Muse Multilayer Automation Platform Overview

Maximizing the Value of IP Optical Networks

As a network operator, you are constantly enhancing and expanding your network infrastructure to address growing demands and lay the groundwork for new revenue opportunities that take advantage of technologies such as IP/MPLS and DWDM. The significant challenge lies in effectively utilizing the network to rapidly deploy and activate new services while ensuring optimization, availability, and peak operational efficiency.

The Muse Multilayer Automation Platform offers real-time management of Ribbon IP and optical networks, equipping users and systems with the essential tools to enhance network investment returns. It seamlessly connects with OSS/BSS or advanced orchestrators through northbound interfaces while delivering visibility, topology insights, and alarm notifications for third-party network devices.

Network Operator Operational Challenges:
- Adaptability to manage unforeseen traffic planning and services
- Requirement for market agility in comparison to competitors
- Minimize customer turnover to safeguard the client base and leverage it as a market differentiator

An IP Optical Automation Platform must deliver the following functionality to address these challenges:
- Enhanced automation for increased market speed and minimized human errors in operations
- Proactive management, planning, and support to effectively tackle market uncertainties
- Comprehensive analysis of extensive data from the network to provide valuable business insights
- Utilization of AI as a supportive tool for troubleshooting and operational assistance
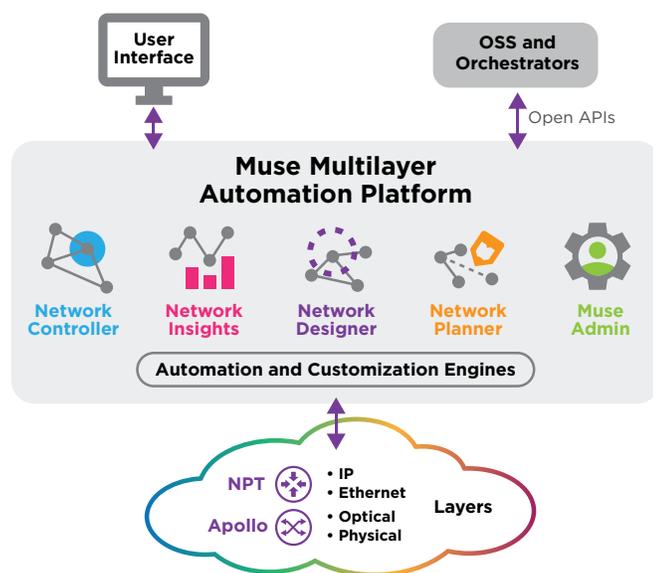

Figure 1: Muse Multilayer Automation Platform Overview

The Muse Multilayer Automation Platform is designed for IP optical transport and service lifecycle management to address network operator's operational challenges in a seamless manner. It provides ongoing capabilities in design, fulfillment, assurance, and maintenance of networks, services, and functions by taking advantage of templates and policies. Leveraging a SDN architecture, Muse effectively streamlines operational processes, enhances response times, and boosts resource efficiency while broadening the range of available services.

Furthermore, it addresses various network architectures that integrate IP and optical technologies, operating them as a unified end-to-end network, regardless of whether dedicated IP/DWDM transport or IPoDWDM connectivity is used.

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The platform accelerates service creation and provisioning while ensuring compliance with SLA commitments and swiftly reconfiguring the network in the event of failures. Furthermore, the platform simplifies network operations, optimizing capital expenditures and lowering costs. To achieve this, Muse aligns network planning with equipment commissioning, consistently analyzes and optimizes network resource usage, and proactively mitigates failures before they arise or quickly contains them when they occur.

Muse Applications

Muse equips network operators with a comprehensive suite of tools for planning, designing, and orchestrating network services, encompassing both packet and optical connectivity. Muse propels network operators into the future, leading to a substantial decrease in the complexity and workload associated with routine manual tasks and operations.

Muse is a modular suite of applications designed to maximize network performance, enabling quick creation and activation of new services while ensuring optimal availability and efficiency. Built on a robust carrier-grade, container-based software platform, Muse offers real-time management of a programmable network infrastructure and automates the lifecycle of service and network operations.

Leverage the Muse Multilayer application platform to efficiently manage and orchestrate both IP and optical networks, catering to diverse connectivity service types. Muse applications encompass the entire lifecycle of connectivity services, including design, implementation, assurance, and ongoing maintenance. The solution integrates automation and intelligence, enabling streamlined provisioning, migration, upgrades, and maintenance processes achieved through the analysis of telemetry data, inventory management, customer insights, as well as traffic balancing and optimization capabilities. Muse decreases daily operational complexity by streamlining the outdated user interfaces of legacy management systems, thereby reducing the time required for routine task completion. Furthermore, Muse enhances network resource efficiency, preventing traffic bottlenecks and facilitating early identification of SLA performance issues.

The Muse application suite provides significant advantages specifically tailored for mobile backhaul and business connectivity services, such as MPLS VPN. These features enhance the reliability and efficiency of data transmission, ensuring seamless connectivity for enterprises. Additionally, the suite is well-suited for optical long-haul services, optimizing performance over extended distances while maintaining high bandwidth and low latency. This dual focus not only improves operational capabilities but also supports advanced networking solutions in an increasingly data-driven environment.

Most network operators are exploring how to leverage AI in their daily operations. Muse delivers this capability via the Muse Agent which is an AI-driven tool that enhances network operations by facilitating natural language interactions with Muse applications. It allows network operations staff to ask questions and obtain insights, improving the intuitiveness and efficiency of network management. By utilizing Muse documentation, the Muse Agent assists with various operational tasks and enables users to request specific actions and configurations, thereby streamlining processes and boosting productivity. This user-friendly approach simplifies network management, empowering users to manage their networks confidently.

Muse Unique Value Propositions (UVP)

Muse provides unparalleled benefits in key areas crucial for network operators. This section outlines several of these unique value propositions:

Multi-Layer Topology

Muse offers a multi-layer topology user interface that allows network operators to visualize and correlate connectivity across both IP and optical layers, enhancing end-to-end network visibility.

This multi-layer view delivers significant value to network operators by providing a comprehensive understanding of the network, thereby boosting your NOC's efficiency through quicker insights into traffic flows, connectivity status, and the root causes of failures.
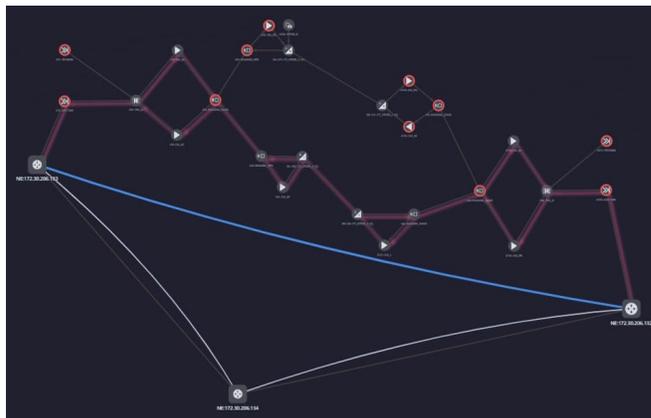
Figure 2: Muse Multilayer Topology
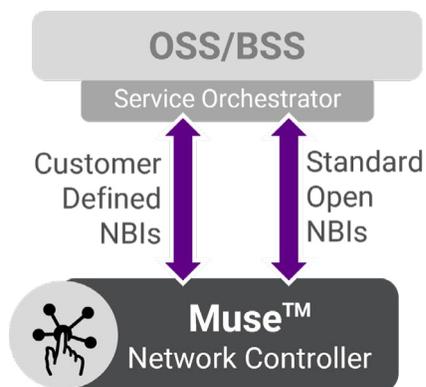
Figure 3: Flexible Northbound Interface

Flexible Northbound Interfaces

Incorporate the Muse Network Controller into your OSS/BSS ecosystem to achieve comprehensive automation. You have the option to utilize standard open northbound interfaces or create tailored interfaces that align with your current environment. These adaptable northbound interfaces deliver significant customer benefits; a unified OSS/BSS ecosystem minimizes operational expenses by automating end-to-end provisioning and significantly enhances the time-to-market for new services.

Cloud-Native Deployment

Muse applications operate on a secure, microservice-oriented virtualized framework that is designed for carrier-grade performance. This infrastructure ensures high availability and geo-redundancy, making it suitable for large-scale networks.

Cloud-native deployment delivers significant customer benefits by guaranteeing the performance and security of network applications while lowering the complexity involved in software maintenance.

Figure 4: Cloud-Native Deployment

Advanced Workflow Automations

Workflows allow for the execution of a series of tasks and processes within the network in a specified order. Users can establish triggers and schedules to initiate the execution of these workflows.

Automated workflows deliver significant value to network operators by reducing human errors and lowering operational expenditures (opex) through the automation of Network Operations Center (NOC) functions, including troubleshooting, maintenance tasks, and large-scale operations.
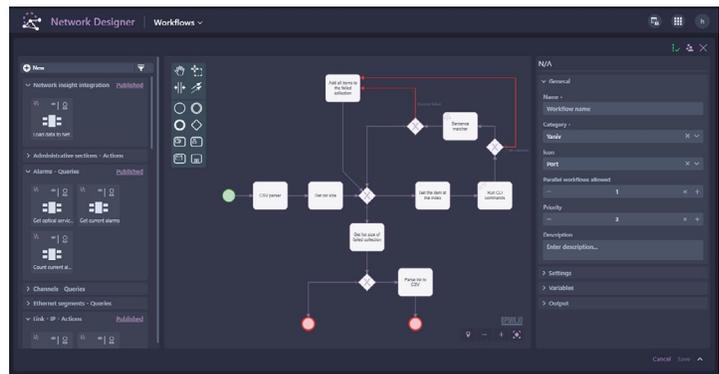
Figure 5: Advanced Workflow Automations
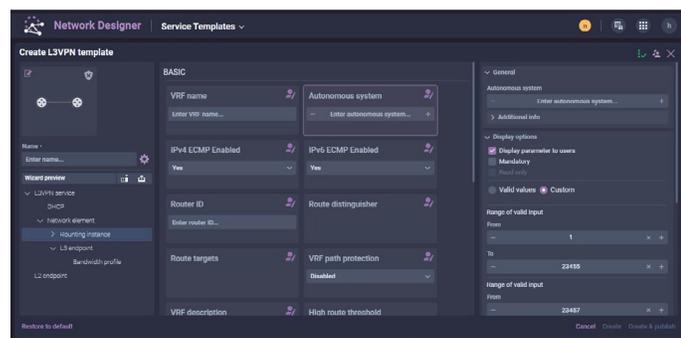
Figure 6: Provisioning Service Templates

Intent-Based Provisioning

Intent-based provisioning facilitates the efficient and targeted development of service templates, allowing for the clear definition of standard service configurations, key performance indicators (KPIs), topology limitations, and assurance techniques.

This delivers significant operational benefits, enabling network operators to rapidly launch new services by only needing essential service parameters. This approach shortens the time-to-market for new offerings and helps minimize human errors.

Closed Loop Automation

Closed loop automation facilitates the automatic validation of service KPIs through established assurance tests. Additionally, it allows for self-healing in the event of SLA breaches by recalculating service paths across multiple layers.

Closed loop automation delivers clear customer benefits by boosting revenues through the sale of performance-assured services and lowering operational expenses by automatically and proactively addressing network challenges.
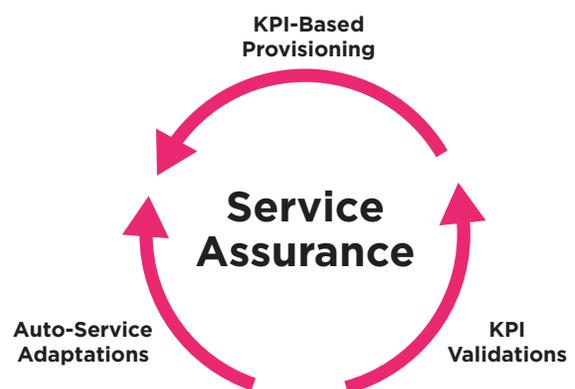
KPI-Based Provisioning

Service Assurance

Auto-Service Adaptations

KPI Validations

Figure 7: Closed Loop Automation

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Insights and Analytics

Advanced analytical insights and capabilities are powered by an innovative Business Intelligence (BI) engine that evaluates both physical and logical inventory, performance, utilization, and various key performance indicators. Users can export analytics reports, identify network trends, and integrate data into automation systems.

These insights and analytics tools offer clear value to network operators by allowing for more effective use of your capital expenditures. They help identify network challenges, provide solutions to business inquiries, and enhance the efficiency of your Network Operations Center.
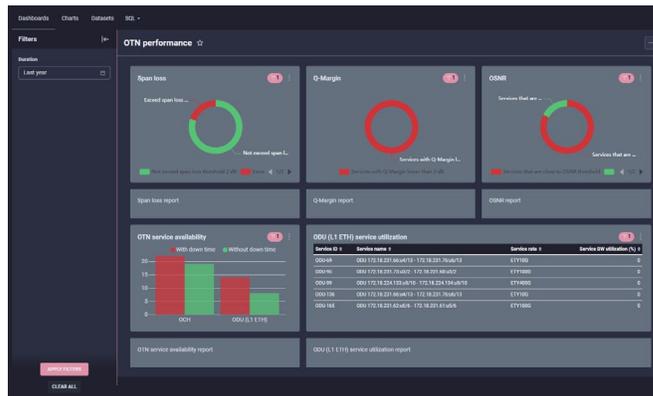
Figure 8: Insights and Analytics

Intuitive Web UI

Muse delivers a cohesive, user-friendly, and adaptable interface that facilitates commissioning, provisioning, troubleshooting, and maintenance tasks. This design offers both flexibility and sophisticated automation features.

The user-friendly web interface presents clear benefits to customers by minimizing management complexities and enhancing time-to-market. It streamlines training for NOC engineers and simplifies their daily operations.
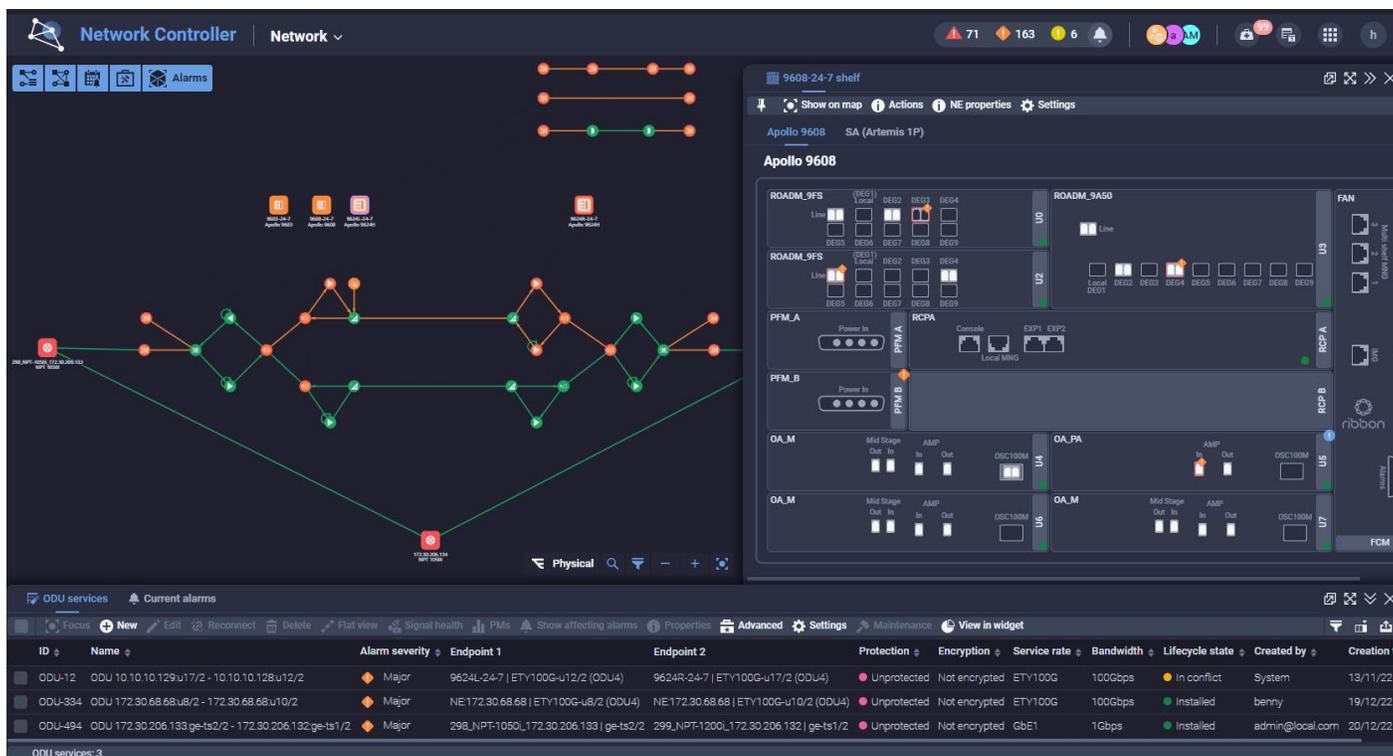

Figure 9: Muse Network Controller Intuitive Web UI

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Network Planner

Muse Network Planner is a sophisticated tool designed for network planning, allowing users to design and simulate transport networks using advanced multi-layer algorithms. This leads to highly optimized topologies, service paths, and equipment allocation in terms of cost efficiency.
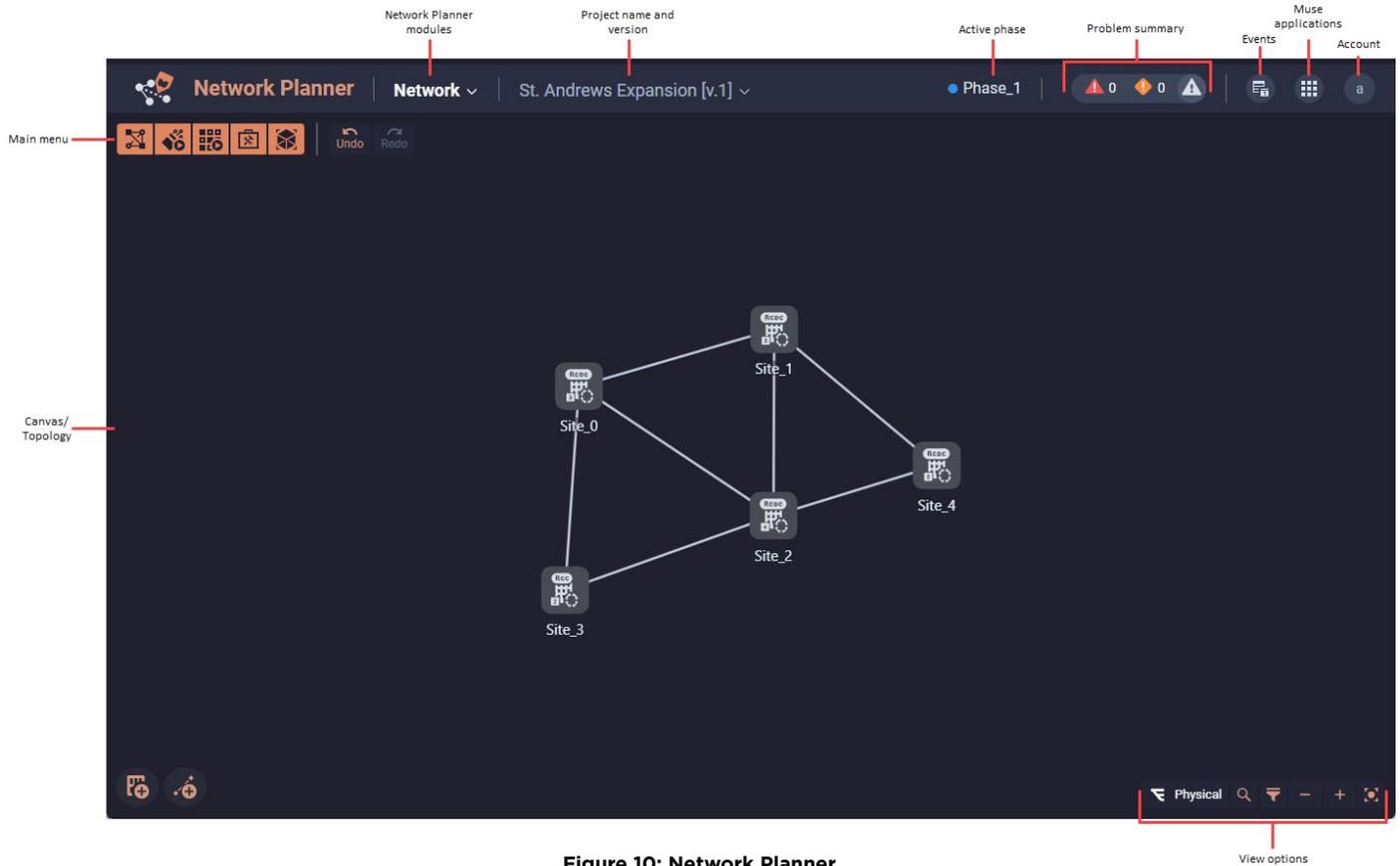

Figure 10: Network Planner

Muse Network Planner delivers clear value to network operators by optimizing use of your capital expenditures through strategic network planning, while ensuring the performance of your optical channels with precise optical simulations.

Muse Software Architecture

The software architecture of Muse is based on a modular and comprehensive design that incorporates various logical layers. This approach simplifies the integration of software modules, supporting external sources or APIs, and offering flexible customization for specific use cases. The design principles of Muse recognize the uniqueness of each network solution deployment in real-world scenarios. Therefore, a project-based adaptation utilizing user-defined templates and low-code tools is essential. Muse is compatible with a diverse array of interfaces, ensuring smooth integration and interoperability across the network.

Muse Solution Architecture
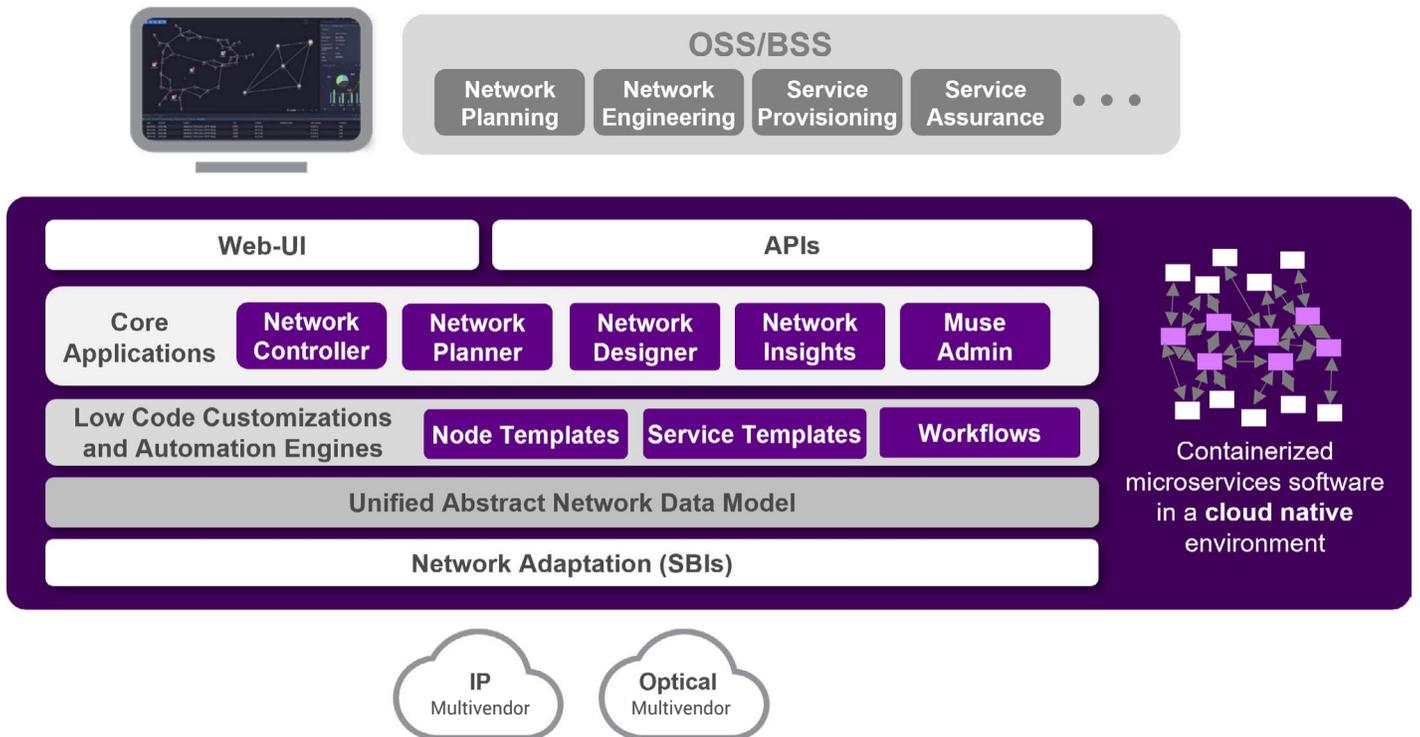
Figure 11: Muse Software Architecture

Muse operates with a wide variety of protocols and information models, providing a modular solution that ensures seamless integration into any necessary network configuration.
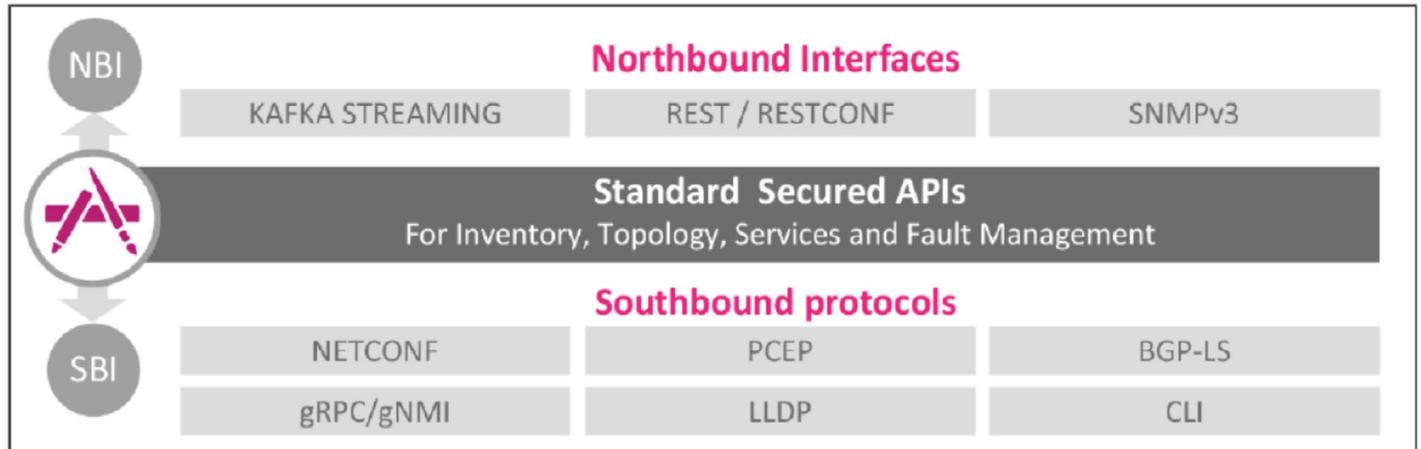
Muse Interfaces

Figure 12: Muse Northbound/Southbound Interfaces

The remainder of this document will outline the essential components of Muse:

Network Controller
Real-time network control system for topology commissioning, service deployment, fault management, maintenance, and automation.

Network Insights
Self-Service Business Intelligence (BI) application for evaluating network inventory, performance, utilization, and various key performance indicators (KPI).

Network Designer
Low-Code UI application for creating service templates, network components, tasks, and automation workflows.

Network Planner
A network planning tool for designing and optimizing topology, optical services, and equipment allocation, with the capability to export all necessary reports.

Muse Administration
Management of the complete Muse applications suite, encompassing user administration, authentication and authorization processes, licensing, system performance monitoring, and additional functionalities.

Network Controller: Overview and Highlights

Muse's Network Controller facilitates comprehensive management of networks and services. It employs an effective multi-layer strategy that ranges from the foundational hardware topology to the upper layers responsible for service provisioning. The Network Controller effectively manages networks leveraging both optical and IP technologies, as well as hybrid architectures that incorporate elements of both.

Muse automatically detects network topology using discovery protocols like BGP-LS, LLDP, and LLDP Snooping, alongside the automatic identification of optical network components. The multilayer displays allow users to concentrate on specific segments, such as the IP/MPLS or Ethernet layers, or focus on individual optical technology layers. Additionally, you can visualize the connections across different technology layers.

Links, trails, and tunnels are configured automatically according to network service needs and established network policies. Muse effectively highlights any topological changes within the network on an intuitive topology map. Users have the flexibility to arrange and adjust the display of this topology in a way that aligns with your specific network requirements. The topology map prominently features logical elements, with distinct icons representing various technologies along with indications of the scale of each network object. Site indicators provide a concise summary of site specifications and capabilities, allowing for an immediate overview of vital information. Network objects can be categorized into logical topology groups to enhance clarity in the network display.

The integration of technology layers results in a seamless representation of all aspects of the network; users can filter the display map and toggle between links across different layers, allowing them to concentrate on key areas within the network. Additionally, users can access a shelf view for detailed insights into inventory, properties, and alarms related to specific platforms.

Multilayer Network and Service Provisioning

To address the diverse and growing demands of end users, Muse integrates the development of multilayer network slices with the delivery of services customized to operate on these slices. Network operators have the flexibility to define distinct performance, and availability guarantees for each slice and service individually while optimizing overall throughput across a shared network that accommodates a complex array of slices and services.

Off the shelf service templates can be applied to specific customers, slices, or services, with the option to create new templates from the ground up. These templates leverage advanced abstraction capabilities to facilitate a broad spectrum of "connectivity configurations," incorporating various performance and reliability parameters along with real-time management of underlying network resources for provisioning purposes. Create, read, update and delete (CRUD) controls are readily accessible, allowing for updates and modifications to slices and services as needed in response to changing customer requirements.
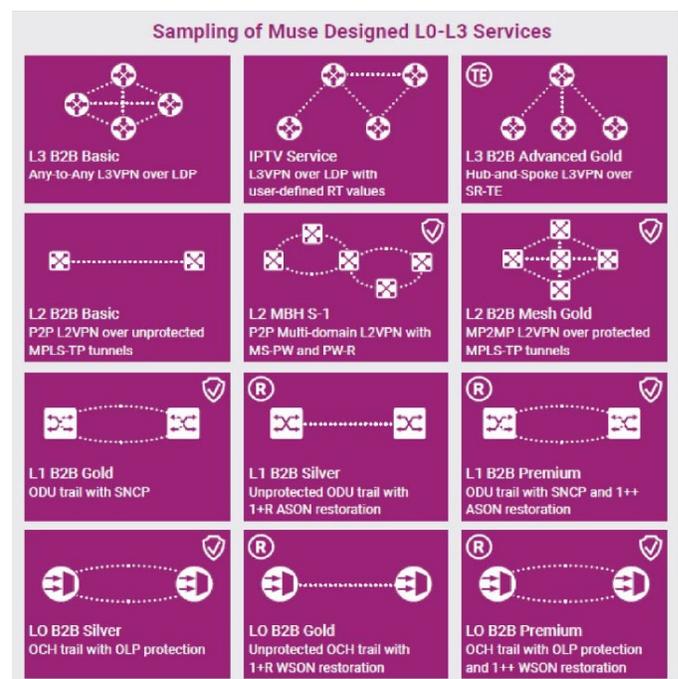

Figure 13: Service Provisioning Templates

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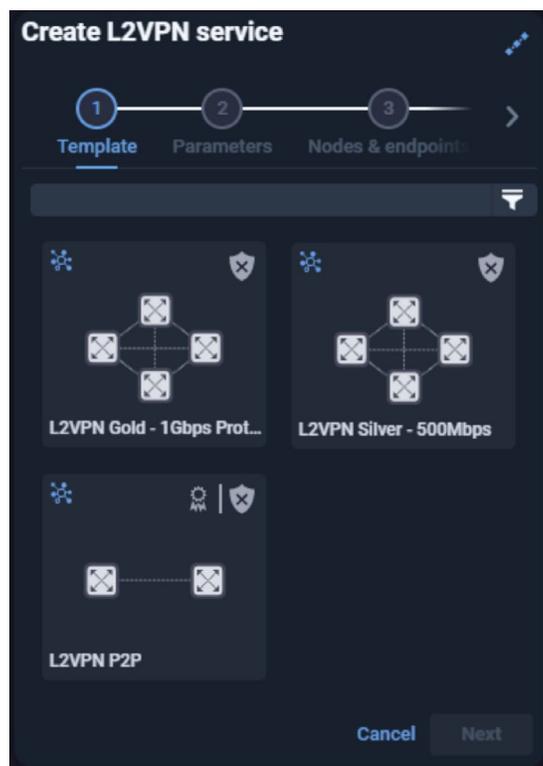## Service Templates Architecture/Service Templates Designer

Figure 14: Service Template examples

A service catalog serves as a detailed inventory of all services offered by the network operator; streamlining the management and delivery of those services. Service templates are essential components of this catalog, as they improve time-to-market and reduce human errors by utilizing predefined service parameters and default values. These templates include a variety of parameter categories:

- Global Parameters such as topology, protection, and scale, which define the overarching structure and resilience of the service

- End-Points Parameters include interface roles, VLANs, and optical channels, which specify the connectivity and configuration details at the service endpoints

- Rates and Bandwidth parameters like bandwidth and QoS profiles, and OTN rates, which determine the service's performance and quality

- Path Computation parameters, which involve path metrics like latency and number of hops, and criteria for including or excluding administrative sections, ensuring optimal route selection

- SLA and Assurance parameters, which set KPI thresholds and schedules for assurance tests, guarantees the service meets agreed-upon performance standards

By clearly outlining these parameters, service catalogs enhance the provisioning process, guaranteeing uniformity and dependability in the delivery of services.

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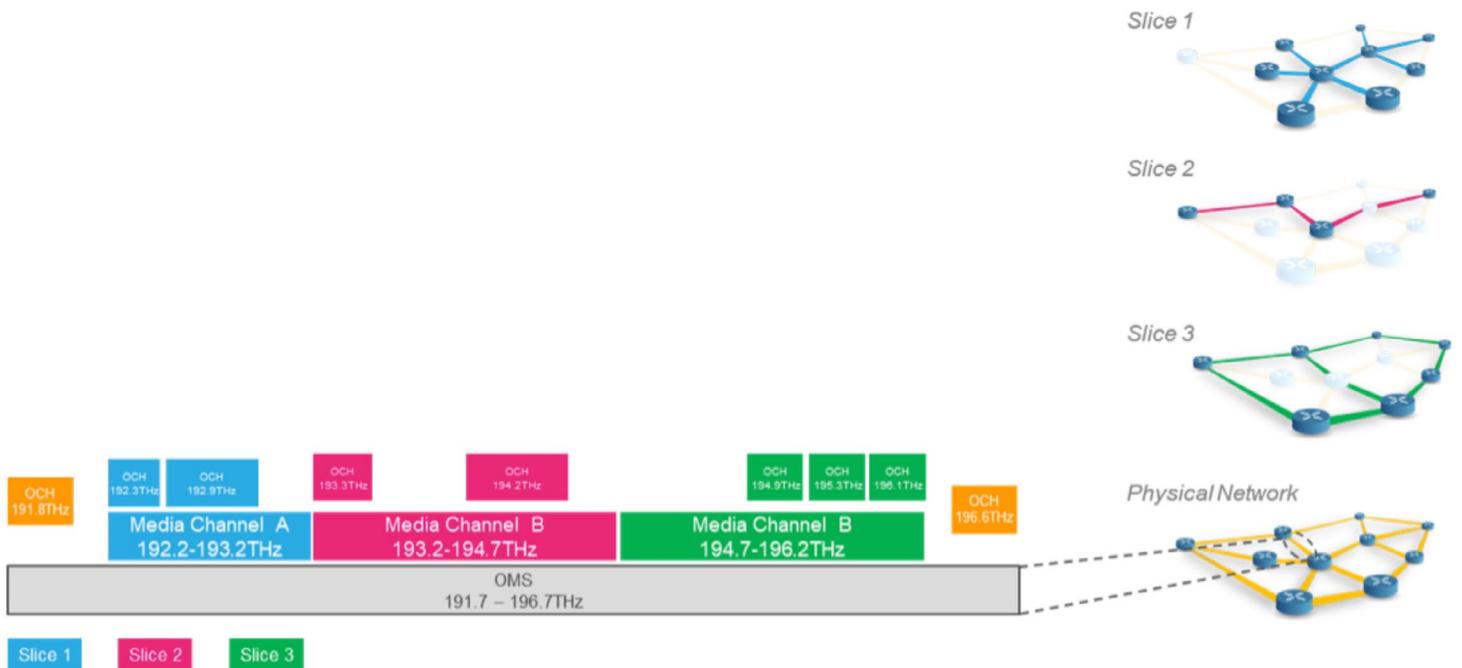## Spectrum Sharing - Slicing and Multi-Tenancy

Figure 15: Spectrum Sharing examples

Dividing a single optical network into multiple logical networks, referred to as network slicing, allows for the customization of services according to distinct operator requirements while sharing the underlying infrastructure. Each logical network— or slice—acquires a dedicated portion of the Optical Multiplex Section (OMS) spectrum, facilitating diverse topologies that meet specific operational and performance needs. In this model, different tenants or operators can allocate resources tailored to their individual demands without impacting other slices. This segmentation empowers each tenant to provision bandwidth, manage resources efficiently, and monitor performance metrics independently, ensuring that tailored services can coexist seamlessly within the same physical framework. Such an approach not only enhances operational efficiency but also maximizes resource utility in shared optical networks while maintaining the necessary isolation and control for each operator's unique applications.

Network Health and Maintenance

Muse Signal Health offers thorough monitoring, detailed reporting, trend analysis, and troubleshooting services. It keeps a complete archive of all collected data, presenting visual insights into optical impairments. With advanced OTDR functionalities, Muse Fiber Health identifies trends by contrasting current data with historical records. Additionally, it seamlessly integrates with GIS systems to display events on a geographical map, including information about ducts and manholes to ensure precise dispatch of repair teams.
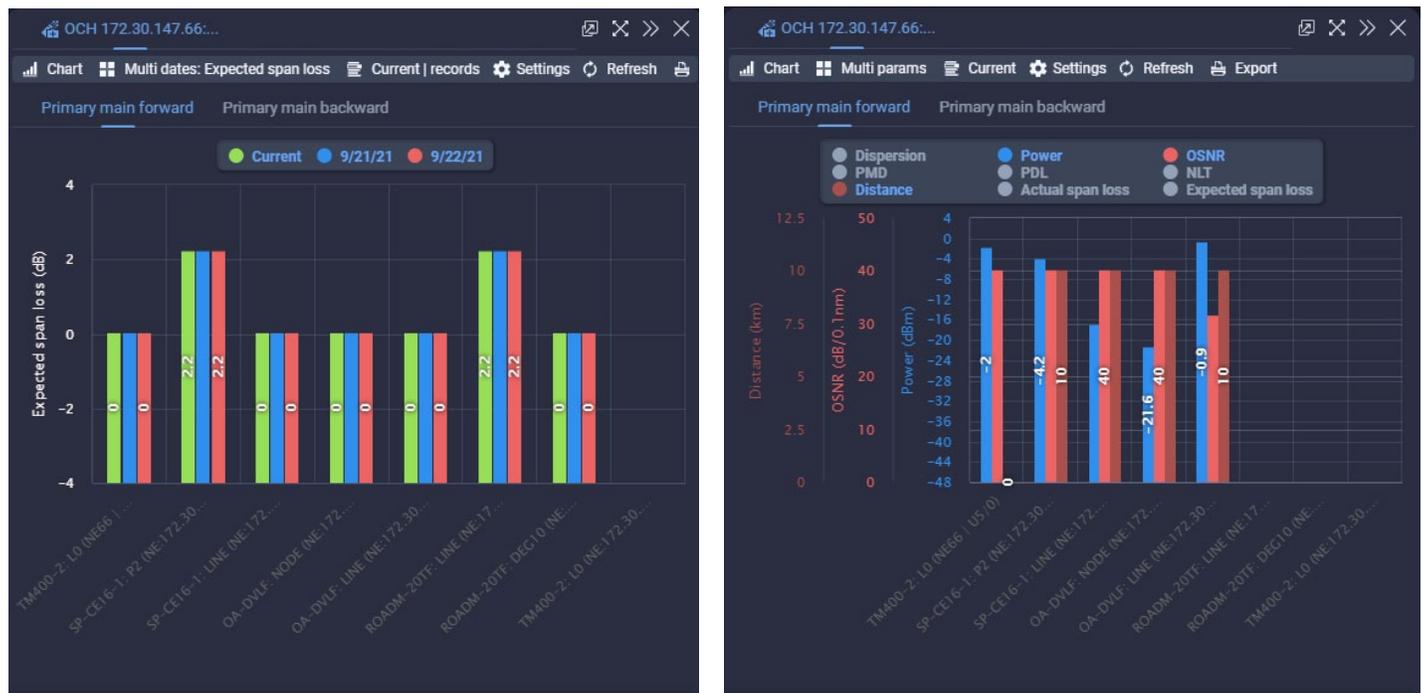
Figure 16: Network Health examples

Alarm Correlation – Root Cause Analysis
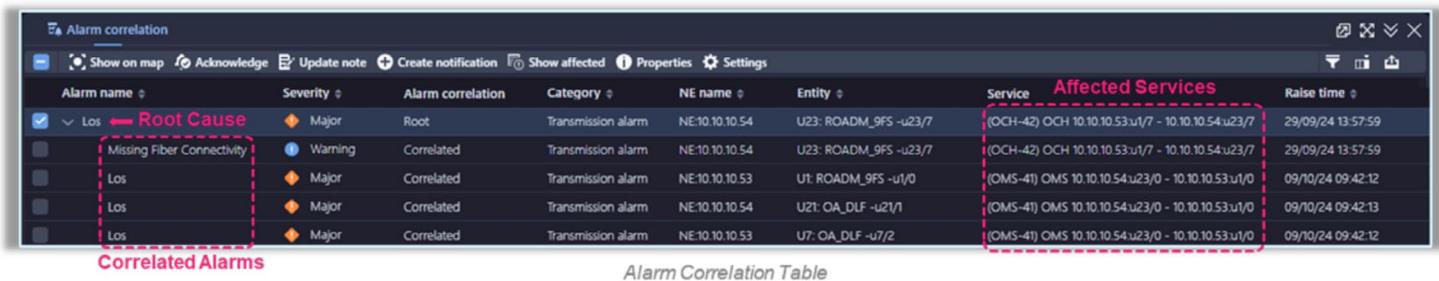

Alarm Correlation Table

Figure 17: Alarm correlation example

To alleviate the operational load on NOC operators, Muse implements automated alarm correlation and root cause analysis mechanisms. It prioritizes actionable alarms by identifying the primary fault—such as the initial Loss of Signal (LOS) event in a cascading failure chain—thereby suppressing derivative or symptomatic alarms. The platform leverages topology-aware analytics and correlation tables to isolate root causes, including hardware malfunctions and link-level failures that propagate service disruptions. This enables operators to focus remediation efforts on the originating fault, significantly reducing mean time to resolution (MTTR) and improving network stability.

Network Insights: Overview & Highlights

Service Assurance, Insights and Analytics

Muse offers a sophisticated business intelligence engine that monitors the network continuously, ensuring that irregular conditions do not disrupt services. This capability enhances capital expenditure utilization and delivers insights that boost the efficiency of the Network Operations Center (NOC).

Muse monitors both physical and logical inventory, performance, utilization, and various key performance indicators (KPIs) in real time while also analyzing historical trends. This allows for the early detection and resolution of issues before they disrupt services. It generates analytical reports for human review and supplies data to automation systems that proactively modify network configurations to optimize performance and efficiency. Additionally, Muse collaborates with network-based service restoration strategies to prioritize services that have stringent availability service level agreements (SLAs).
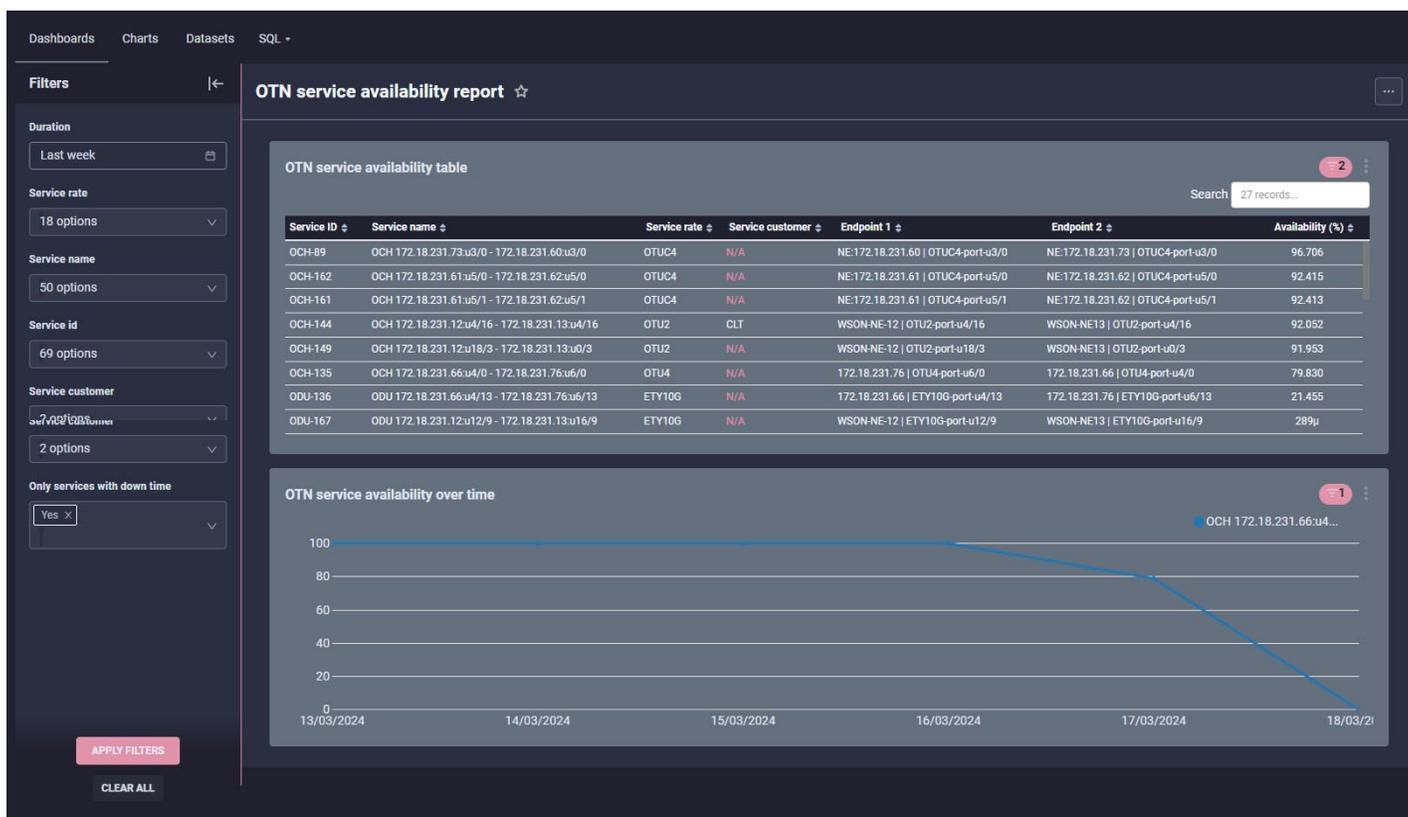
Figure 18: OTN Service Availability Report

Pre-defined and user-defined BI reports and dashboards provide detailed insights into network performance and inventory management. These reports can be created on demand, set to run on a schedule, or accessed through a REST API, offering flexible opportunities for analyzing both physical and logical IP and Optical inventory. Critical metrics encompass utilization trends, peak usage, OSNR reports, span-loss data, and protection status indicators. Inventory tracking is enhanced with historical change records and availability reports, while users receive alerts when thresholds or KPIs are exceeded. Furthermore, automatic synchronization with the Network Controller guarantees that the information remains current and precise.

Physical Inventory
- NEs, Cards, Ports
- Sites, Links, Admin-Sections
- Configurations, Power, Part-Numbers
- Installation/Removal Dates
- And More…

OTN Logical Inventory
- OMS, OCH, ODU
- CRUD Dates
- EPs, Links and NEs Info
- Path and Spectrum Info
- Utilization Info
- And More..

IP/MPLS Logical Inventory
- L3VPNs, L2VPNs, EVPNs
- CRUD Dates
- EPs and NEs Info
- MPLS-TP tunnels Info

Network Alarms
- Network and Services Alarms
- Clear and Raise time
- Affected objects

OTN Services Performance
- Data-Sets for 15M and 24H
- OCH and ODU Services
- Latency (us), Availability (%)
- Clients Up/Down Time and Utilization
- And More..

IP Services Performance
- Data-Sets for 15M and 24H
- Ports Availability (%)
- Ports Utilization (Gbps)

Figure 19: Network Insights Pre-Defined Data-Sets

Pre-Defined vs. Self-Service Capabilities

Pre-Defined: Users have the ability to access pre-defined dashboards and reports derived from purchased data sets. They can generate reports on demand, set them to run according to a specific schedule, or utilize NBI for reporting. Please be aware that both scheduling and NBI functionalities require additional licenses. These dashboards ensure users have access to the most current information for thorough analysis.

Self-Service: Users can develop custom report templates and dashboards from their purchased data sets by utilizing low-code UI tools that do not necessitate SQL expertise. For more intricate customization options, users may leverage SQL Lab to create their own data sets from all available data in the DWH, which does require proficiency in SQL query writing. Furthermore, users can enrich the DWH by using the Workflow Engine, which also requires knowledge of SQL queries along with obtaining appropriate Workflow Engine licenses and tokens.

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Figure 20: Physical Inventory report example

Network Designer: Overview & Highlights

Network Designer applications offer a user-friendly interface for low-code enhancements to Muse. Users can craft and develop custom service templates, automation tasks, workflows, and even models of network elements. Once published, these designs become accessible in the Network Controller for provisioning and execution.

Utilizing the Node Designer allows network operators to customize daily network operations according to your specific requirements and boost operational efficiency by establishing an optimal balance between automation and flexibility.

Practical Automation

Muse enables network operators to implement automation at their own pace, ranging from human-led initiatives to fully closed-loop systems. Through workflow automation, a series of tasks and processes can be executed within the network following a specified sequence. Operators are empowered to set triggers and schedules that initiate the workflow. This approach minimizes human errors and lowers operational expenditures by automating Network Operations Center (NOC) functions such as troubleshooting, routine maintenance, and bulk operations. A prime example of closed-loop automation builds on service provisioning by utilizing a populated service template that automatically verifies the service's Key Performance Indicators (KPIs) using established assurance tests prior to activation. This not only increases revenue by supporting the sales of services with performance guarantees but also accelerates time-to-market.

Low-Code Approach – Automation
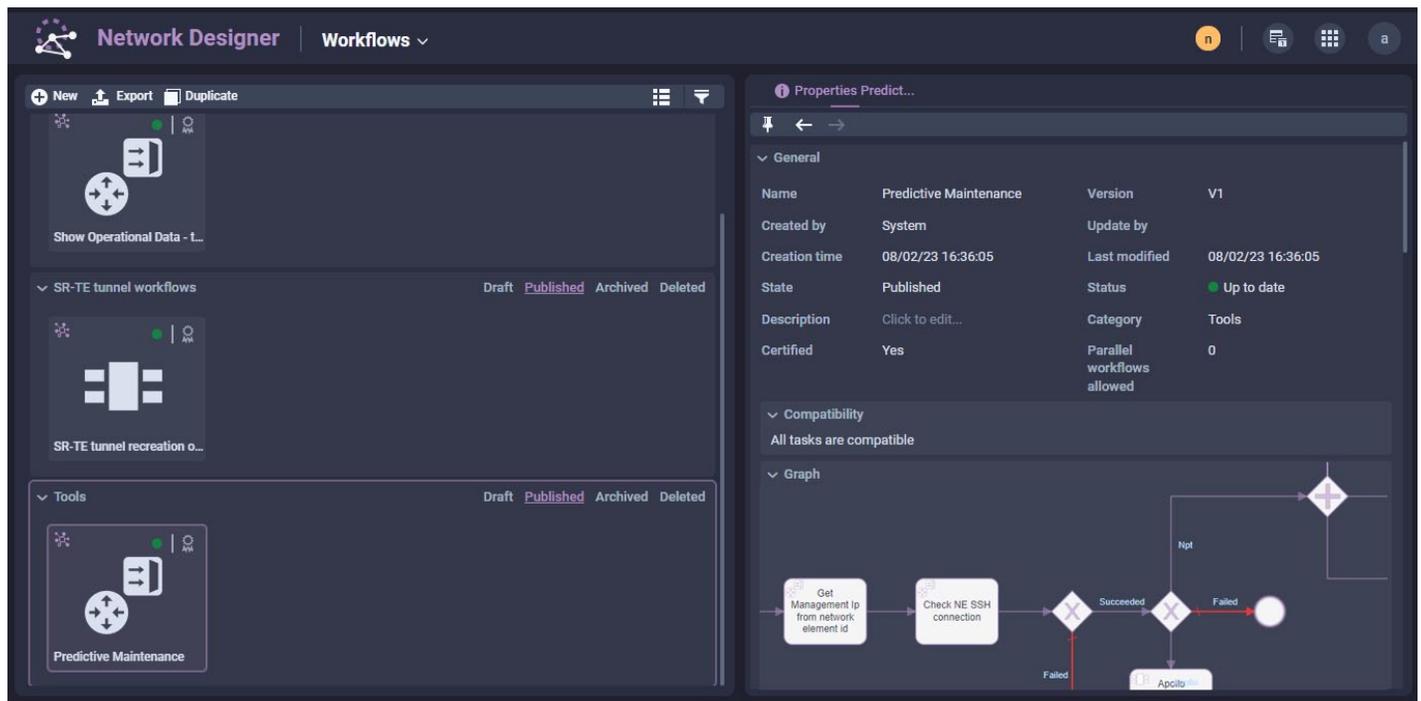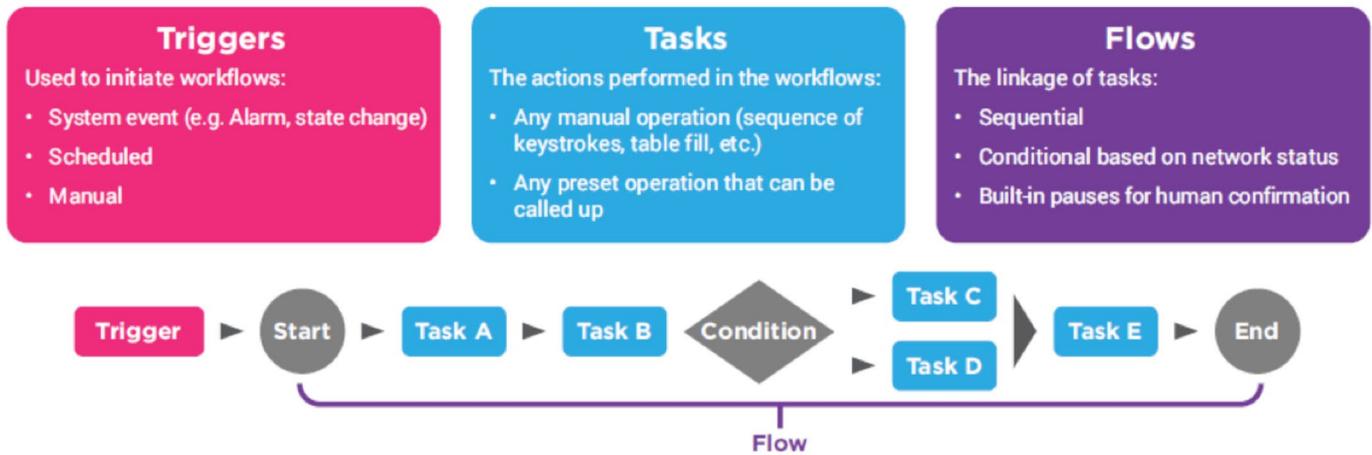
Figure 21: Workflows examples

Muse's low-code workflow automation empowers network operators to adopt automation at a comfortable speed. As shown in Figure 3, operators have a wide range of options for establishing execution triggers, outlining tasks, and overseeing workflows. Any operational procedure can be transformed into an automated workflow. Importantly, these workflows can be thoroughly tested prior to activation, giving operators peace of mind regarding their functionality. This confidence can be reinforced by adding pauses for confirmation initially; however, as users become more accustomed to the system and develop trust in its reliability, these pauses may eventually be removed.

Muse Closed Loop Automation
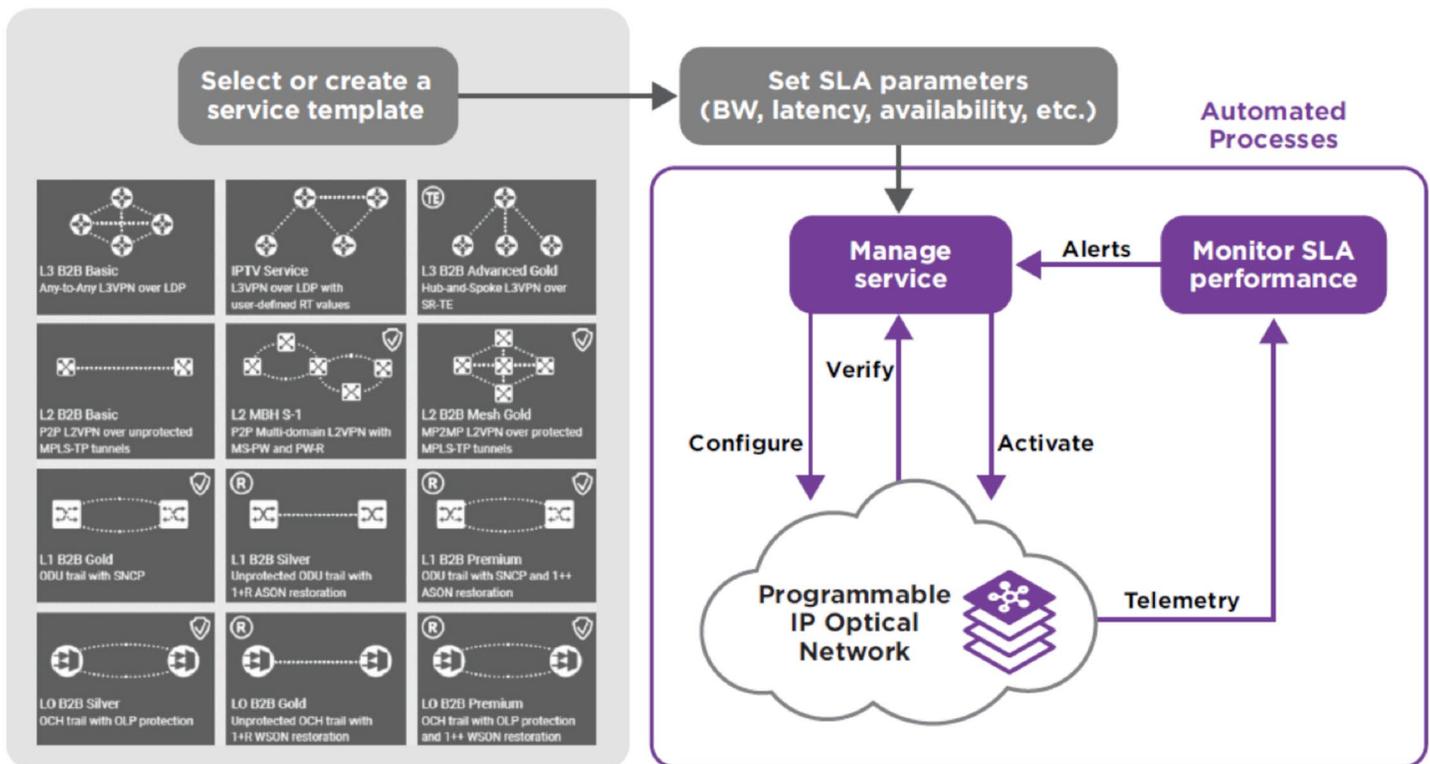
Figure 22: Closed Loop Automation

Service provisioning is a key operations process that effectively transforms network capabilities into tangible customer value. By automating this process, network providers can increase revenue, boost customer satisfaction, and reduce costs. As demonstrated above, Muse is capable of establishing a fully automated closed-loop service provisioning system.

The journey begins with service definition. A network operator or an end-customer accessing a portal selects a service template and fills it in with performance parameters that define the Service Level Agreement (SLA). While this initial step remains manual, Muse's low-code tools facilitate the creation of new templates or adjustments to existing ones.

In the following stages, network operators combine Muse low-code automated workflows to create a closed-loop service provisioning process tailored to their specific operational environment.

1. **Network configuration** – Muse identifies and allocates the necessary network resources to support the service.

2. **Service activation** – Muse activates the service.

3. **Service verification** – Muse validates that the service complies with its SLA by employing either pre-defined or customer-adapted assurance tests.

4. **Service Monitoring** – Muse continuously monitors the service performance against its SLA. Should any parameter deviate from the defined criteria, an alert is issued, or Muse attempts to rectify the issue autonomously if feasible.
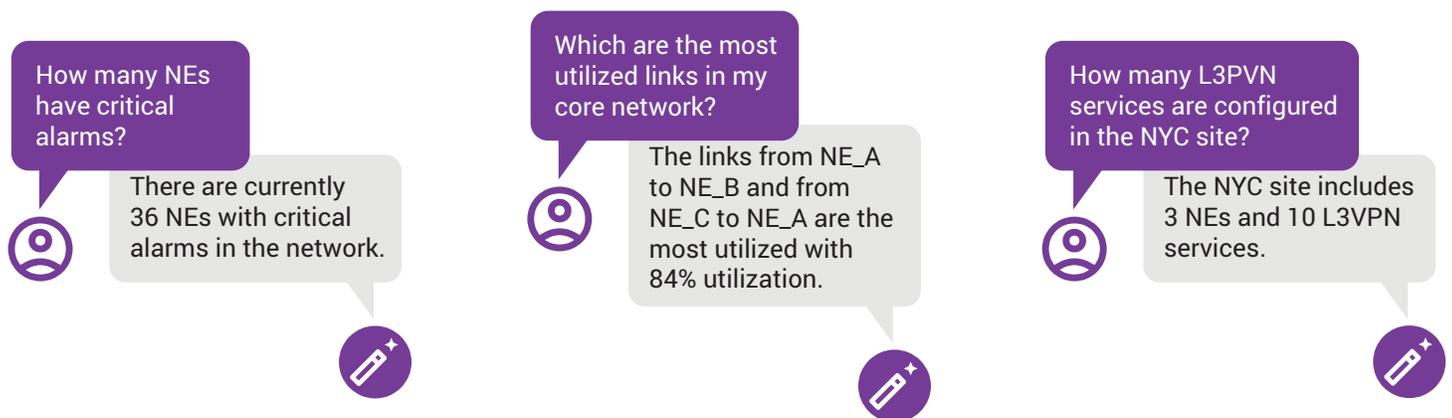
Muse AI Agent

Figure 25: Muse AI Agent examples

The Muse Agent based on AI transforms network operations by enabling natural language interactions with Muse applications. This innovative tool allows network ops staff to ask questions and receive valuable insights and suggestions, making network management more intuitive and efficient. By leveraging Muse documentation, the Muse Agent helps with various operational actions, ensuring users have the support they need to navigate complex tasks. Additionally, users can request the Muse Agent to perform specific actions and network configurations, streamlining processes and enhancing productivity. This natural way of operating networks simplifies tasks and empowers users to manage their networks with ease and confidence.

When interacting with the Muse Agent, users can ask AI tool a variety of insightful questions to optimize their network operations. For instance, they might inquire, "How many Network Elements (NEs) have critical alarms?" to quickly identify and address urgent issues. Another useful question could be, "Which are the most utilized links in my core network?" to understand traffic patterns and manage network load effectively. Additionally, users can ask, "How many L3PVN services are configured in the NYC site?" to get a detailed overview of service configurations at a specific location. These questions help users gain valuable insights, streamline network management, and ensure optimal performance.

Planning and Design Teams benefit from effortlessly accessing network utilization and availability data, enabling them to quickly obtain detailed insights into how the network is being used and its current availability status. They can also retrieve comprehensive information on network services, making it easier to gather details about the various services running in the network.

Operators experience a significant time reduction is required for NOC operations, simplifying tasks, while enabling NOC experts to have more time for more complex activities. This streamlines the process of identifying and resolving network issues, saving time in troubleshooting and leading to faster issue resolution. Additionally, it helps prevent human errors in network status interpretation, reducing the likelihood of mistakes when assessing the network's condition.

Sales and Marketing Teams can easily access customer services and their status, quickly obtaining information about the services customers are using and their current status. This capability assists in discovering where new services can be marketed and sold to customers while identifying additional opportunities for growth and customer engagement.

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Network Planner: Overview & Highlights
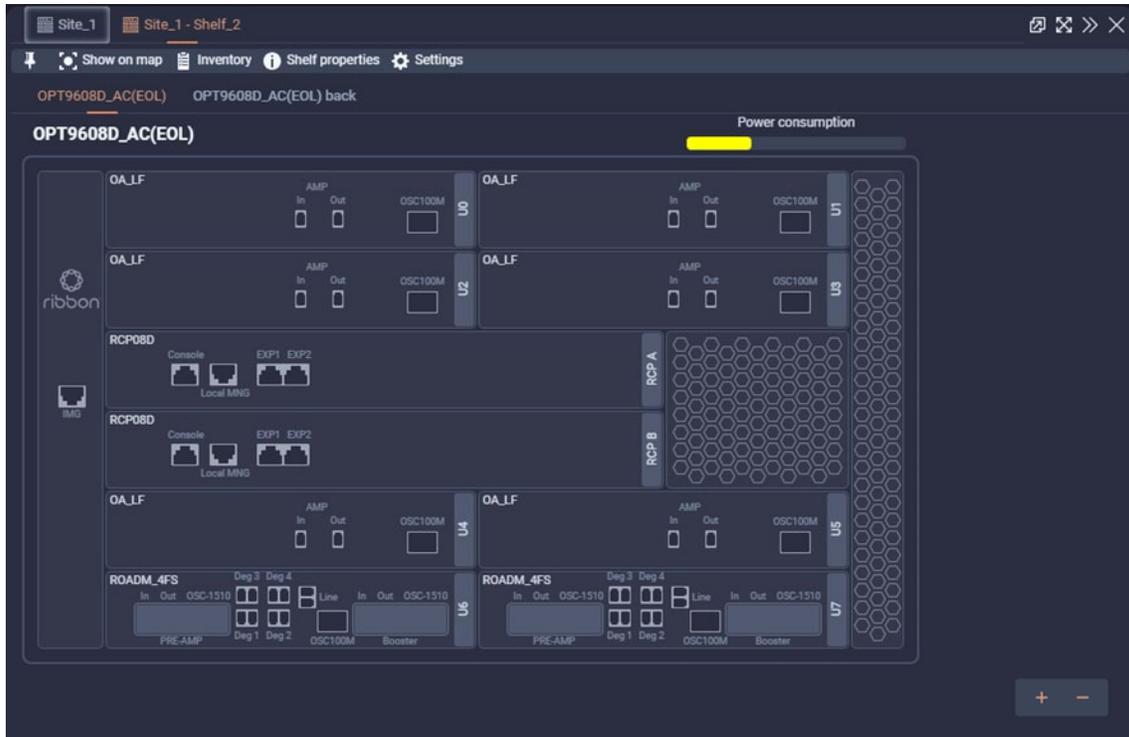
Figure 26: Network Planner equipment configuration
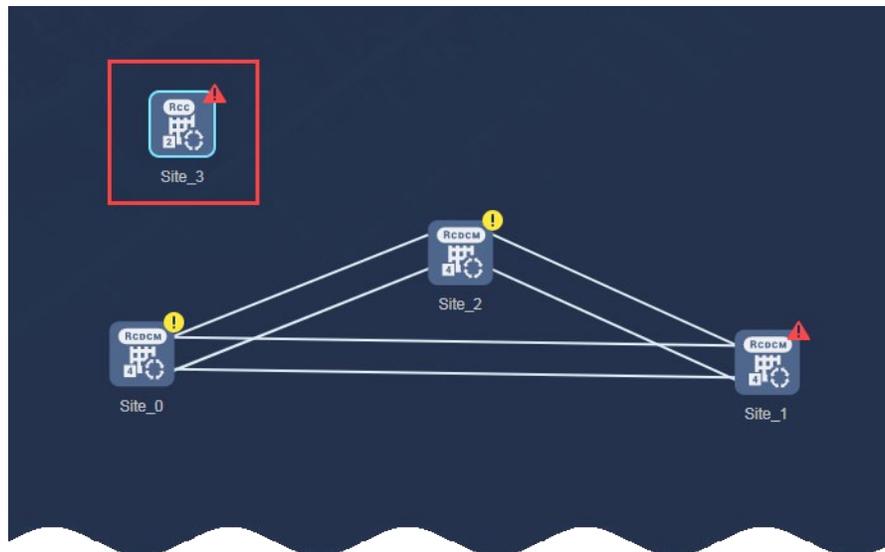
Figure 27: Network Planner site planning
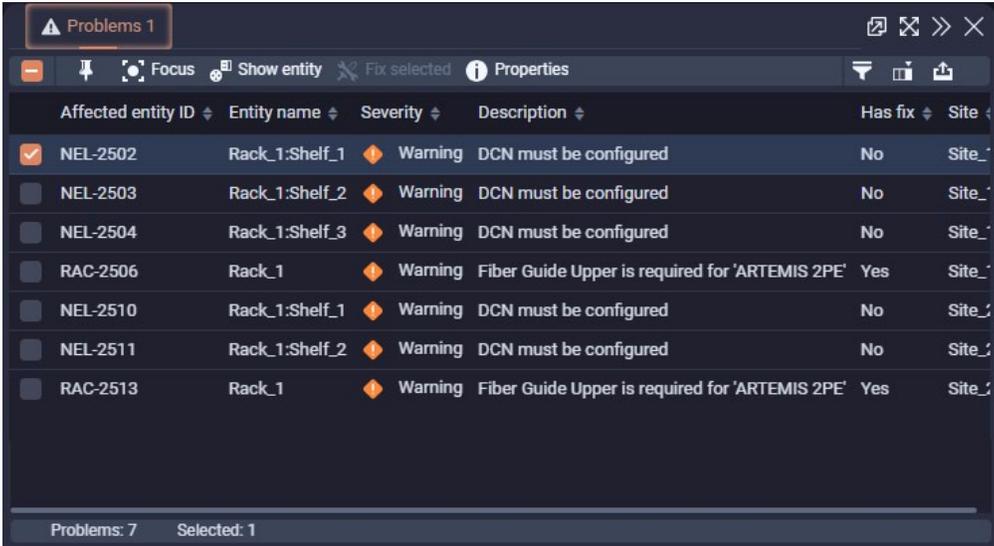
The Muse Network Planner is a sophisticated tool for network planning that allows network operators to design, construct, and simulate optical and packet networks. Users can create their network and its services offline, later transferring your designs to online network controller applications using Muse's internal APIs. Your network is commissioned and provisioned in line with your specifications. With Network Planner, users can assess information about their network topology and route requirements to effectively plan routes, paths, configurations, and resource allocations. Additionally, the tool enables users to produce reports based on the planned configuration, which includes inventory details, topology insights, and optical simulation findings.

Network Planner provides comprehensive support for both optical and packet network planning, enhancing L0-L3 topologies and services. It features capabilities for simulating network growth and failures, along with deployment to operational networks. Additionally, Network Planner enables multilayer planning, optical simulations, and effective management of service demands and restorations, including APIs for integration with other applications.

Muse Network Planner includes many of the following capabilities.
  • Network planning
  • Fiber connectivity (cables, SRLG)
  • Traffic planning
  • Service protection and restoration paths
  • BOM and project generation
  • Expansion planning, syncing with the live network for the most accurate plan

Figure 28: Network Planner configuration warnings

Optical site planning
  • Define network sites and fiber properties, including fiber type, length, attenuation, dispersion, etc.
  • Library of site templates for quick configurations, such as multi-degree ROADM, CDC, in-line amplifier, etc.
  • Smart automatic distribution functions, including:
  • Automatic amplifiers assignment based on fiber length
  • Automatic optimized OTDR distribution
  • Automatic DCN configuration

Planning and Commissioning

Muse Network Planner optimizes traffic capacity and network availability while utilizing a minimal set of resources, making it suitable for both greenfield and brownfield networks. For brownfield networks, Muse leverages actual configuration data sourced from the network. Planning begins with a service demand matrix, followed by advanced algorithms that optimize based on user-selected criteria such as cost, latency, and OSNR. Users can also focus on specific sections of the network to scrutinize plans in detail. Simulation testing evaluates design robustness, studying how to address CIR services during failures and allowing for iterative design improvement.

Once the planning and design phases are finalized, Muse generates comprehensive files for site installations and directly downloads configurations to equipment for seamless plug-and-play deployment.
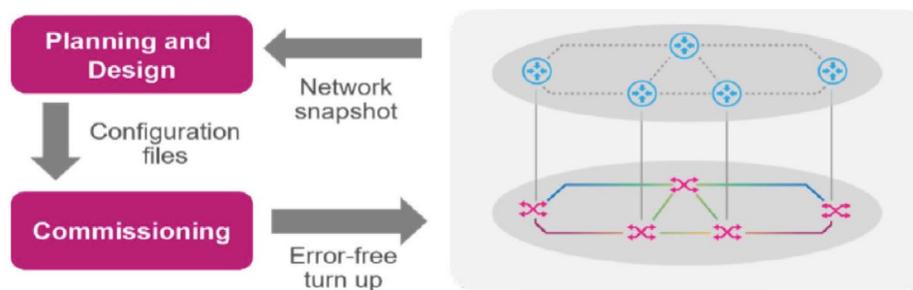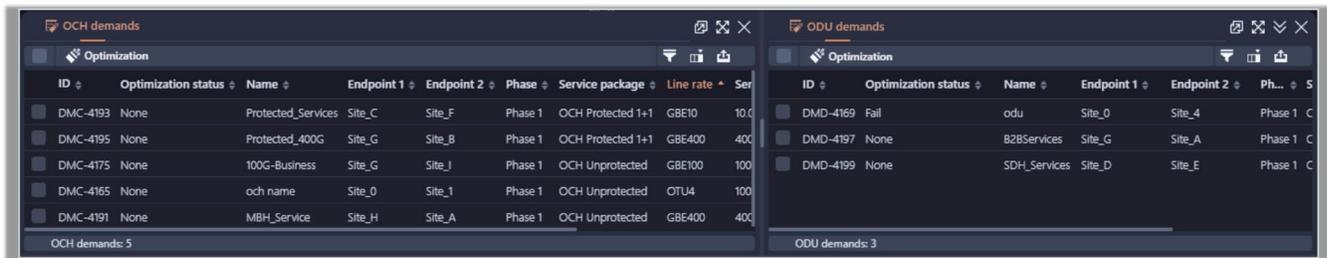

Figure 29: Network Planner Design & Commissioning

MUSE Network Planner delivers the following capabilities:

Topology Planning involves thoroughly designing the connectivity between sites, configuring the necessary equipment, and understanding the characteristics of fiber optics to establish a resilient network infrastructure. It also includes addressing Service Demands and Restorations, focusing on safeguarding and reestablishing optical services to ensure continuous service delivery. By employing optical simulations, planners can assess optical impairments, thereby validating the network's reliability and performance. The use of Advanced Optimization Algorithms during planning helps identify cost-effective solutions while balancing performance with budgetary considerations. Ultimately, transitioning from planning to fulfillment harmonizes these strategies with the operational network, ensuring smooth implementation and efficiency in operations.

Another key function of Muse's Network Planner is Optical Site Planning:

Identifying network sites and fiber characteristics is essential for effective network planning and optimization. This process entails detailing the type of fiber, its length, as well as its attenuation and dispersion properties to guarantee peak performance. Employing site templates facilitates swift and efficient configurations, catering to various site types, including multi-degree ROADM sites, CDCs, and in-line amplifiers. Advanced automatic distribution functions further improve this workflow by seamlessly assigning amplifiers based on fiber length. Additionally, these functions enhance OTDR distribution and adjust DCN settings efficiently. Such automation simplifies network setup, minimizes manual errors, and fosters a strong and efficient network infrastructure.

Network Planner-Traffic Optimization

Figure 30: Network Planner Traffic Optimization example

In the Network Planner, incorporating OCH and ODU traffic demands requires inputting several parameters, including endpoints, rates, protection strategies, and restoration alternatives. The planning algorithm subsequently evaluates the network to produce an optimized design, identifying service paths, allocating wavelengths, aggregating ODU-XC, and setting aside resources for restoration. Upon finalizing the optimized network design, all services are exported from the Network Planner to the Network Controller for execution.

Muse Cloud-Native Architecture: Overview & Highlights

Carrier-grade Cloud Native Deployment

Muse is designed with a modern cloud-native software architecture that utilizes containerized microservices, supported by widely accessible technologies for databases, messaging, security, administration, and more. This approach delivers numerous advantages such as expedited application development, enhancements, and customization through CI/CD processes. Additionally, it simplifies integration within a telco or enterprise cloud while providing multiple layers of security against hacking threats and inadvertent internal misuse.

Furthermore, Muse's architecture can be deployed across multiple locations with geo-redundant active-standby synchronization to fulfill the highest standards of carrier-grade availability. It can also be tailored to a minimal lightweight configuration suitable for smaller installations.

Ultimately, by utilizing a cloud-native architecture, Muse can be easily customized to address the unique requirements of IP and Optical network management, enhancing the value and efficiency of investments in these networks.

High Availability and Geo-Redundant Cloud Native Deployment

Warm Geo-Redundancy

Users can set up automatic hourly and daily backups from the main site to the backup site through the user interface, ensuring both data integrity and availability. The backup site will automatically restore the database, confirming that the data is intact and ready for use, which greatly minimizes switchover time. Users have the option to restore any backup or schedule restoration times as required. Manual switchover can also be conducted through the backup site's interface. Additionally, admin alerts from the backup sites are displayed on the main site, offering a centralized monitoring point on the active site while ensuring that the backup site is ready when called upon.
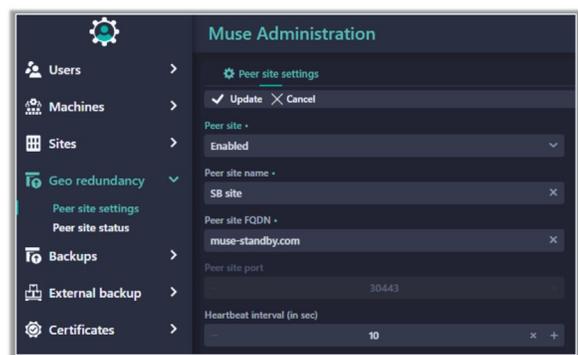

Figure 31: Geo Redundancy settings

Multi-Tenancy Model

Multi-tenancy is a logical hierarchical approach that enables secure resource segregation between individual customers (tenants) of the service providers. Muse uses multi-tenancy to segregate resources such as network services and infrastructure resources. Service providers configure each tenant and user, defining the roles and resources to which each one is entitled.

In a typical multi-tenancy model, a service provider would define a set of individual users, where each user defines a set of individual services, configured per user. The multi-tenancy model keeps each individual service securely segregated.
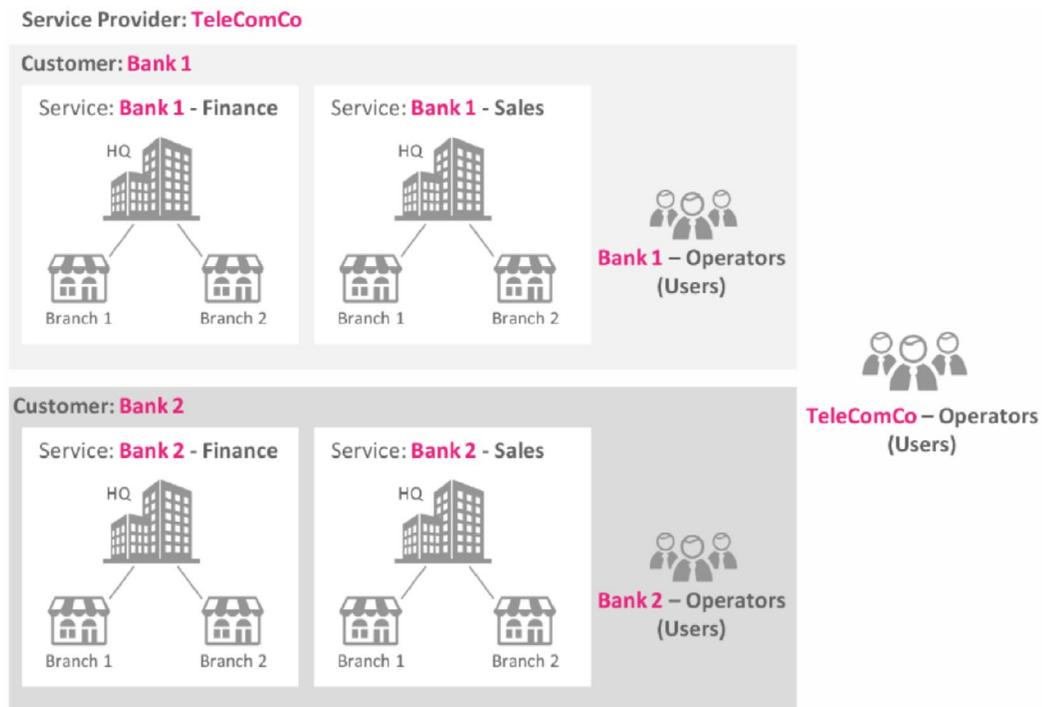

Figure 32: Multi-Tenancy Model

Contact Us   Contact us to learn more about Ribbon solutions.

About Ribbon

Ribbon Communications (Nasdaq: RBBN) delivers communications software, IP and optical networking solutions to service providers, enterprises and critical infrastructure sectors globally. We engage deeply with our customers, helping them modernize their networks for improved competitive positioning and business outcomes in today's smart, always-on and data-hungry world. Our innovative, end-to-end solutions portfolio delivers unparalleled scale, performance, and agility, including core to edge software-centric solutions, cloud-native offers, leading-edge security and analytics tools, along with IP and optical networking solutions for 5G. We maintain a keen focus on our commitments to Environmental, Social and Governance (ESG) matters, offering an annual Sustainability Report to our stakeholders. To learn more about Ribbon visit rbbn.com.