

# proNX Optical Director

## Product Overview

Whether service providers are developing new cloud services, investing in 5G and the Internet of Things, or expanding fiber capacity to address the next wave of traffic growth, Juniper delivers the packet-optical technology that reduces TCO and helps grow service revenue.

Designed to create a more open, automated, and efficient operational environment, proNX Optical Director is a software platform that manages and controls Juniper Programmable Photonic Layer open-line system elements and Juniper coherent DWDM transponder-based solutions. These include BTI Series Packet Optical Transport Platforms, as well as integrated DWDM transponders on TCX Series, MX Series, PTX Series, and QFX Series platforms.

## Product Description

Juniper software innovation enables customers to use open-line systems to lower costs, improve operational efficiency, and accelerate the pace of network evolution to meet demand for next-generation services and applications.

Juniper Networks® proNX Optical Director automates the deployment, scaling, and management of optical line system devices. The software includes the following features:

- Network fault, configuration, accounting, performance, and security management
- Optical control loop
- Service visualization and activation
- Web-based user interface

Based on a highly available and extensible microservices-based architecture, proNX Optical Director enables operators to easily and reliably deploy, scale, and integrate applications and services, regardless of whether they are from Juniper, the operator's own software development team, or third-party developers. The proNX Optical Director applications are orchestrated independently; resources such as compute, availability, and redundancy are tailored to the operator's unique needs per application.

A distinctive attribute of proNX Optical Director is its centralized management of photonic layer control. By disaggregating the optical control plane from the Juniper Programmable Photonic Layer, users can more predictably and flexibly modify control plane behavior while maintaining service continuity, lowering operational expenses, and fine-tuning transport-layer performance.

Openness and programmability are hallmarks of proNX Optical Director, which includes a web-based user interface with NETCONF and southbound telemetry APIs for easy configurability and service monitoring. Rich, standards-based northbound REST APIs help the operator easily and cost-effectively integrate proNX Optical Director into orchestration and business/operations support systems (BSS/OSS) layers.

When combined with Juniper Networks NorthStar Controller, proNX Optical Director plays a key role in enabling the migration to a multilayer optimized network. Using a standards-based YANG model, proNX Optical Director exchanges optical network topology data with NorthStar Controller to gain visibility from the photonic layer into Layer 3, facilitating multilayer resiliency and protection.



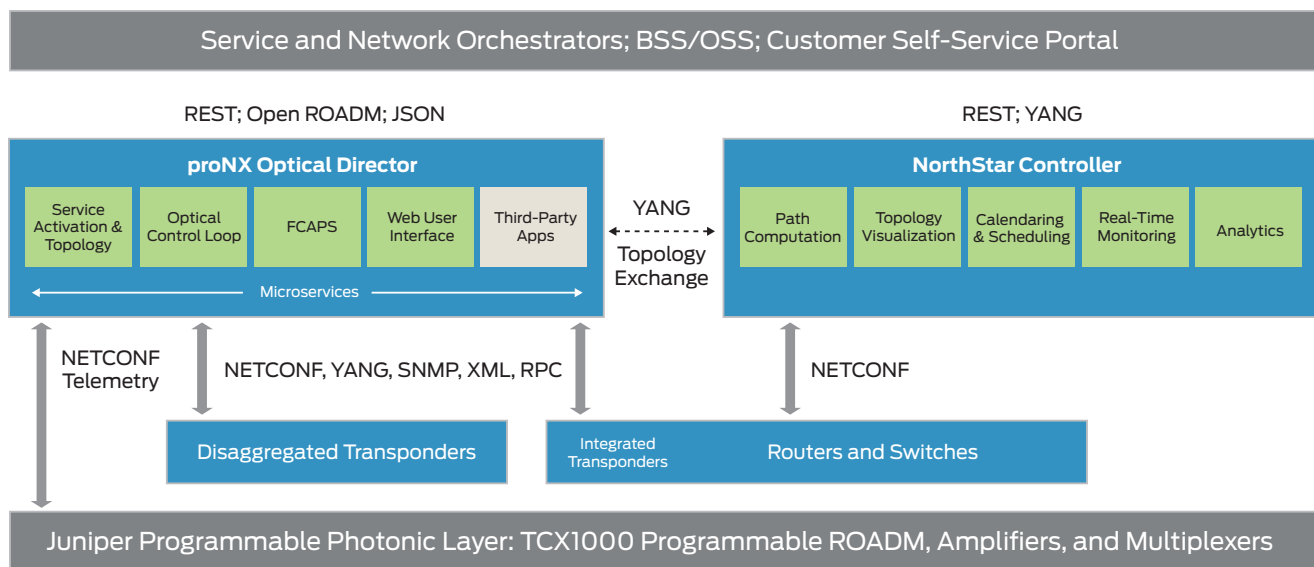


Figure 1: Juniper Networks packet optical architecture

## Architecture and Key Components

Using a microservices-based architecture, proNX Optical Director helps build flexible, independently deployable applications that communicate with one another over a network to execute specific functions. For example, with service visualization and activation, proNX Optical Director facilitates a simple scaling mechanism by adding additional commodity servers to the network and running replicas of the applications on them. The proNX Optical Director applications are comprised of small, modular, independent services that are loosely coupled and communicate through standards-based APIs, making them easier to develop, update, and maintain in service provider networks.

The proNX Optical Director software executes on a Linux, Docker, Kubernetes (LDK) stack and is focused on redesigning the operating system around the principles of immutable infrastructure. The host system provides tools for managing bootable, immutable, versioned file-system trees from upstream content.

The proNX Optical Director microservices-based architecture delivers the following operational advantages:

- Autonomous deployments that facilitate features such as simple bug fixes, adding a single new field to an already-running application, or changing a particular service component.
- A natural transition to a DevOps model that eliminates the need for separate budgets and teams for development, maintenance, and operations.
- Decreased downtime, which directly increases revenue by improving user retention and engagement while maintaining the consistency of application performance.
- Better reliability by dispersing functionality across multiple services, eliminating an application's susceptibility to a single point of failure. Stronger applications perform better, suffer fewer outages, and can scale rapidly.

- Operational agility through microservices that enable high-velocity software deployment delivery and include the ability to continuously produce new features and capabilities at scale.

## Features and Benefits

### Automated Installation

proNX Optical Director leverages the DevOps tool from Ansible to install and configure its LDK stack as well as the applications that ship with it, enabling a simple, agentless proNX Optical Director installation using an automated, immutable process.

### Third-Party Onboarding

proNX Optical Director includes the ability to onboard applications from third parties. The platform infrastructure provides a facility for "sandboxing" external applications, enabling customers or partners to leverage the resource, infrastructure, and data available within proNX Optical Director for their own use cases. For example, the platform could be used to host an end user, a self-service provisioning portal, a specialized analytics application, and a root cause analysis application, to name a few.

### Disaggregated Optical Control Loops

The proNX Optical Director software centralizes optical control loop network functions. Rather than executing on the devices themselves, this function has been virtualized within the controller component of proNX Optical Director. In addition to the standard benefits of Network Functions Virtualization (NFV), disaggregating the control loops enables control plane behavior to be customized for a specific user's network.

### Open Standardized APIs

proNX Optical Director provides a suite of RESTCONF-based APIs for controlling and managing the optical line system. These APIs are standardized on the Open ROADM Multi-source Agreement (MSA) models, providing operators with an open approach

to network programmability. Services include a full suite of documentation that describes the APIs they expose, as well as instructions and examples on how to program them.

Centralized Aggregation Services

proNX Optical Director includes aggregation services for retaining device logs and metrics, and has been engineered to supplement this data with logs and metrics from the applications themselves as well as the software used to manage them. This provides a comprehensive view of the network and the tools used to manage it. The aggregation services provide both user (web-based UI) and machine (REST)-based interfaces for querying the data.

Canary Releases

proNX Optical Director supports the “soft” deployment of application updates into production, allowing only a small percentage of traffic to initially access the new software. This enables an incremental, safe rollout of new software versions without impacting the full solution.

Web-Based User Interface

proNX Optical Director provides a Web-based user interface, enabling efficient, intuitive service activation, monitoring, and troubleshooting. The user interface also provides visibility into how proNX Optical Director is executing within its cluster.

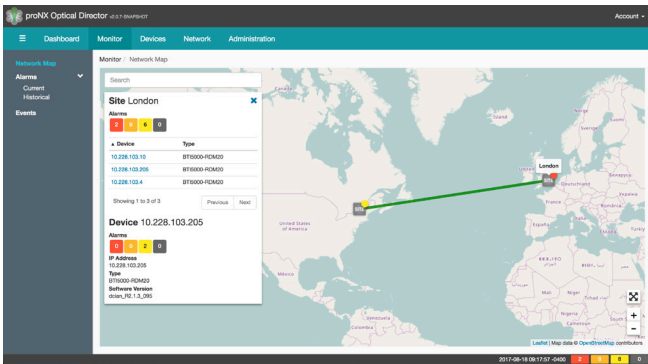


Figure 2: proNX Optical Director Link View

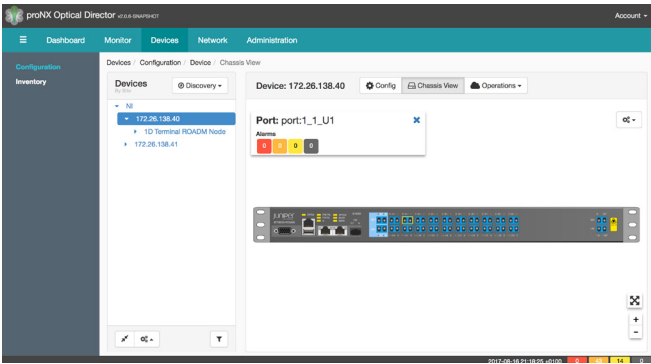


Figure 3: proNX Optical Director Shelf View

Specifications

The proNX Optical Director software runs on x86 64-bit hardware sourced from any vendor. Resource requirements are dimensioned based on the size of the network managed.

Ordering Information

| Product Number     | Description                  |
|--------------------|------------------------------|
| proNX-OPT-DIR      | proNX Optical Director       |
| proNX-OD-RTU-G1    | proNX OD RTU License—Group 1 |
| proNX-OD-RTU-G2    | proNX OD RTU License—Group 2 |
| TCX1000-RDM-2P-UP  | TCX1000 RDM 2-Port License   |
| TCX1000-RDM-4P-UP  | TCX1000 RDM 4-Port License   |
| TCX1000-RDM-16P-UP | TCX1000 RDM 16-Port License  |

About Juniper Networks

Juniper Networks challenges the status quo with products, solutions and services that transform the economics of networking. Our team co-innovates with customers and partners to deliver automated, scalable and secure networks with agility, performance and value. Additional information can be found at [Juniper Networks](#) or connect with Juniper on [Twitter](#) and [Facebook](#).

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