



# Nokia WaveSuite Service Enablement

Get ready to automate the delivery of optical services

Application note

## Abstract

Cloud access and the rise of edge data centers are driving unprecedented demand for optical network services. The inherent strengths of optical network services—high bandwidth, high availability and ultra-low latency—make them an ideal choice for addressing these applications.

As a communications service provider (CSP), how can you get optical network services into customers' hands faster and give customers more flexible optical network services that are billed based on traffic utilization? And how can you support the resale of optical services through intermediaries such as your internal business units, partners or resellers? Finally, how can you optimally slice the physical network into virtual optical connectivity to sell high-capacity connectivity services using the Network-as-a-Service (NaaS) model?

This application note explores these questions and explains how the Nokia WaveSuite Service Enablement (WS-SE) application uses business relationship-aware intelligence and automation to quickly enable a more consumable, revenue-generating optical network.

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## Introduction

The opportunity for communications service providers (CSPs) 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, Industry 4.0, cloud services, big data analytics, mobile network slicing and artificial intelligence as well as the 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), optical network channel partners or wholesalers to help them achieve their network growth goals. These organizations need help because they typically lack the required in-house optical networking expertise or have a limited amount of optical network resources to meet the growth targets needed to support the business.

The inherent strengths of optical network services—high bandwidth, high availability and ultra-low latency—make them an ideal choice for addressing these applications and changing network architectures. To stay competitive, CSPs are looking to turn their optical networks into CAPEX- and OPEX-friendly platforms that can create value by enabling new service innovation, accelerating service deployment and improving the customer experience. But as networks become more complex and budgets shrink, it's becoming more difficult for businesses to get more value from the network in isolation.

The Nokia WaveSuite Service Enablement (WS-SE) application helps CSPs address these opportunities by enabling them to sell high-capacity, low latency and high availability optical network services. The application also enables CSPs to pursue new business possibilities using optical Network-as-a-Service (NaaS).

This application note explains how WS-SE uses business relationship-aware intelligence and automation to quickly enable a more consumable, revenue-generating optical network.

## Automating the delivery of optical services

Automating optical network service delivery is top of mind for many CSPs because it's a key requirement for creating differentiated service experiences and minimizing network total cost of ownership (TCO). It doesn't matter whether the corporate strategy is to enhance network connectivity or build additional value platforms. Most of the service-related traffic eventually traverses an optical network, so automating the optical connectivity to support this traffic is vital for business success.

Service providers 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 optical 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 RSPs 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 CSP.

## The path toward service automation

Many optical network leaders know they have much work to do to realize the power of optical network service automation. Getting control of service-supporting connectivity is a practical first step toward automating service delivery.

Many CSPs rely on outdated manual mechanisms to create and track optical service connectivity. These mechanisms slow service delivery time because they take a long time to prepare service-supporting infrastructure. They also impede service troubleshooting because they don't make it easy to determine which customers use the connectivity, especially when connectivity is resold.

The next step toward automating service delivery is to prepare to offer optical connectivity as a service to resellers of optical connectivity, including CSP internal business units. CSPs need to be ready to enhance open APIs with intelligence about how optical services are sold throughout a hierarchical service value chain that includes themselves and their internal business units, along with partners, resellers and end customers. These enhancements should include support for new optical NaaS offers, which means adding B2B2X (business-to-business-to-anyone) hierarchical intelligence for:

- Defining, advertising and visualizing customizable service catalogs and their associated SLAs
- Creating customizable service assurance reports that track performance against SLA objectives
- Automating service fulfillment with the option to front-end service fulfillment with complementary automation of business-layer processes such as service quotations and contracts
- Advertising the availability of new network capacity to potential customers
- Selling services through ready-to-go portals
- For high-availability optical network services, visualizing their working and protection routes and route diversity
- Integrating service automation into existing back-office systems.

These capabilities accelerate the delivery of services throughout the hierarchical value chain. They also reduce OPEX for everyone involved in the service transaction.

To support today's software-defined networking (SDN) environments and ensure rapid deployment of automation, service providers must build all of these capabilities into open software applications that streamline the interface between the organizations that run the network (e.g., operations, engineering) and other organizations that support the sale of optical services or that need optical connectivity to support services.

Finally, service providers must assess their ability to automate on their own. This means asking themselves questions about whether they have the resources and expertise to successfully achieve their automation goals. Questions like "Can we take control of our service-supporting connectivity and quickly get it ready to support services?" and "Do we have technology in place to support the sale of services between the organizations that run the network and the organizations that need optical connectivity to support services?" Sellers of optical services shouldn't need to introduce complexity to accommodate SLAs or the hierarchical nature of the value chain or to support optical NaaS offers.

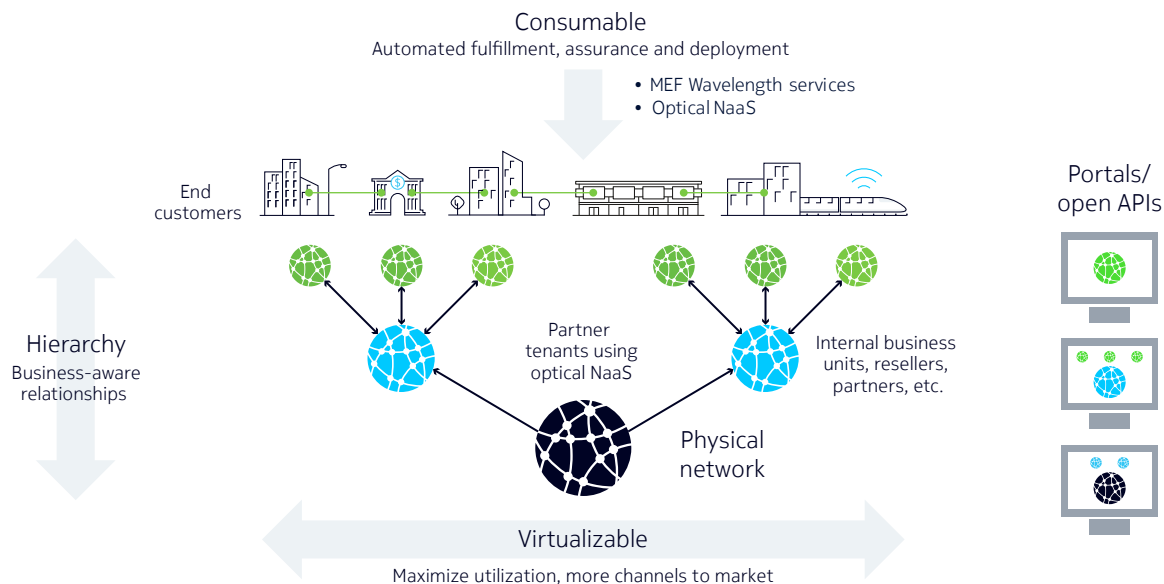
Open applications that support the network and services perspectives can speed up service automation by providing interfaces that are more aware of the business relationship between the organizations involved. Supporting both perspectives also facilitates rapid service troubleshooting between services and network organizations, resulting in lower network TCO and higher customer retention when things go wrong.

## Automating services with Nokia WaveSuite Service Enablement

Nokia created the WaveSuite applications, the Nokia WaveHub value-driven ecosystem and the Nokia WavePrime Digital Process Automation (DPA) practice to make it easy for service providers to address their optical network service automation requirements.

The WS-SE application is built around patented service virtualization techniques that understand how optical services are sold throughout a hierarchical service value chain that includes physical network, internal business units, partners, resellers and the ultimate end customers.

Figure 1. Nokia WS-SE foundational data model



WS-SE has built-in knowledge of how to automate the sale of optical network services. It uses this knowledge to support optical NaaS offers that partners and internal business units can use to sell services and avoid the constraints of slow manual processes for creating the underlying network connectivity. This accelerates service deployment and reduces OPEX for all involved.

## Optical NaaS

The optical NaaS concept combines multi-tenancy with a model for hierarchical business relationships to create new channels to market for optical network services. It brings benefits to CSPs by driving new demands for optical connectivity in their network infrastructure. It brings benefits to tenant partners leveraging the physical network, such as RSPs, SIs 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 service providers 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.

Service providers can use the model to reach previously inaccessible markets for optical connectivity and partners to resell optical network 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 physical network owner. All of this creates an opportunity for service providers to offer optical NaaS to businesses that need optical connectivity but don't want to run an optical network. Achieving this type of transformation is difficult in any networking domain. It is all the more challenging for optical network services, which frequently have prolonged service delivery times (often weeks) and rely on predominantly manual business processes for service order management, connectivity provisioning and service assurance.

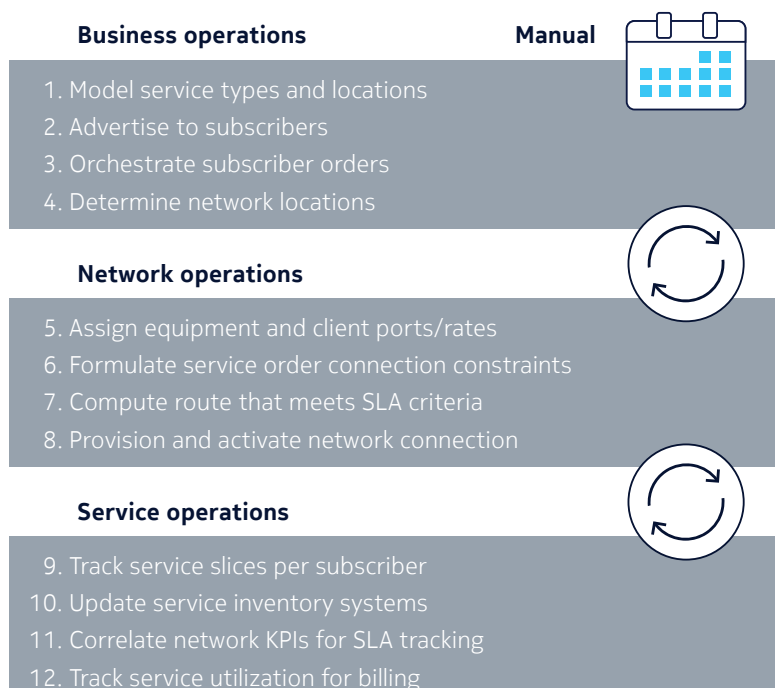
## Accelerating optical network service delivery

With existing business processes and systems, it can take a service provider many days or even weeks to provision, activate and start billing a subscriber for a new optical connectivity service. This long interval is typically caused by the reliance on manual processes, which makes it very challenging to bring new optical connectivity services to market—and virtually impossible to scale these services cost effectively.

### A closer look at the PMO for optical service delivery

For many large service providers, the present mode of operation (PMO) for delivering a new optical connectivity service to subscribers (or tenants of the optical network) often involves several organizations and many manual steps, as shown in Figure 2.

Figure 2. Manual steps for optical connectivity service delivery



For example, the business operations team needs to manually model the service definition, advertise to prospective subscribers and extend customer relationship management (CRM) systems and business support systems (BSS) to model the service. The team needs to extend the service provider's order management and billing systems to process subscribers' orders for the new service.

When the subscriber orders the service, the network operations team needs to assign optical equipment, compute a route that fits the defined service-level agreement (SLA), and then provision and activate the connection in the network.

Finally, the services operations team needs to correlate network key performance indicators (KPIs) to the service for SLA conformance tracking, update BSS inventory systems and track ongoing service performance.

Service providers typically perform most of these operations manually, which results in long order-to-service-revenue intervals even when all the steps in the process succeed. Further delays arise when steps cycle among the business, network and service teams. For example, a service provider may need to restart the entire fulfillment process if the network operations team assigns a network connectivity route that does not match the SLA intent of the service or the service parameters specified in the subscriber order. The net result is often weeks-long service delivery times.

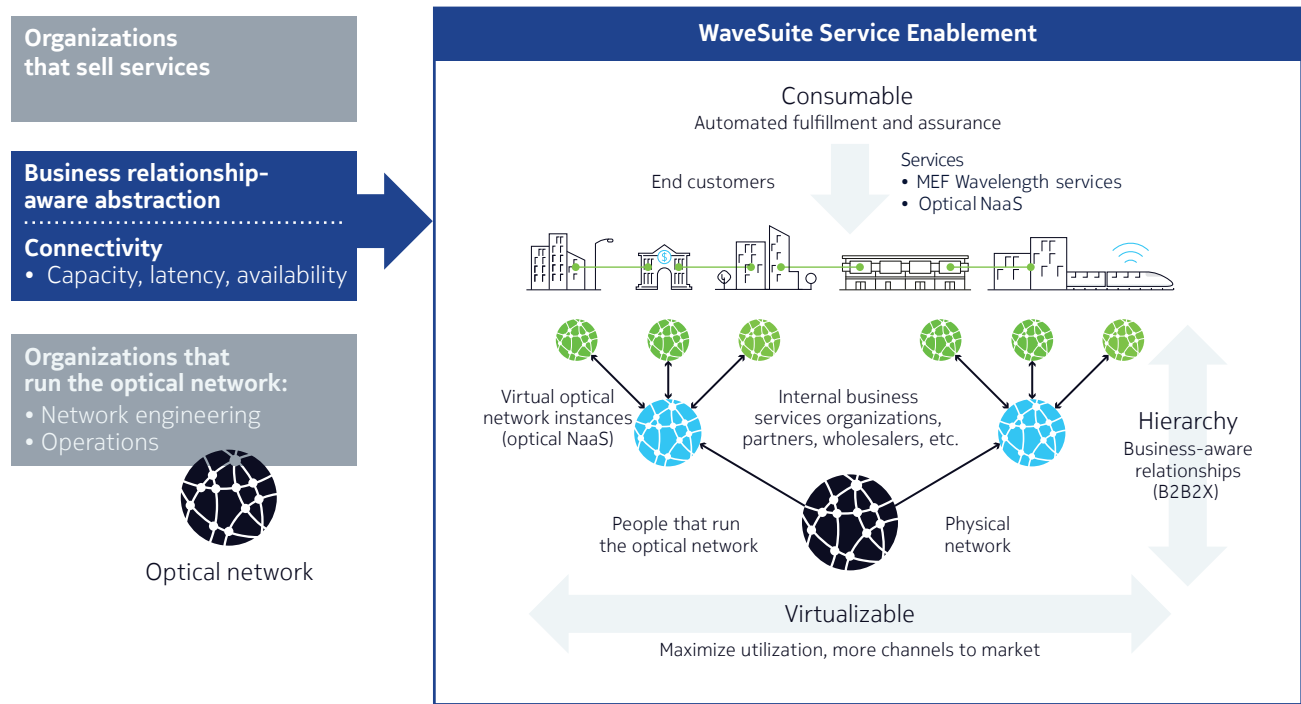
## What if optical connectivity services could be fulfilled in minutes?

Nokia WS-SE makes it easy for service providers to address these challenges by:

- Abstracting service definitions
- Automating service orchestration and network connectivity fulfillment
- Supporting unique service virtualization techniques for optical network connectivity that have awareness of the business relationships between the service provider, reseller/wholesale business partners and end subscribers.

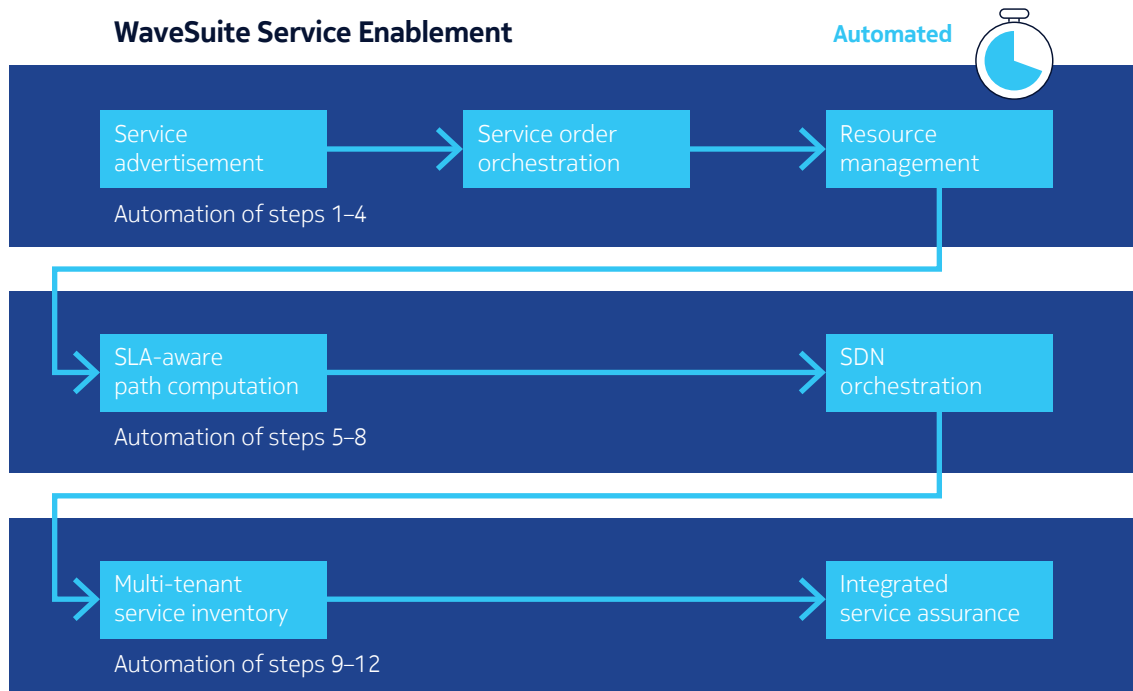
Figure 3 shows the WS-SE service abstraction model.

Figure 3. Nokia WS-SE service abstraction model



WS-SE reduces optical connectivity service delivery times from weeks to minutes by using these unique capabilities to enable full life cycle automation across business, network and service operations (see Figure 4).

Figure 4. Automating the steps for optical service delivery using Nokia WS-SE



## **Service advertisement**

The service provider starts the process by deciding which service definition and SLA criteria to use for the service. WS-SE then uses unique techniques to virtualize the definition and SLA criteria and instantly advertise it to prospective subscribers (or reseller partners) through an automated, on-demand service portal. The service provider can easily tailor the service definition and the locations at which the service is offered to meet subscribers' needs.

## **Service order orchestration**

A subscriber can order the service by using the portal to select a service specification, a location and special constraints such as the minimum required end-to-end latency. WS-SE automatically orchestrates the order from service provider validation and review through subsequent service implementation in the network.

## **Resource management**

The most challenging aspect of automating service delivery is assigning the appropriate network resources. The equipment and port assignments must match the desired service type and rate, and the end-to-end service path must be computed so that it deterministically implements the desired SLA intent.

For example, a premium service that is sold as fully route diverse and protected must be routed so that each leg of the service is transported over non-intersecting equipment and fiber links. A service with strict latency requirements, such as in a 5G transport scenario, must be assigned a network path that meets a maximum permitted threshold for end-to-end service latency.

The path computation engine in WS-SE is fully aware of these types of service-level requirements. It can deterministically automate service path assignment based on unique optical domain-aware algorithms. WS-SE then coordinates the provisioning and activation of the network connection through automated interactions with the underlying SDN controller using a standard TAPI interface.

## **Service inventory and assurance**

After network connectivity is provisioned for the service, WS-SE discovers the network connection from the SDN controller and updates its multi-tenanted service inventory view. Unlike other orchestration solutions, WS-SE maintains an event-based, fully synchronized view of resource assignments to ensure that ongoing changes to the network do not disrupt service order processing. This view shows the service inventory and underlying connectivity for all network tenants, including the service slicing capabilities used by each subscriber.

As the final step in the automation journey, WS-SE starts ongoing assurance monitoring for the service and hands off the completed service to the subscriber. Integrated service-level assurance capabilities automate the process of aggregating network KPIs into service-level performance summaries for critical SLA indicators such as service availability, service utilization and service latency. For high-availability optical network services, visualizing their working and protection routes and route diversity is also supported.

## **A new FMO for optical service delivery**

WS-SE provides a new future mode of operation (FMO) for optical service delivery. For the service provider, the net result of using WS-SE is a fully automated service delivery process that provides a transformative reduction in OPEX. For the service provider's subscribers, the net result is a transformative, bandwidth-on-demand user experience that provides best-in-class service delivery times that were previously unachievable for optical connectivity.

## A closer look at Nokia WaveSuite Service Enablement

Ultimately, the WS-SE application allows CSPs to increase revenue by creating a more consumable network that supports more customers and new channels to market. The application also helps the CSPs avoid a large investment in CAPEX and OPEX. The CSP's customers—and their customers—can use these same capabilities to minimize network CAPEX and bootstrap service operations with ready-to-go self-service tools.

### **Rapid service deployment**

Turning up optical network 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, WS-SE allows service providers to offer services that are as fast and easy to turn up as cloud services.

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

Tools for on-boarding existing services enable CSPs to deploy WS-SE in existing brownfield networks. This enables them to evolve to full optical network service automation on their own timeframes.

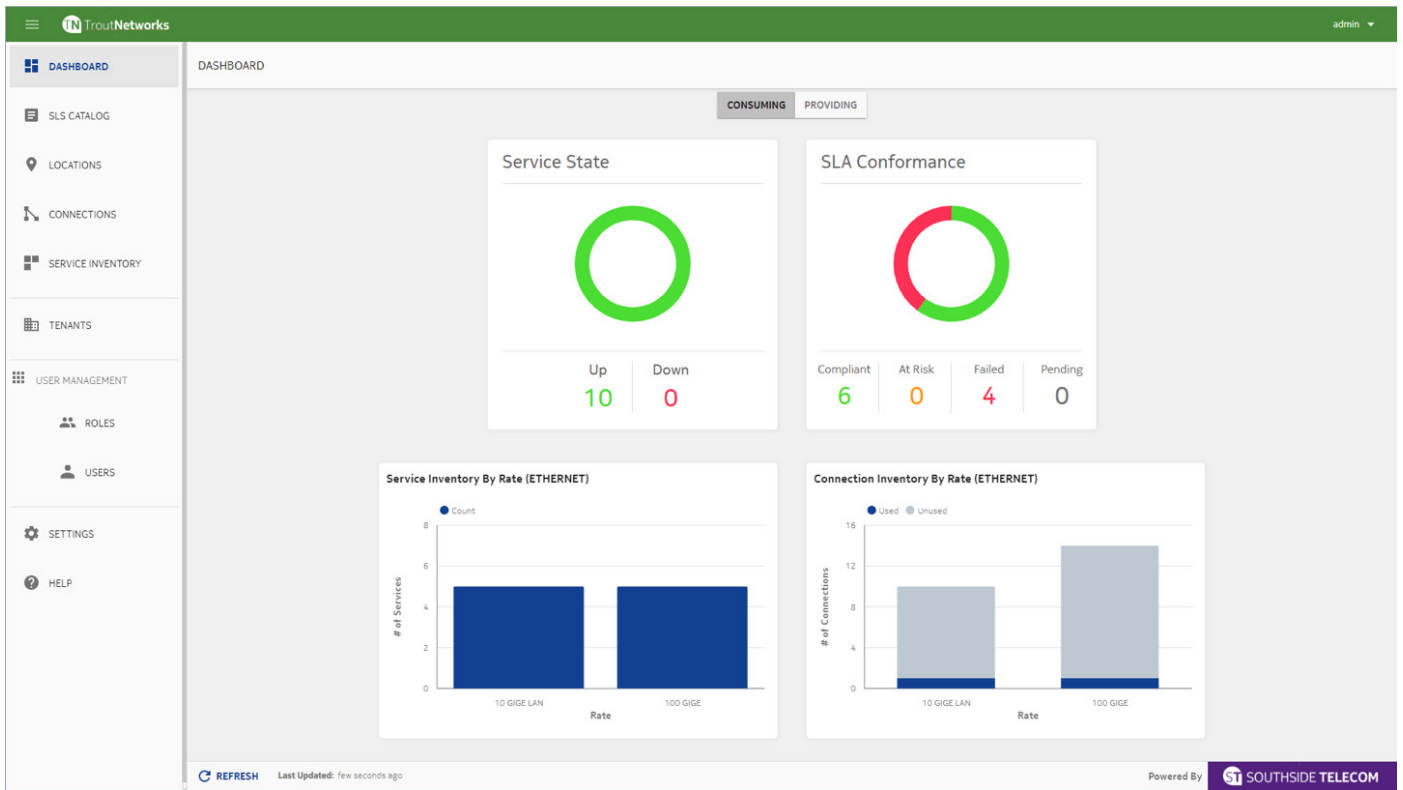
### **Service assurance**

The WS-SE service assurance capabilities facilitate sales by using MEF service definitions to model optical network services (i.e., MEF Wavelength Services). In addition, WS-SE enables subscribers 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 WS-SE application provides service dashboards (see Figure 5) 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 or degraded)
- Service SLA conformance (e.g., compliant, non-compliant or at risk)
- Service inventory categorized by service class, rate and assigned customers/tenants.

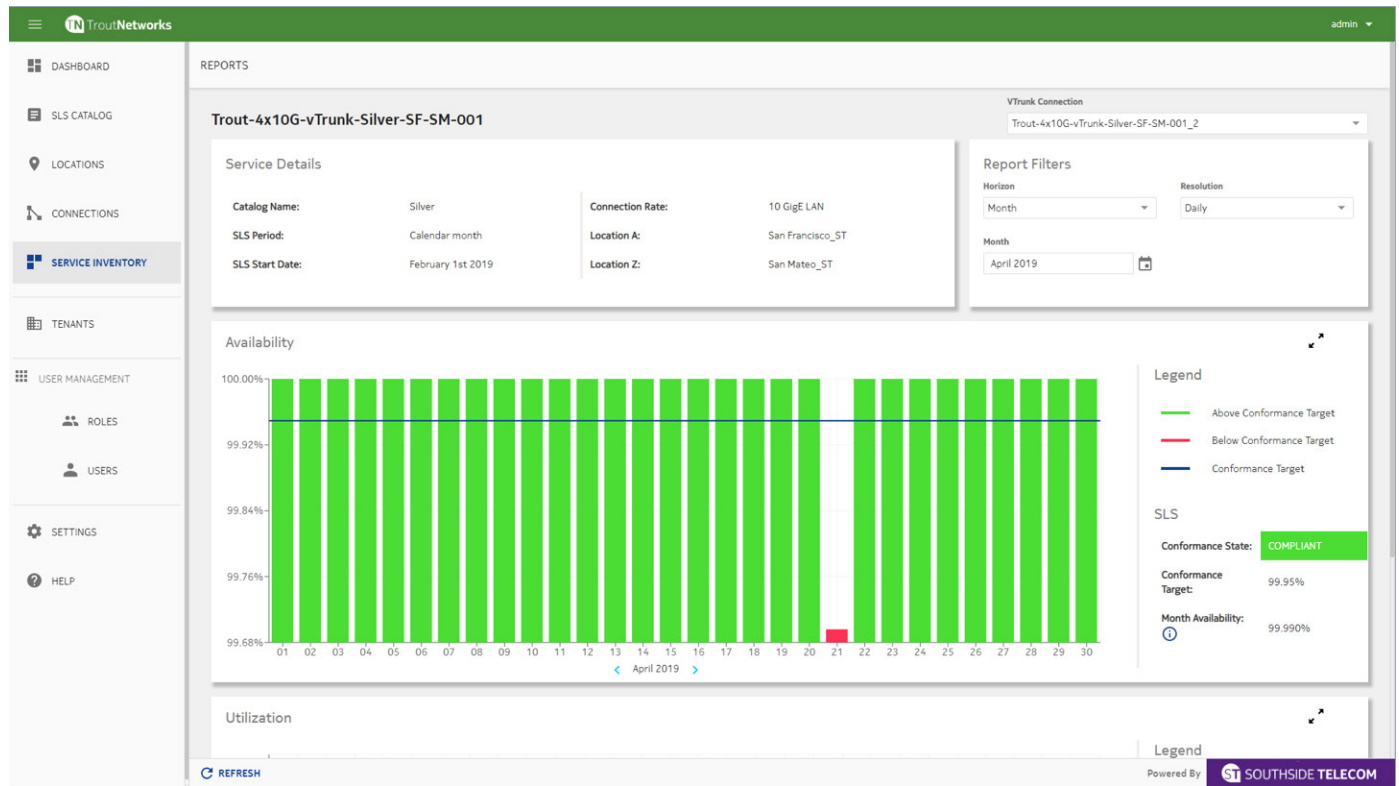
Figure 5 WaveSuite Service Enablement - Assurance dashboard for a partner tenant



The WS-SE application also provides access to flexible per-service views and reports (see Figure 6). 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 6 WaveSuite Service Enablement – Assurance service reporting for a partner tenant



WS-SE 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 (see Table 1) is enabled through a combination of the Service Utilization Reporting feature and the WS-SE northbound interface.

Table 1. Nokia WS-SE burstable billing

| Service level | Usage plan | Price per month (USD) | Actual monthly usage (95th percentile) |          |       |       |
|---------------|------------|-----------------------|----------------------------------------|----------|-------|-------|
|               |            |                       | January                                | February | March | April |
| 1             | <10G       | \$ 1,500              | 8.0G                                   |          |       |       |
| 2             | 10G to 20G | \$ 2,000              |                                        | 11.2G    |       | 17.0G |
| 3             | 20G to 40G | \$ 3,000              |                                        |          | 22.0G |       |
| 4             | 40G to 60G | \$ 4,000              |                                        |          |       |       |

WS-SE 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 Nokia WS-SE application supports a pay-as-the-service-grows approach that enables CSPs to minimize up-front investment and risk. CSPs pay for WS-SE through an incremental model based on the number of connectivity services registered within the application. This pay-as-the-service-grows approach ensures that CSPs can maximize their ROI as they economically utilize the application to scale their network revenues.

Nokia offers WavePrime professional services that help CSPs further minimize investment and risk. These services include:

- Pre-integration support
- Network Digital-Twin-as-a-Service
- Software customization.

### **Pre-integration support**

The WS-SE application can be pre-integrated with and host in a virtual environment with other Nokia WaveSuite applications or with the Nokia Network Services Platform (NSP). WS-SE can also be integrated in multivendor network SDN environments.

To ensure secure and private operations, WS-SE retains all hierarchical tenancy and service virtualization intelligence. This reduces the requirements for SDN controllers and supports a more open software environment.

### **Network Digital-Twin-as-a-service**

The network Digital-Twin-as-a-service (DTaaS) capability can be used to create a virtual network digital twin to support the software deployment life cycle. The creation of network digital twins lowers the dependency and costs of physical networks and equipment labs.

DTaaS can scale to introduce new phases of the CSP's network, introduce new vendor technologies to accelerate automation development, de-risk network maintenance activities, and speed up qualification of vendor equipment.

### **Software customization**

WavePrime provides support for customized software integration, integration with non-Nokia SDN controllers, web portal development, on-boarding of existing services into the WS-SE architectural environment, and building and operating the network.

WavePrime also supports ready-to-go use cases leveraging WS-SE for applications such as:

- Hard slicing the optical network for mobile networks
- Spectrum sharing for long-haul and subsea routes
- Calendared wavelength services and new B2B2X services.

All WS-SE capabilities are available via open, standards-based interfaces:

- 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.



These interfaces enable further automation and customization of optical network services delivery. In addition, service providers can more easily realize their open network initiatives — and thereby accelerate optical network service delivery and reduce network TCO.

The WS-SE application and these interfaces can also be tested using Nokia WaveHub Labs virtual networks to accelerate software integration and a CSP's automation initiatives.

## Summary

The Nokia WS-SE application enables increased CSP revenue through new types of optical network services, virtualization of optical network connectivity and innovative new business models for bringing optical NaaS to market. WS-SE also helps lower network TCO with support for automation, to get optical network services into customers' hands quickly, and tools to help service providers rapidly integrate WS-SE into their operations environment.

By making it possible to sell optical NaaS, WS-SE helps all levels of this hierarchy to use new partnerships and channels to expand into new markets. WS-SE also allows each organization to focus on its core business and avoid needing to make a significant investment in optical networking.

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

## Abbreviations

|       |                                   |          |                                          |
|-------|-----------------------------------|----------|------------------------------------------|
|       |                                   | ONF TAPI | Open Networking Foundation Transport API |
| API   | application programming interface | OPEX     | operating expenditures                   |
| B2B2X | business-to-business-to-any       | OSS      | operations support system                |
| BSS   | business support system           | ROI      | return on investment                     |
| CAPEX | capital expenditures              | RSP      | retail service provider                  |
| CSP   | communications service provider   | SDN      | software-defined networking              |
| KPI   | key performance indicator         | SI       | systems integrator                       |
| MEF   | Metro Ethernet Forum              | SLA      | service-level agreement                  |
| NaaS  | Network-as-a-Service              | TCO      | total cost of ownership                  |

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