Ease the Deployment and Operation of Disaggregated Xponders over Any Optical Line System

Consolidate network view and end-to-end service provisioning and management with Nokia Transcend Open Wave Manager

End-to-End Service Fulfillment in Open Optical Networks

The evolution of optical networks to openness and disaggregation is driving the separation of their two key functions: optical line systems and optical engines (i.e., optical networking transponders/muxponders, here referred to as Xponders, or transceiver-based pluggable optical interfaces equipped in third-party devices). Not only does the disaggregation of optical engines and line systems offer network operators more choice in terms of supply, but it also enables faster development and independent adoption of new functionalities and innovative network technologies, particularly considering that coherent optical engines have much faster innovation cycles relative to optical line systems. Network operators look into open networking as a means of deploying the latest generation of optical engines over their existing line systems and improving their network economics; open networking de-risks supply chain and quality issues and better ensures business continuity. Overall, with open optical networks, operators are able to be more competitive and offer more differentiated services to the market.

However, increased operational complexity is a top concern for network operators considering the move to open networking. Despite the work of initiatives such as Open ROADM MSA, OpenConfig, Open Networking Foundation (ONF), and Telecom Infra Project (TIP) toward standardization of open APIs and common data models for optical equipment, there are still limitations in these definitions that hinder the development of simple "out-of-the box" solutions for unified management and control of multi-vendor open optical networks. Furthermore, network operators need to continue monetizing deployed legacy equipment, managed via proprietary interfaces that often do not comply with the specifications of the standardization activities and require dedicated, vendor-specific management platforms.

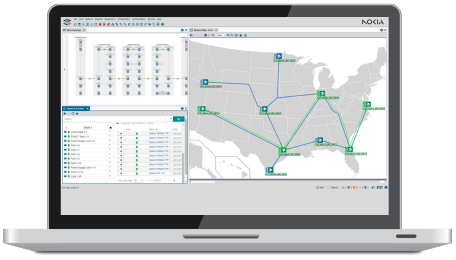
Introducing Open Waves and Open Wave Manager

Nokia uses the term "open waves" to describe the deployment of Xponders or pluggable optics from one equipment vendor over an optical line system from a different vendor. This is sometimes referred to as an alien wavelength deployment.

Nokia Transcend Open Wave Manager (OWM) is a use-case-driven standalone software application within Nokia's Transcend Open Optical Toolkit, a portfolio of network automation solutions addressing the specific concerns of open optical networking. OWM makes it operationally simple to deploy, operate, and troubleshoot open waves, i.e., Xponders or pluggable optics equipped over third-party optical line systems.

Benefits of Transcend Open Wave Manager

- Increase your optical network competitiveness with the move to open networks
  - Introduce latest-generation, best-in-breed optical engines over your existing line system
  - Select among a choice of suppliers, de-risking supply chain and quality issues and ensuring business continuity
  - Improve your network economics
- Streamline the operation of your open optical network with end-to-end network and service visibility and consolidated inventory, enabled by automated equipment and topology discovery across Xponders and optical line system
- Simplify and accelerate service creation in your open optical network, with:
  - End-to-end connectivity verification
  - End-to-end optical circuit and service provisioning
  - Automated Xponder power settings
- Simplify and accelerate troubleshooting in your open optical network with combined performance and fault management data, as well as fault correlation across multi-vendor platforms
- Deploy and integrate the application seamlessly in your infrastructure and software environment thanks to the use of standard northbound and southbound interfaces



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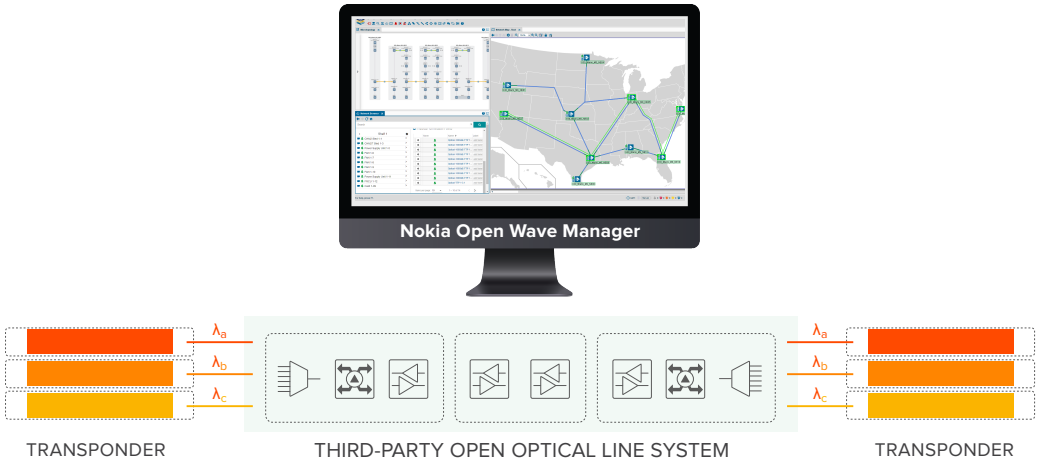

Figure 1: Nokia's Open Wave Manager offering consolidated management of open waves

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The OWM application offers consolidated management and control of services running in a multi-vendor open optical network.

Without such an application, the information pertaining to the open optical network is spread over two or more vendor-specific network management systems (NMS) or software-defined network (SDN) controllers – one for the line system, and one or more for the transponders or pluggable optics.

The end-to-end view is only attained either at the OSS or high-level orchestrator, which typically will not preserve all details specific to the optical technology, or through the manual work of an expert who:

- Reconciles network inventory, topology, connectivity, and services information
- Combines and harmonizes performance and fault monitoring data for the Xponders/pluggables and line system domain
- Performs a complex analysis process if there is need for troubleshooting

The OWM application de-risks these tasks by automating them, minimizing operational errors and ensuring the simple deployment and operation of open waves in an open optical network. This translates into faster time to market, faster time to revenue, and better compliance to service-level agreements.

How Open Wave Manager Works

OWM controls Xponders in an optical network directly through its southbound interface. As for third-party line systems, they are also integrated in OWM's southbound interface, but in this case this is achieved by leveraging the northbound interface (NBI) of the vendor-specific line system NMS or SDN controller. This architecture enables the unified management of all Xponders and line system functions required to operationalize open waves.

OWM discovers line system nodes and topology, as well as any preexisting optical circuits and corresponding equipment already deployed over the line system. It reconciles this information with the Xponders' view, supporting unified visualization and monitoring of all involved network elements, connections, and services – from power levels to status and alarms. Additionally, OWM offers optical connectivity verification across Xponders and line system, as well as end-to-end optical and digital service creation, including automated Xponder power setting and automated fault correlation for troubleshooting open waves.

The functionality offered by OWM, and described above for Xponders, is applicable to any optical engines (i.e., optical networking Xponders or transceiver-based pluggable optical interfaces equipped in third-party devices). OWM acts as an optical domain controller, integrating, orchestrating, and abstracting the open optical network to higher layers of management and control. Through its own T-API-based open and standard REST northbound interface, OWM enables the integration of the consolidated open optical network and its services into the customer operations support system, business support system, or multi-layer network orchestrator.

Open Wave Manager Deployment

OWM is a web-based application implemented using modern cloud-native technologies. Based on microservices and deployable in containerized environments, it is easy to deploy and upgrade in any software ecosystem and has a small memory and CPU footprint when compared to a traditional NMS/SDN controller.

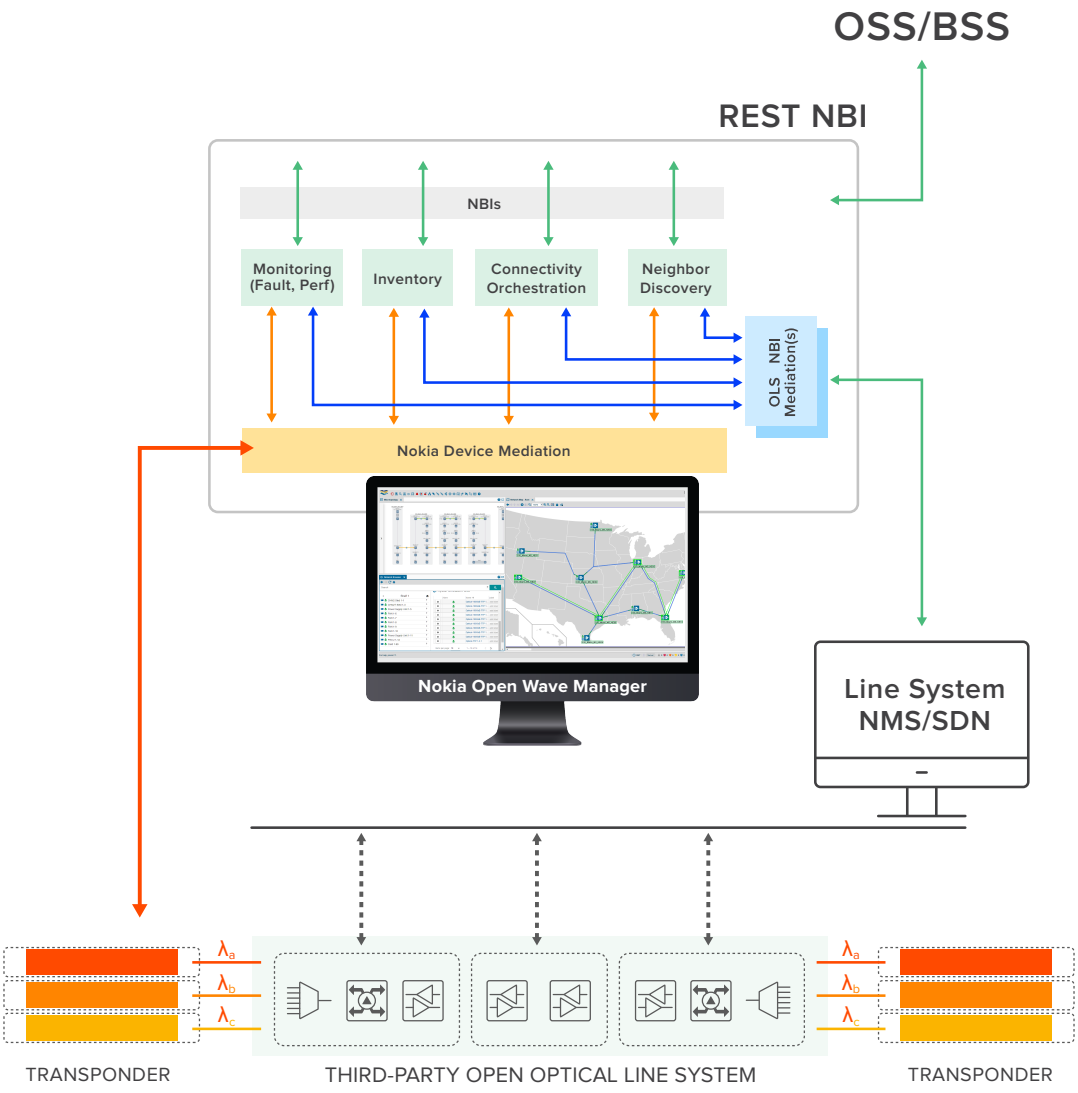

Figure 2: Open Wave Manager at work: interfacing the operator back office, Xponders, and line system NMS

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As an alternative to a standalone OWM deployment, OWM can be used as a plug-in to Transcend Network Management System (TNMS), extending an existing TNMS installation with visibility over a third-party line system.

Nokia offers a range of professional and support services to ease the deployment and operation of open waves. Among them, Nokia's software consulting services help operators in the deployment of Open Wave Manager in their own specific tooling ecosystems, with integration services available for assisting northbound integration with OSS/BSS systems.

Nokia's software consulting services have a long history in working with operators, combining unique software integration and development capabilities with target-oriented consulting for business process optimization.

Summary

OWM enables simple, efficient, and error-free operation of open optical networks. OWM provides consolidated network views, connectivity verification, and end-to-end optical circuit and service provisioning with automated power settings, as well as simplified troubleshooting. Nokia's Open Wave Manager is the software application of choice to minimize any operational complexity brought about by the adoption of open optical networking.

About Nokia

At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

With truly open architectures that seamlessly integrate into any ecosystem, our high-performance networks create new opportunities for monetization and scale. Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.

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