
Planning	Planning Tool	Planning Tool	Rule of Thumb
Provisioning	Planning Tool	NMS	NMS
Typical Scenario	Long Haul	Long Haul/Metro	Metro

Table 1: New Wavelength Planning and Provisioning Models

## BENEFITS OF TNMS AWARE WAVELENGTH PROVISIONING

- **Speed** the activation of new wavelengths by integrating accurate, real-time wavelength planning into Coriant® TNMS, leveraging Coriant Aware™ Technology
- **Decrease** OpEx by reducing the number of steps and the need for skilled planning tool experts in the wavelength activation process
- **Match, or even exceed**, the reach of best-in-class offline planning tools while still benefiting from fast and simple provisioning directly from the NMS
- **Maximize** capacity with the automated identification of the optimal flexi-rate interface settings (modulation, baud rates, FEC options, etc.) and super-channels
- **Address** your customers' security concerns by eliminating the need to share sensitive topology and provisioning information with third parties such as the optical equipment vendor

## Planning-Tool Centric

The first approach to new wavelengths is centered on a sophisticated offline planning tool. This planning tool is used to find the optimal valid path through the network or to validate a preselected path. Provisioning a new wavelength is achieved by then pushing the configuration from the planning tool to the network elements. The NMS will then autodiscover the new wavelength. This approach is the option most often used by Coriant's long haul customers leveraging TransNet and TNMS. Benefits of this approach include optimal reach/capacity, minimized risk, and provisioning accuracy. However, this approach has disadvantages in terms of provisioning speed, operational costs, and security. Operational costs are higher because of the need to involve skilled planning tool experts, while security may be an issue where third-party (i.e., the optical equipment vendor) support is used for planning and provisioning, which creates the need to share potentially sensitive information.

## Hybrid

A second approach to new wavelengths is using the offline planning tool for planning and the NMS for provisioning. This approach is most commonly used for metro regional networks planned with the Coriant® 7196 Optical Planning Tool (OPT) and provisioned with TNMS, although it is also an option for Coriant long haul networks with TransNet and TNMS. This approach also benefits from accurate network planning. The path validated in the planning tool can then be used for provisioning in the NMS. This path could be entered manually or imported from the planning tool. While offering many of the advantages and disadvantages of the planning tool-centric approach, the main difference is that while this approach could be slightly faster than the first approach, it incurs a risk that the provisioned path does not match the planned path if a mistake is made when entering the path manually.

## Planning Lite

The third approach to new wavelengths, more commonly used in metros with less challenging reach requirements and with a higher rate of wavelength additions, is much lighter on planning and optical path validation. Instead, this approach relies on rules of thumb. The planning lite approach uses the NMS to route and provision wavelengths while leveraging the planning tool only to validate the most challenging paths, if at all. While this approach can work well in a metro environment offering fast provisioning times and low OpEx, it still involves a degree of risk or reduced reach and becomes less suitable as metro wavelength speeds evolve beyond 100G.

While each of these approaches has advantages and disadvantages, they all force network operators to make trade-offs between reach/capacity, operational costs, speed of activation, security, and risk.

## INTEGRATING ACCURATE & REAL-TIME WAVELENGTH PLANNING

TNMS is an end-to-end management platform that enables operators to easily and cost effectively manage multi-layer (PDH, SONET/SDH, IP/Ethernet, MPLS-TP, OTN, DWDM), multi-domain (access, metro, core), and multi-vendor networks. TNMS easily integrates into existing OSS environments and empowers a holistic approach to network and service management across the broad range of Coriant packet and optical transport and data center interconnect (DCI) solutions. Coriant has enhanced TNMS with the ability to plan and provision wavelengths based on a sophisticated and accurate optical model that, although running in real-time, still considers both linear and nonlinear effects. This process eliminates the need to first plan the wavelength in an offline planning tool before provisioning it in the NMS. This capability is also available for the Coriant Transcend™ SDN Transport Controller.

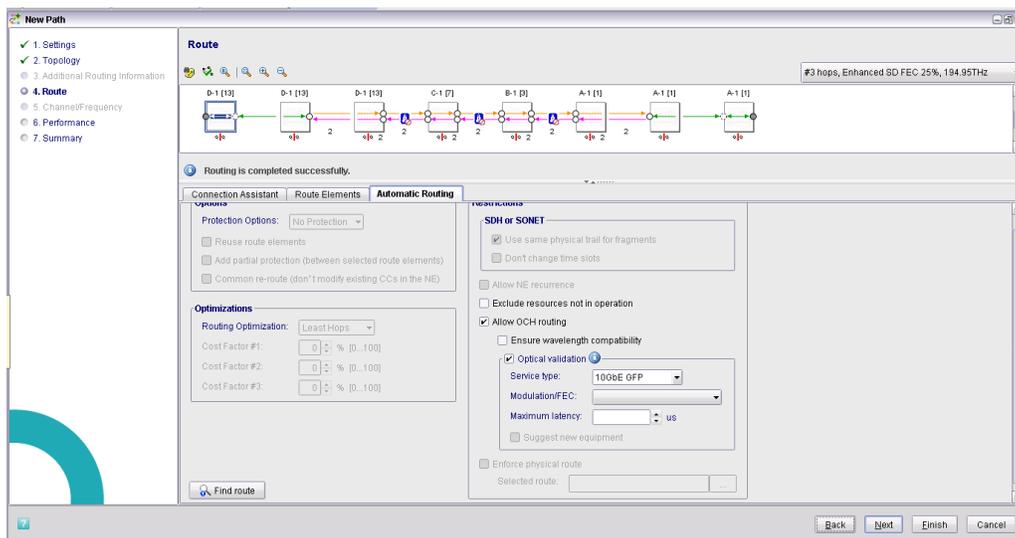


Figure 1: Coriant TNMS Aware Wavelength Provisioning

This enhanced wavelength provisioning is available for the Coriant® hiT 7300 Multi-Haul Transport Platform, Coriant® mTera® Universal Transport Platform, Coriant® 7100 Packet Optical Transport Platform, Coriant Groove™ G30 DCI Platform, and for alien wavelengths (i.e., third-party DWDM interfaces). Provisioning over existing resources (i.e., transponders/muxponders and 3R regen points already configured in the network) is supported with either sites, client ports, or line ports as the end points. Provisioning without existing resources is supported with the tool suggesting new equipment to add to the network. This equipment can then be manually placed in TNMS, which generates service commissioning reports including slot assignments and cable plans. Client side OCh, line side OCh, and OMS protection are all supported. Optional constraints include latency, the ability to include/exclude links and network elements, and the option to use the same or disjoint paths relative to other wavelengths. TNMS also inherits from TransNet the concept of work orders, the grouping of equipment and services, and adds the new user profile, planner, with planning rights but no provisioning rights.

## LEVERAGING CORIANT AWARE™ TECHNOLOGY

Coriant Aware™ Technology is an innovative software-enabled toolkit for maximizing the value of dynamic optical networks with sophisticated real-time performance awareness and control. It is comprised of two key components, the OPE and the Margin Processing Engine (MPE). The MPE component is responsible for accurate real-time measurement of the residual margin, while the OPE enables accurate and real-time wavelength planning in the NMS, SDN, and ASON/GMPLS control plane. For more detail on Coriant Aware™ Technology, see the Coriant white paper *Evolving the Awareness of Optical Networks*.

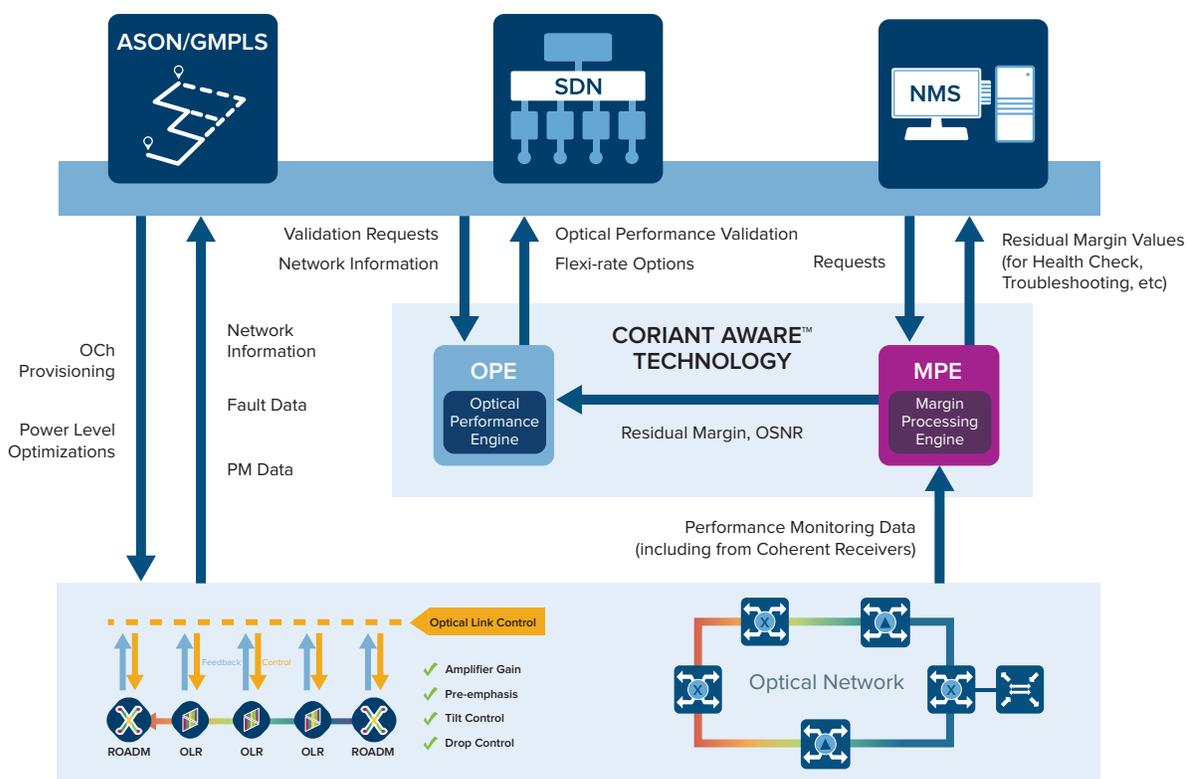


Figure 2: Coriant Aware™ Technology

Leveraging the OPE component of the Coriant Aware™ Technology toolkit enables TNMS to integrate the planning function for new wavelengths with the accuracy of a best-in-class offline planning tool – yet with the real-time performance required for provisioning, rerouting, and other time-sensitive use cases. The path computation function within TNMS generates the potential paths for each wavelength which it then sends to the OPE for optical validation. With optical models that consider both linear and nonlinear effects and while using simplified mathematical operations to achieve real-time performance, the OPE responds with the valid options for each requested path. These options can include modulation types, baud rates, FECs, frequencies, and power levels. Thus, the OPE enables the best options, including flexi-rate interface settings and super-channel options, to be selected.

# BENEFITS OF TNMS AWARE WAVELENGTH PROVISIONING

## **Faster Service Activation**

By eliminating the need to separately plan wavelengths in an offline planning tool, by reducing the number of steps in the wavelength activation process, and by eliminating boundaries between planning and provisioning organizations, TNMS aware wavelength provisioning accelerates new wavelength activation. Revenues for new services can be accelerated with faster time-to-service, which can also be a key factor in winning new customers and retaining existing ones.

## **Reduced Operational Costs**

In addition to the reduced number of steps in the wavelength activation process, operation costs are further reduced as new wavelengths can now be planned and provisioned without needing to draw on skilled planning tool experts.

## **Maximized Reach and Capacity**

Coriant Aware™ Technology enables TNMS to perform real-time wavelength planning with accuracy that matches that of best-in-class planning tools. Fast activation, decreased operational costs, and enhanced security are achieved without reducing reach or increasing risk. Capacity can be maximized with the OPE able to identify valid options for flexi-rate interface settings (modulation, baud rates, FEC options, etc.) and super-channels, including the most optimal options. Furthermore with live network data including residual margin from the MPE component of Coriant Aware™ Technology, reach and capacity have the potential to even exceed best-in-class offline planning tools by eliminating margin stacking and improving the power level setting.

## **Increased Security**

For many network operators the specialist skills required to make the most effective use of sophisticated offline planning tools leads them to outsource this activity to the optical equipment vendor. This can create a concern for security conscious end-customers, as sensitive topology and provisioning data needs to be shared with a third party. By eliminating the need to share this data, the potential for winning sales with security conscious customers increases.

## **SUMMARY**

By integrating the OPE component of Coriant Aware™ Technology, TNMS is now able to deliver fast and simple wavelength provisioning that increases revenues while decreasing operational costs. Furthermore, these benefits are achieved without compromising reach/capacity, and even offer the potential to exceed the reach/capacity of best-in-class offline planning tools by incorporating live network data including residual margin from the MPE component of Coriant Aware™ Technology.

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