



Nokia WaveSuite Service Enablement

A new service view for optical networks

Application note

Abstract

The rise of digital technologies is increasing demand for bandwidth, putting owners of optical networks in an ideal position to sell high-capacity connectivity services using the Network-as-a-Service (NaaS) model. This application note illustrates how the Nokia WaveSuite® Service Enablement solution enables optical network operators to seize this business opportunity.

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Introduction

The opportunity for optical network operators to sell high-capacity connectivity services has never been stronger. The need for bandwidth continues to grow to support applications such as the Internet of Things, cloud services, big data analytics and artificial intelligence as well as increasing the amount of multimedia traffic. At the same time, network architectures are changing to support the cloud. Cloud compute and storage are moving closer to users for improved latency and more affordable bandwidth. The internet is also being bypassed with high-speed connectivity to cloud communication exchange points.

Furthermore, many enterprises and organizations are facing the challenging task of building out more optical network capacity to support their businesses. They often look to systems integrators (SIs) or optical network wholesalers to help them achieve their network growth goals. These organizations need help because they typically lack the required in-house optical networking expertise.

Nokia WaveSuite Service Enablement applications help optical network operators address these opportunities by enabling them to sell high-capacity wavelength connectivity services. The applications also enable these operators to pursue new business possibilities using a new service view for optical Network-as-a-Service (NaaS). This application note describes how the WaveSuite Service Enablement applications use business relationship-aware assurance, fulfillment and service inventory software to quickly enable a more consumable, revenue-generating optical network.

Enabling new optical services possibilities

Optical network operators are continuously looking for ways to maximize the return on their network investment by generating more service revenue and increasing network consumption. However, they are always being pulled in two directions—either to support existing services or reduce network operating costs. In many cases, the network investment or deployment timelines required to support new services, such as optical NaaS, negatively impact the business case. This is especially true given operators' shrinking budgets and the investment in software required to assure, fulfill and inventory new optical NaaS service offerings.

Operators that wholesale optical network connectivity are also looking for tools to automate optical NaaS delivery and assurance. They want to enable new business models so they can sell high-capacity partitioned connectivity to retail service providers (RSPs) or SIs that, in turn, resell optical connectivity services to end customers.

These business models require a software solution that can model the business relationships between the RSP and SI service providers and their subscribers. They also require virtualization and partitioning of service connectivity, which will enable each RSP and SI partner to independently resell connectivity services to its subscribers. A further challenge is to provide self-service tools that will allow RSP and SI partners to monitor service health while assuring service-level agreements (SLAs) independent from the optical network operators.

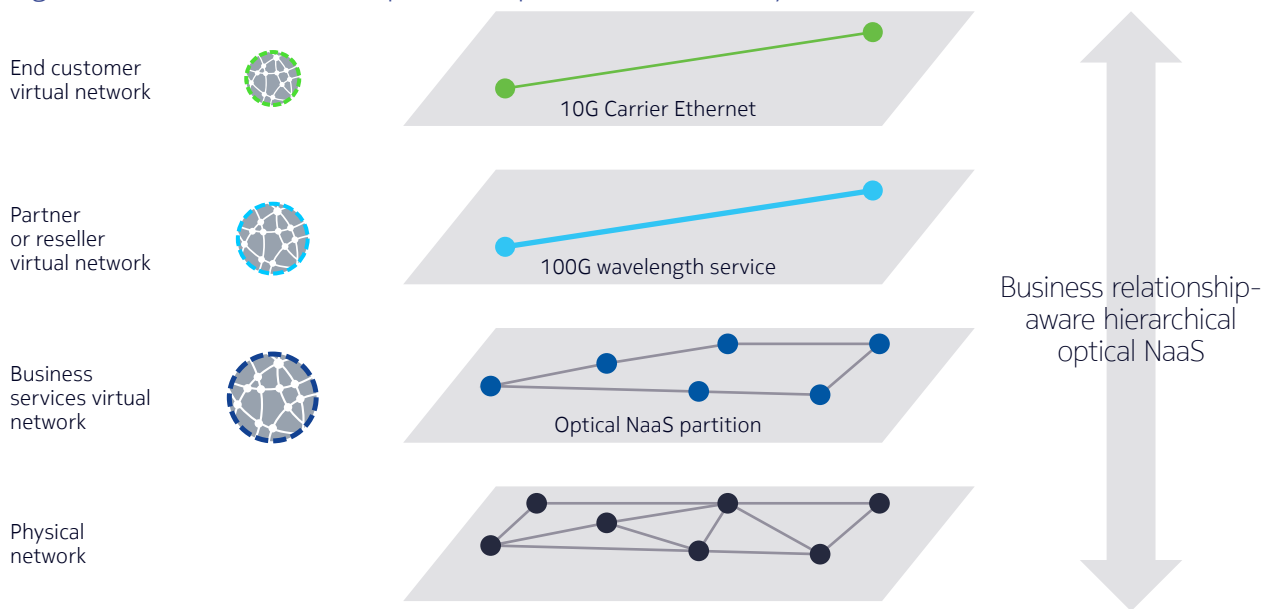
Streamlining optical service deployment

The optical NaaS concept combines multi-tenancy with a model for hierarchical business relationships, to create new channels to market for optical connectivity services. It brings benefits to optical network operators by driving new demands for optical connectivity in their network infrastructure. It brings benefits to tenant partners such as RSPs, systems integrators and cloud providers by enabling them to generate new revenue with their own privately labeled optical connectivity services.

Optical NaaS uses a hierarchical, business relationship-aware model that makes it easy for operators to build networks using virtual representations of underlying physical network resources (see Figure 1). This model also allows customers to get their services from the company with which they are already doing business.

Optical network operators can use the model to reach previously inaccessible markets for optical connectivity and enable tenant partners to resell optical services without incurring the significant expense of building their own network. Service portals streamline service delivery by enabling services to be turned up and down on demand at any level of the hierarchy, without input from the underlying service provider or network operators.

Figure 1. Business relationship-aware optical NaaS hierarchy

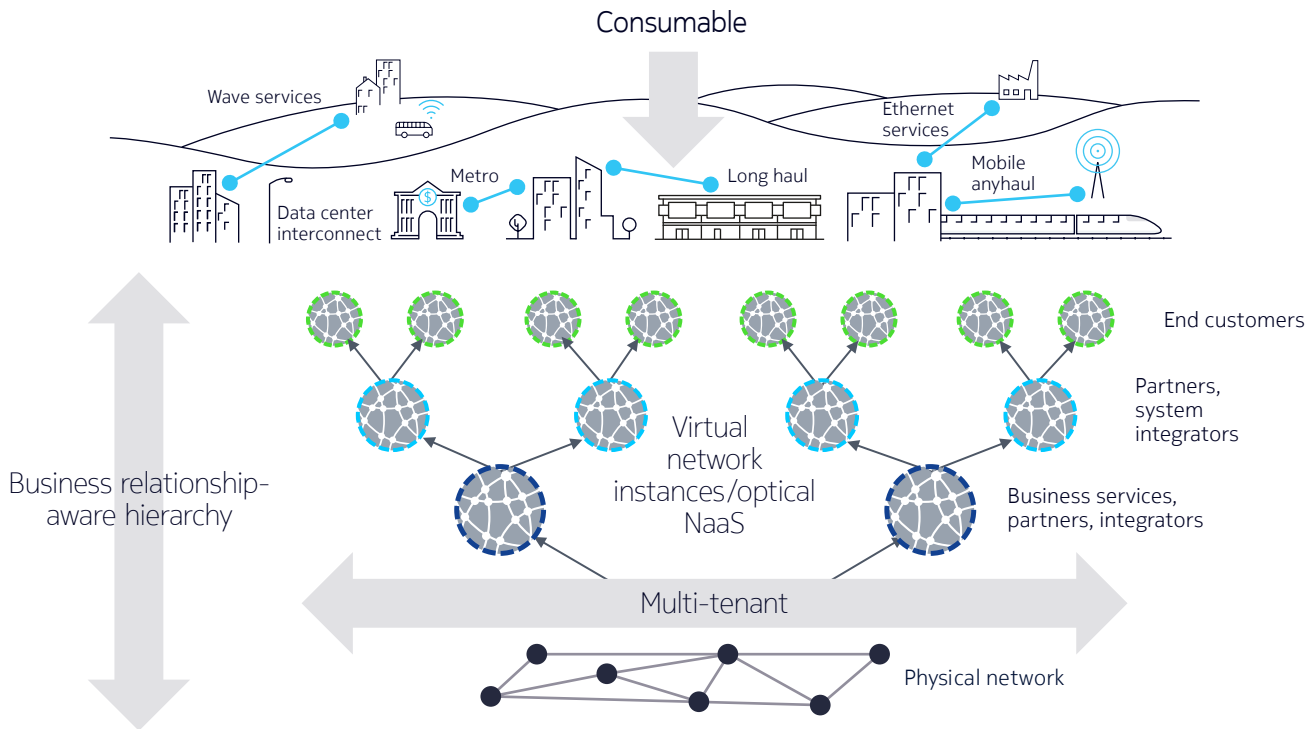


Nokia WaveSuite Service Enablement applications

The Nokia WaveSuite Service Enablement applications use patented business relationship-aware hierarchical models to make the network more consumable and allow each business layer to focus on what it does best (see Figure 2). This could be running a massive network, selling wholesale and retail services, or operating a cloud network that requires scalable and flexible customer connectivity. The Service Enablement applications enable optical network operators to partner more easily with IT systems integrators, cloud operators- and carrier- neutral providers that have their own unique and varied end-customer channels.

The root of the tenancy hierarchy is the operator that owns the physical optical network infrastructure. The hierarchy's intermediate levels are virtual network providers that resell virtual connectivity to other virtual network providers or end subscribers.

Figure 2. Nokia WaveSuite Service Enablement business-aware virtual network hierarchy



By making the optical network more consumable for end customers and retailers, the Service Enablement applications facilitate the rapid deployment of the software infrastructure required to address the market for higher-capacity connectivity services. The applications enable this fast deployment by using intelligent network partitioning to create virtual networks that support optical NaaS tenants.

Virtual networks can be partitioned directly from the physical network or indirectly from another virtual network provider. Each virtual network is a secure and independent network partition owned by the virtual network provider. The Service Enablement applications model the business relationships between each virtual network provider and its underlying service provider, and between the virtual network provider and its subscribers. These applications support service fulfillment, service assurance and service inventory. They use a shared software base that supports hierarchical multi-tenancy and service virtualization.

Ultimately, the Service Enablement applications allow optical network operators to increase revenue by creating a more consumable network that supports more customers and new channels to market. The applications also help the operators avoid a large investment in CAPEX and OPEX. The operator's customers can use these same capabilities to minimize or eliminate network CAPEX and bootstrap service operations with ready-to-go self-service tools.

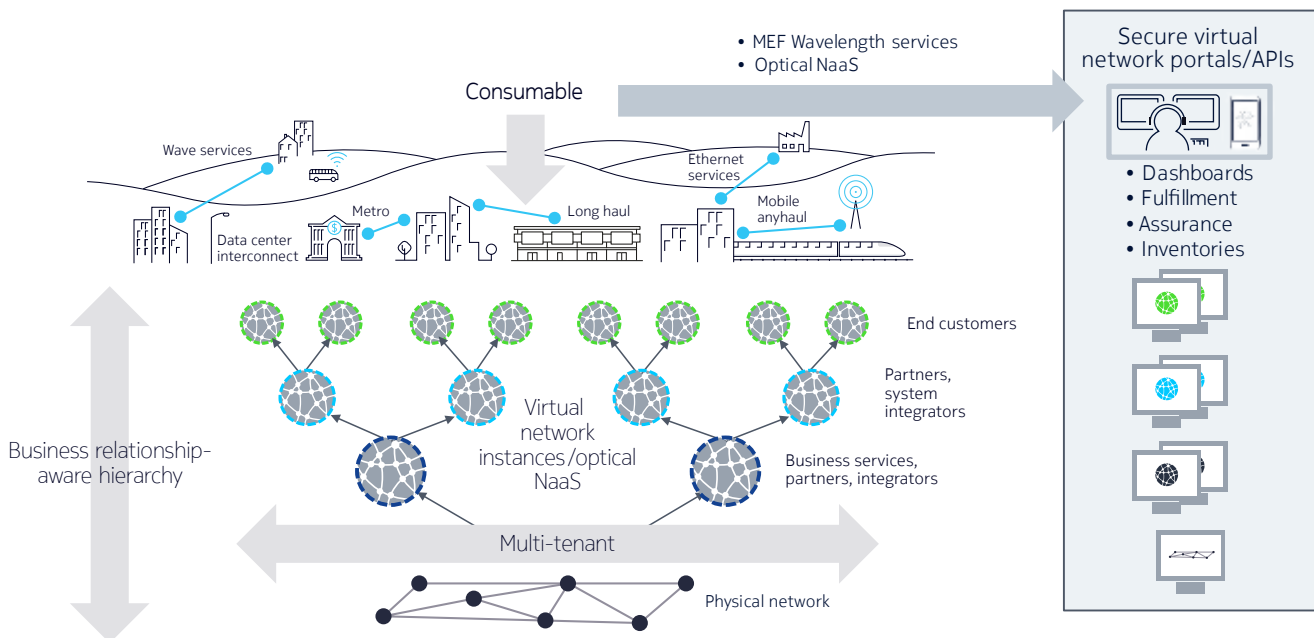
Going beyond traditional VPN services

The Nokia WaveSuite Service Enablement software goes beyond traditional virtual private network (VPN) service models by allowing virtual network providers at each level to independently define and operate multiple levels of virtual connectivity services (see Figure 3). The virtual network owner can sell services from its network without ongoing coordination with its underlying provider (e.g., the physical optical network operator).

The owner can also add its own physical devices, such as Customer Located Equipment Network Interface Devices (CLE NIDs), to its virtual network and without making a large investment in physical infrastructure. In doing so, the owner can focus on more strategic parts of its business.

Virtual network owners can also use virtual network instances (VNIs) to support optical NaaS applications, which are similar to the optical NaaS being provided to them.

Figure 3. Nokia WaveSuite Service Enablement hierarchy portals/APIs



Rapid service deployment

Turning up optical services has traditionally been slow and difficult. Customers are now accustomed to cloud services that can be provisioned at the click of a button. Through web-based portals, the Service Enablement applications allow optical network operators to offer services that are as fast and easy to turn up as cloud services. The applications allocate resources from virtual optical network partitions to support optical connectivity service offers.

Relationship-aware service and network inventory tools track free and allocated service resources. Using these tools, virtual network owners and service providers throughout the hierarchy can track services for their subscribers along with the underlying virtual network resources used to develop the services.

When needed, virtual network owners can request additional resources from their underlying provider, using tools that clearly depict where additional network capacity is available. These new service requests

ultimately become requests to set up new optical connectivity on the physical network. The optical network operator can automate fulfillment of these connectivity requests through a combination of:

- Service fulfillment applications that determine the best way to route connections to implement the provider's service definition within the constraints of virtual provider tenancy
- Handoffs of connectivity requests from the Service Enablement applications to the underlying software-defined networking (SDN) controller, which automates route computation and connectivity setup in the network.

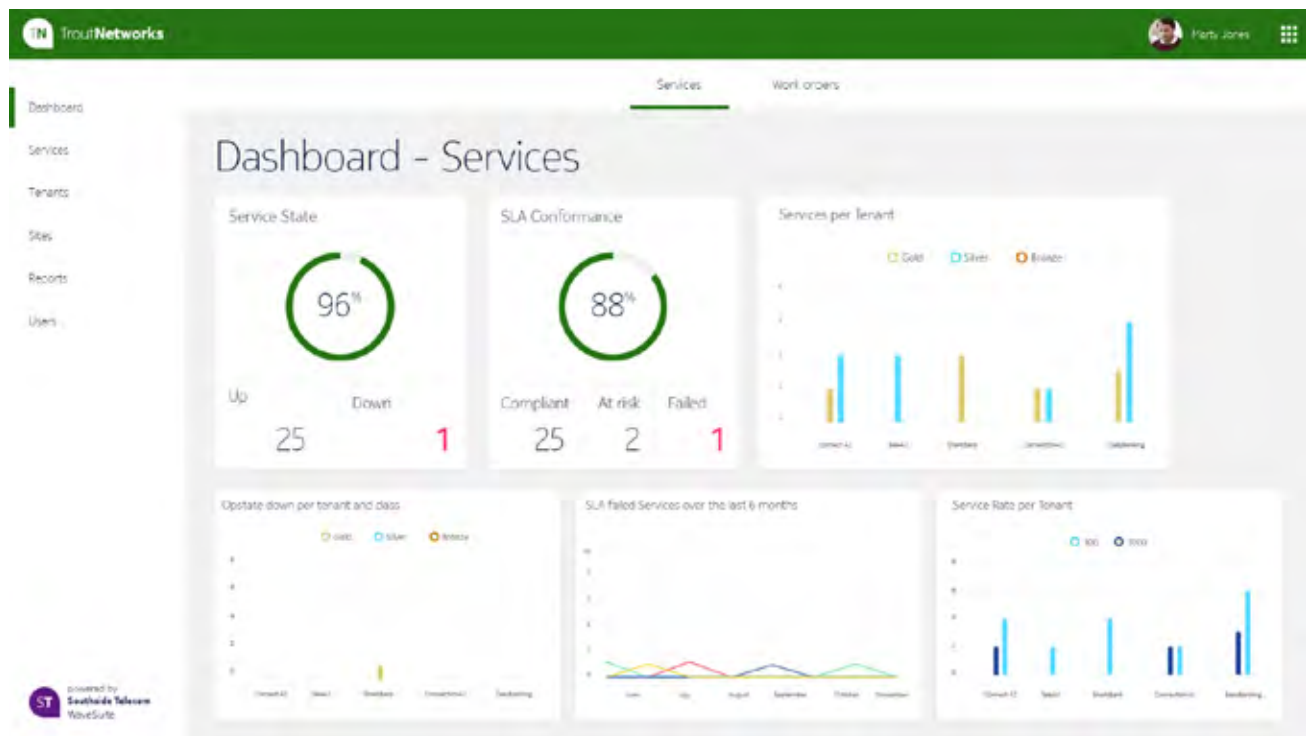
Service Assurance

WaveSuite Service Enablement applications facilitate sales by using MEF service definitions to model optical wavelength services. In addition, the applications enable service providers throughout the hierarchy to create customized template service catalog entries to model service definitions and SLA attributes. The resulting service catalog template is used for all Service Enablement applications to provide a streamlined view of services throughout their life cycle.

The applications provide service dashboards (see Figure 4) and service reporting capabilities for all levels of the hierarchy through self-service portals. These dashboards provide a quick view of service health through summary views of:

- Service operational state (e.g., up, down, degraded)
- Service SLA conformance (e.g., compliant, non-compliant, at risk)
- Service inventory categorized by service class, rate and assigned customers/tenants.

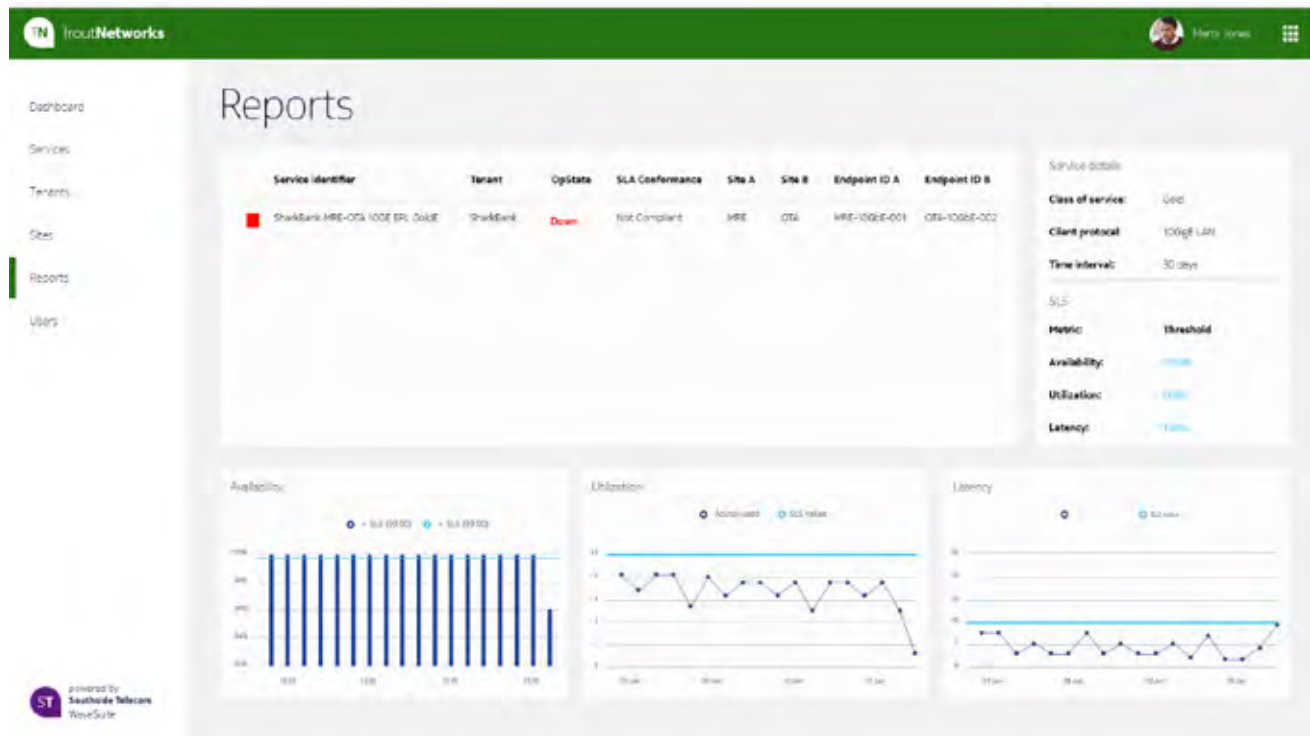
Figure 4. WaveSuite Service Enablement dashboard



The Service Enablement applications also provide access to flexible per-service views and reports (see Figure 5). These reports enable providers at all levels to rapidly assess service performance against SLA objectives. Providers can consider selling these reports to open a revenue stream. A variety of service reports provide a comparative view of service performance against SLA objectives modeled in the service catalog. These reports cover objectives such as:

- Service availability
- Service latency/delay
- Service utilization.

Figure 5. Nokia WaveSuite Service Enablement service reporting



WaveSuite Service Enablement also supports wavelength service burstable billing, enabling new service offers that unlock new pay-per-use billing models for optical connectivity services:

- Service utilization reporting provides tracking of tenant bandwidth consumption over a billing period.
- Utilization thresholding detects “burst” events to drive pay-per-use billing and alert the service provider to upsell opportunities.
- In-service updating of the billable service rate specifications enables upsell to higher service rates without reconfiguring the underlying optical connectivity.

The burstable billing capability is enabled through a combination of the Service Utilization Reporting feature and the WaveSuite Service Enablement Northbound Interface.

The Service Enablement applications’ fulfillment, assurance, inventory and dashboard interfaces support customizable branding that prominently displays the business relationships between service subscribers and their service providers.

Reducing investment and risk

The WaveSuite Service Enablement applications support a pay-as-the-service-grows approach that enables optical network operators to minimize up-front investment and risk. Operators pay for Service Enablement applications based on the number of services consumed in the network.

Nokia offers additional services that help operators further minimize investment and risk, including:

- **Pre-integration support:** The WaveSuite Service Enablement applications can be pre-integrated with the Nokia Network Functions Manager for Transport (NFM-T) network management solution and the Nokia Network Services Platform (NSP) SDN controller. The NSP provides functions such as multi-layer network control, real-time network optimization, and integrated network diagnostics and repair. To ensure secure and private operations, the Service Enablement applications retain all hierarchical tenancy and service virtualization intelligence. This reduces the requirements for SDN controllers and supports a more open software environment.
- **Professional services support:** Nokia WavePrime provides support for custom software integration, integration with non-Nokia SDN controllers, web portal development, on-boarding of existing services into the Service Enablement architectural environment, and building and operating the network.

In addition to generating more service revenue, the Service Enablement applications can streamline service-related operations in several ways:

- A consistent operational model can be used for all services, including optical NaaS.
- Optical NaaS operations can be decoupled from the underlying physical network or virtual network.
- Tools for on-boarding existing services enable operators to deploy the Service Enablement applications into existing brownfield network deployments.
- Northbound operations support system/business support system (OSS/BSS) interfaces simplify interworking with existing OSS/BSS infrastructure.
- Standard ONF TAPI 2.0-based southbound interfaces support integration with SDN controllers from third-party vendors.
- The WaveSuite Service Enablement applications reduce service deployment risk and investment for the optical network operator's subscribers and reseller partners:
- CAPEX expenditure for networking equipment is minimized or eliminated by taking advantage of the physical optical network's economies of scale.
- The OSS/BSS software investment for service fulfillment, assurance, network inventory and service inventory is minimized.
- Subscribers and resellers require less knowledge and expertise to implement optical connectivity services.

Summary

Nokia WaveSuite Service Enablement applications provide a new service view that enables optical network operators to address new business opportunities with less investment and risk. These applications also allow wholesale operators to streamline delivery of infrastructure to multiple retailers while giving retail customers the same level of flexibility to sell optical NaaS to their customers. Other service providers can use the WaveSuite Service Enablement applications to generate new revenue with wavelength or optical NaaS services.

By making it possible to sell business relationship-aware optical NaaS, the Service Enablement applications help all levels of this hierarchy to use new partnerships and channels to expand into new markets. These applications also allow each organization to focus on its core business and avoid having to make a significant investment in optical networking.

To learn more about how Nokia WaveSuite Service Enablement applications can help you get new value from optical networks, visit our [Optical Networks web page](#).

Abbreviations

API	application programming interface
BSS	business support system
CAPEX	capital expenditures
MEF	Metro Ethernet Forum
NaaS	Network-as-a-Service
ONF TAPI	Open Networking Foundation Transport API
OPEX	operating expenditures
OSS	operations support system
RSP	retail service provider
SDN	software-defined networking
SI	systems integrator
SLA	service-level agreement

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With our commitment to innovation and technology leadership, driven by the award-winning Nokia Bell Labs, we deliver networks at the limits of science across mobile, infrastructure, cloud, and enabling technologies.

Adhering to the highest standards of integrity and security, we help build the capabilities we need for a more productive, sustainable and inclusive world.

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