

JUNOS SPACE SERVICES ACTIVATION DIRECTOR

Product Overview

Service providers and enterprises must be able to rapidly provision and offer new MPLS and Carrier Ethernet services across their networks. In order to reduce operational costs and enable quick service rollouts, these network operators need an intelligent provisioning application that facilitates the design, deployment and management of services.

Junos Space Services Activation Director is a collection of applications that facilitate automated design and provisioning of L2VPN and L3VPN services, configuration of QoS profiles, validation and monitoring of service performance and management of synchronization. These applications also provide a rich set of API functions to enable northbound integration and service orchestration with other OSS platforms.

Junos Space Network Management Platform

Junos Space Services Activation Director is part of Junos Space, a comprehensive network management solution that simplifies management of Juniper's switching, routing, and security devices. Junos Space is a critical component of our SDN strategy as it provides a centralized management plane for a single point-of-contact into the network and a common management platform for managing and creating applications to meet your specific needs. With Junos Space, you can simplify and automate the network, improve network agility, and deliver new services quickly ... all from a single console. Junos Space is composed of the following three software elements:

1. Junos Space Network Management Platform – Provides comprehensive FCAPS and element management of Juniper devices which improves operator efficiencies, providing a programmable interface and exposable API's that enable the development and integration of 3rd party applications.
2. Junos Space Management Applications – Plug-n-play, domain-specific applications to help you provision new services and optimize workflow tasks across thousands of Juniper devices
3. Junos Space SDK (software development kit) – A programmable network solution that enables you to leverage the connections and intelligence imbedded in the network to create customized management solutions for your specific needs

Junos Space Services Activation Director is one of the plug-n-play applications running on the Junos Space Network Management Platform. While the Junos Space Network Management Platform offers broad fault, configuration, and device provisioning capabilities with a task-specific user interface, the multiple Junos Space Management Applications extend the breadth of the platform to optimize network management for various domains. These applications enable you to automate the end-to-end provisioning of new services across thousands of devices with a simple point-n-click GUI interface, and to optimize management for specific domains, such as Core, Edge, Access & Aggregation, Data Center, WAN, and Campus & Branch.

Junos Space Services Activation Director Product Description

Companies that offer MPLS and Carrier Ethernet services face common business challenges such as controlling capital and operating expenses, accelerating time to market and increasing customer satisfaction. At the same time, these companies also have to deal with technical challenges such as:

- Provisioning a customer service rapidly and accurately
- Scaling to keep up with customer demand
- Tracking site-specific quality of service (QoS)
- Troubleshooting and pinpointing problems in the network
- Finding trained personnel with expertise in networking and MPLS technologies

Junos Space Services Activation Director is a set of multiple Junos Space Management Applications that allow service providers and enterprises to rapidly enable new service offerings. It facilitates an automated and streamlined approach to the service design and provisioning process, and helps to reduce fallouts from misconfigured customer services thereby increasing customer satisfaction and retention. Besides automating key provisioning tasks, Junos Space Services Activation Director also provides a complete network management solution including automated network discovery, MPLS resource management, point-and-click service provisioning, validation, and troubleshooting for MPLS and Carrier Ethernet service environments.



Figure 1: Junos Space Service Activation Director Functions

The Junos Space Services Activation Director consists of a comprehensive suite of interconnected applications for service provisioning, path configuration, synchronization management, QoS configuration, and network diagnostics. These applications and their high-level capabilities are summarized below:

- **Services Activation Director-Network:** Automate the design, activation, and validation of the provisioning process for L2 and L3 VPNs across MPLS and Carrier Ethernet networks, enabling service providers to efficiently and cost-effectively manage deployments while reducing fallouts from misconfigured services.
- **Services Activation Director-Transport:** Design, provision and activate RSVP signaled label-switched paths (LSPs), as well as static LSPs. LSPs can be configured as end-to-end, P2P, or P2MP LSPs.
- **Services Activation Director-QoS:** Create QoS profiles and assign them to specific Ethernet services.
- **Services Activation Director-SLA:** Perform management functions such as Ethernet Connectivity Fault Management (CFM), Ethernet link-level fault detection and management, and Bidirectional Forward Detection (BFD).
- **Services Activation Director-Sync:** Configure and provision synchronization interfaces such as IEEE1588-2008(PTP) and Synchronous Ethernet (SyncE).

The Junos Space Network Management Platform and the Junos Space Services Activation Director are all accessible through a northbound Representational State Transfer (REST)-based API. This enables network providers to tap into the rich functionality of Junos Space and build native applications on their Operations/Business Support Systems (OSS/BSS) as they begin to embrace SDN architectures in their networks.

The Junos Space Network Management Platform infrastructure provides the basic capabilities for device management and system administration, such as:

- Device discovery
- Device image management
- Device inventory management
- Script management
- Log files management
- User and security administration
- Fault management
- Performance management

In addition to these basic functions, the Junos Space Network Management Platform facilitates a multi-tenant, plug-and-play application environment that enables fast start up and in-service device upgrades.

Rapid Device Discovery

Junos Space Network Management Platform uses a variety of methods to discover network devices and bring them under management. Once the devices are under management, Junos Space Network Management Platform collects the entire physical inventory of these network elements and maintains a centralized repository of real-time information about each device, such as:

- List of line cards (FPC)
- Interface cards (PIC)
- Serial number for each chassis component
- Juniper Networks Junos operating system version
- Operational, administrative state, speed/duplex of the interfaces
- Chassis type

Device Pre-Staging

Once devices have been discovered, pre-staging takes the devices already under Junos Space management and prepares them for service activation. Services Activation Director-Network automatically detects the MPLS roles and the corresponding UNIs of discovered devices. The pre-staging process discovers network provider edge (N-PE) devices in the Junos Space database and assigns roles to those devices and their interfaces. This simplifies the service provisioning task, because only the qualified devices are allowed to be selected.

Automated MPLS Resource Management

Deploying Carrier Ethernet services requires multiple network resources to be allocated and tracked per customer site. The most common network resources are VLAN ID, Virtual Circuit (VC ID), route targets, and route distinguishers. In the case of VLAN IDs, these are usually allocated per customer-facing interface. When a service provider is potentially handling hundreds of customers, each being provisioned hundreds of services, tracking network resources can quickly become unmanageable and unscalable—particularly when the resources are manually tracked. For example, consider a scenario where a customer is experiencing loss of packets from one site to another. How quickly can a help desk operator be able to troubleshoot the problem to help this customer?

Services Activation Director-Network provides automated MPLS resource management. It auto allocates VLAN IDs to the user-to-network interfaces (UNIs), VC IDs and IPv4 addresses, and it tracks used resources. This not only minimizes user input during provisioning but also guarantees that the service provisioning pushed to the devices does not conflict with existing resources on the network.

Rapid Service Design

Predefined service definitions in Services Activation Director-Network capture Juniper best practices for standard services in terms of the options selected, prefilled values for attributes such as bandwidth and more. Privileged users can create custom service definitions for non-standard network configurations.

Name	State	Service Type	Topology	Created by	Created Date
L3VPN-BSP-Static	Published	L3 VPN (BSP-Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
L3VPN-BSP-Static-1	Published	L3 VPN (BSP-Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
L3VPN-Static-1	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
L3VPN-Static-2	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
L3VPN-Static-3	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
L3VPN-Static-4	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
L3VPN-Static-5	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
L3VPN-Static-6	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
L3VPN-Static-7	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
L3VPN-Static-8	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
L3VPN-Static-9	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
L3VPN-Static-10	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
L3VPN-Static-11	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
L3VPN-Static-12	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
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L3VPN-Static-46	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
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L3VPN-Static-49	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST
L3VPN-Static-50	Published	L3 VPN (Static)	Mesh	msayer	Nov 19, 2012 11:43:32 PM PST

Figure 2: Pre-configured Service Definitions

Juniper recommended configurations for various service types include the following:

- P2P E-LINE service
- Full mesh and hub-and-spoke VPLS service
- Full mesh and hub-and-spoke L3VPN service

Automated Service Provisioning

Seventy-five percent of network outages are due to human error, such as misconfiguration when changing an existing customer configuration. Imagine that you have to activate a 20-site virtual

private LAN service (VPLS) for a customer. How do you get started? Start a spreadsheet and keep track of the endpoints, PE routers, interfaces, VLANs per interfaces, route targets, route distinguishers, and other MPLS resources? You start by configuring the first site with great attention to detail, update your spreadsheet or piece of paper, and slowly you make your way to your twentieth site by the end of the week. Now, how do you know that the VPLS for the twentieth site is working? You need to go site by site and verify that you have reachability to all remote sites, issuing 20x19 pings.

What happens when you lose the spreadsheet where you captured all of the information for this customer VPN? What do you do if you need to add a twenty-first site to this VPN and verify that this new site is working with the preceding 20 sites?

Services Activation Director-Network provides a simple point-and-click provisioning tool that allows the operator to easily select the endpoints for activating a customer multisite VPN. It also provides pre-validation before applying a VPN configuration to target devices, verifying that there are no collisions with existing configurations on the target devices and ensuring that set of network parameters ultimately works and renders the VPN connection functional.

Services Activation Director-Transport facilitates bulk provisioning of pseudowires for mobile backhaul deployments. This capability greatly simplifies provisioning of thousands of cell sites at a time with configuration that is somewhat similar. Services Activation Director-Transport helps to design, provision, and activate RSVP signaled label-switched paths (LSPs), as well as static LSPs. These LSPs can be configured as end-to-end, point-to-point, or point-to-multiple-point LSPs.

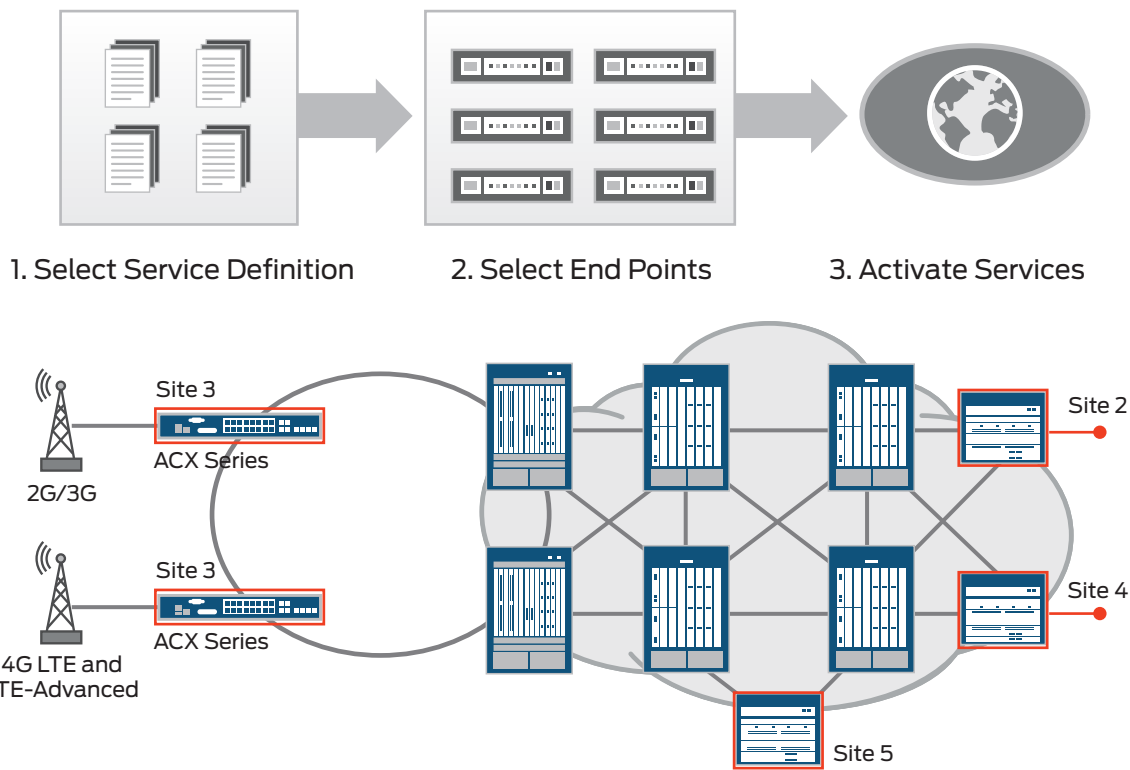


Figure 3: Automated VPLS Service Activation

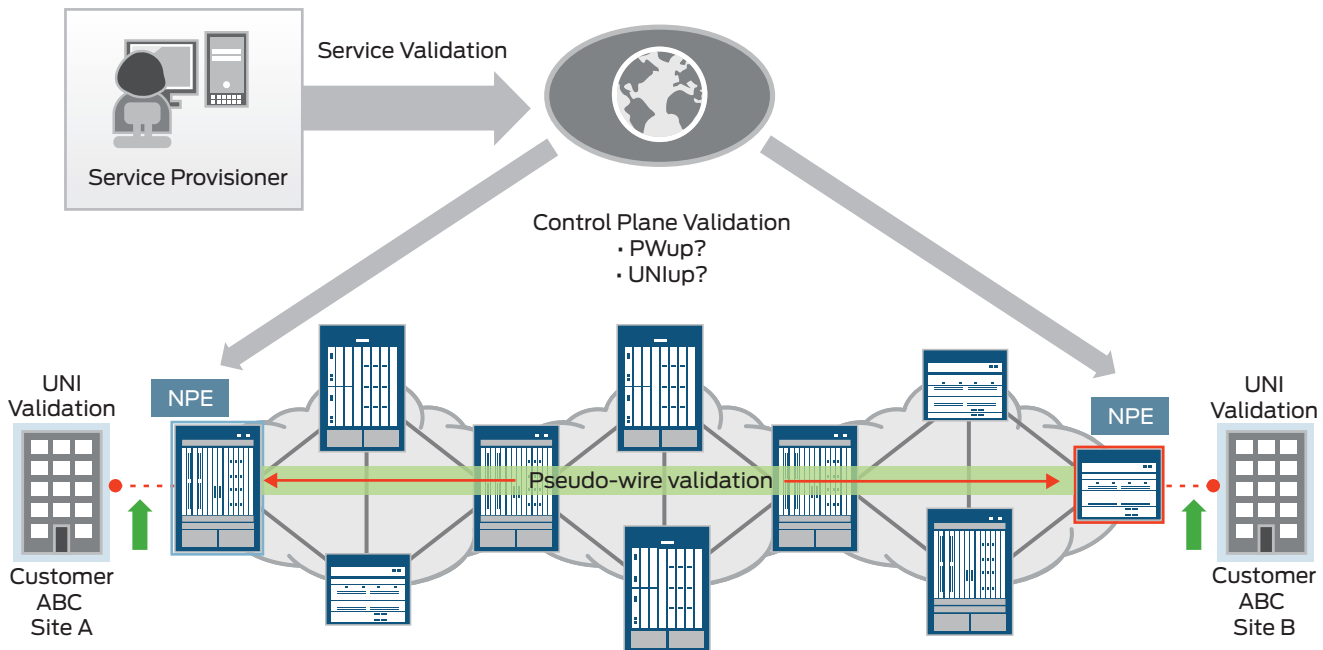


Figure 4: Service validation using OAM flows

Automated MPLS Service Validation and Troubleshooting

Generating an accurate configuration and applying that configuration is the first step. But ensuring that the service is operational is an additional step that Services Activation Director-Network provides. Verifying that the control plane and data plane are functional guarantees that the VPN service is actually up and running.

The real value of Junos Space Services Activation Director comes when the number of VPN sites is large. The Services Activation Director-Network application detects all of the sites in a VPN and is able to verify that the label-switched paths (LSPs) are operational on all sites—issuing a full-mesh MPLS Operation, Administration, and Maintenance (OAM) verification to validate that the data plane is operational.

If one or more sites are not reachable, the operator is immediately alerted to the broken sites with a detailed analysis of the failure conditions.

Services Activation Director-Network—with its built-in autodiscovery (AD), resource management capabilities and service design—allows services providers to quickly start offering Carrier Ethernet services in a very cost-effective manner.

Services Activation Director-Network provides the following benefits:

- Removal of all possible manual configuration errors
- One centralized location for all L2VPN and L3VPN services
- Reduced mean time to recovery (MTTR) when troubleshooting customer connectivity issues

Synchronization Management

The Services Activation Director-Sync application manages synchronization devices such as Juniper's TCA Series Timing Appliances as well as synchronization subsystems within other Juniper devices that support the IEEE1588-2008 standard – commonly known as Precision Time Protocol, or PTP. In addition to managing device level synchronization attributes, Services Activation Director-Sync also manages logical timing entities or domains that comprise groups of devices or subsystems. Users can create timing domains, assign various synchronization devices and subsystems to a domain and then apply a specific timing service template to each domain. Services Activation Director-Sync scans through the devices in the timing domain and performs configuration operations one-by-one based on the service template, thus automating and greatly simplifying the configuration process.

Services Activation Director-Sync provides configuration management, health monitoring, discovery, and GUI visualization of synchronization devices.

Customized QoS profiles for bandwidth management

The Services Activation Director-QoS facilitates configuration of Quality of Service (QoS) features to provide improved service to certain types of network traffic. Enabling QoS on an Ethernet service can improve network service by providing dedicated bandwidth, setting traffic priorities across the network, improving loss characteristics, shaping network traffic, and managing network congestion. Illustration 5 shows the Services Activation Director-QoS application points for traffic on an Ethernet service.

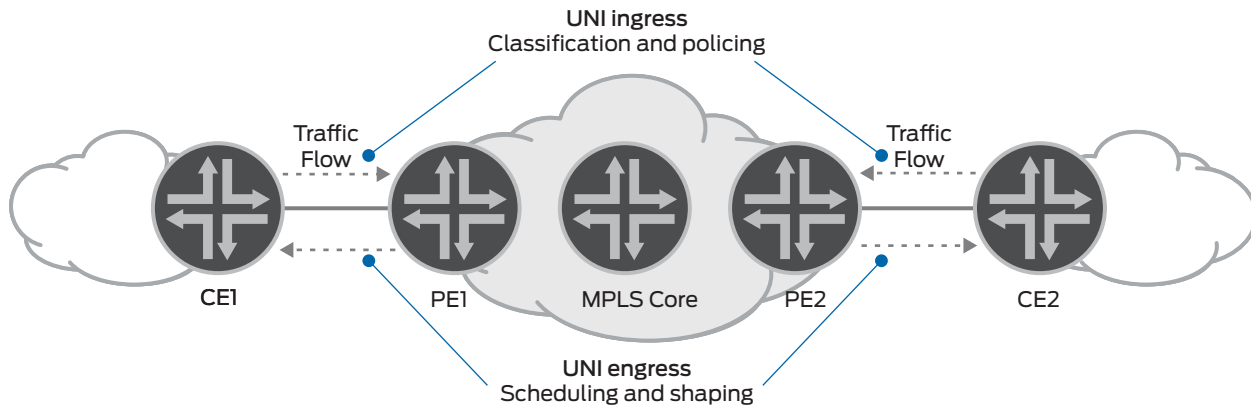


Figure 5: Possible locations where QoS profiles may be applied

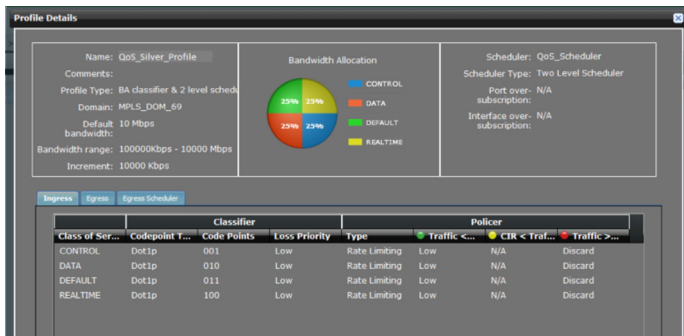


Figure 6: QoS profiler

Users create QoS profiles to configure the appropriate QoS settings for a service. The QoS profile specifies classification and policing for UNI ingress traffic and scheduling, shaping, and rewrite rules for UNI egress traffic. Once a QoS profile is created, it can be assigned to an Ethernet service to configure the UNI ingress and UNI egress interfaces on the N-PE devices associated with the service. Figure 6 is a screen shot of Services Activation Director-QoS showing the details of the classes of services.

Service Validation and SLA Monitoring

After a service has been provisioned, the service provider must be able to monitor the service in order to guarantee SLAs. Monitoring involves checking end-to-end path connectivity of control plane and the data plane. Control plane validation involves verifying that the MPLS edge routers have indeed established logical connections. For E-LINE LDP and BGP, LSPs have to be peered, and pseudowires from both PE routers have to be operationally in 'up' status. For VPLS multipoint to multipoint, each site/leg has to have all the configured LSPs operationally 'up'.

Data plane validation is one last step that leverages exiting MPLS OAM pings to ensure that the data plane is indeed working. The Services Activation Director-SLA application provides the following monitoring capabilities:

- Connectivity Fault Management (CFM) configuration at the port and interface level
- Service level CFM for P2P (E-Line) and VPLS (E-LAN) services
- Support for Y.1731 based one-way and two-way measurements for frame delay, frame delay variation, frame loss and service availability

The Services Activation Director-SLA application enables users to set up CFM flows between service endpoints in order to monitor the end-to-end service using Y.1731 frames. Users can choose to gather performance data on demand, or create SLA Iterators and assign them to a service in order to periodically measure the data. In addition to these iterators, users can also associate an Action Profile with a service to describe actions that must be performed when connectivity problems are detected with the service.

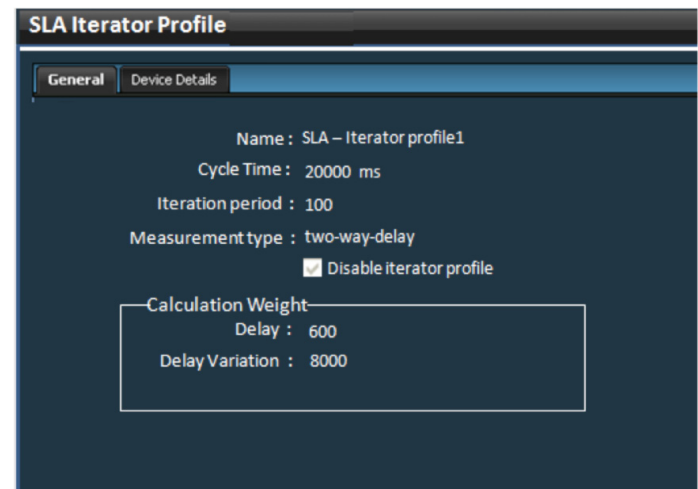


Figure 7: SLA Iterator profile

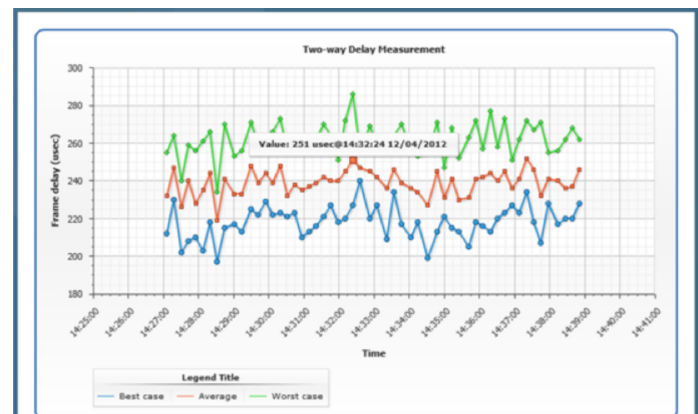


Figure 8: Performance data collected through OAM flows

Features and Benefits

Features	Feature Description	Benefits
Reliable and scalable architecture	<ul style="list-style-type: none"> The Junos Space Service Activation Director runs on a distributed and scalable architecture. The Junos Space fabric can be expanded organically, as administrators can simply add nodes to increase scalability. Users can monitor the health of the fabric, and adjust node membership, as needed. The application automatically load-balances the processing across any new nodes as required. 	<ul style="list-style-type: none"> Allows for a resilient application infrastructure. Allows for expansion of the application infrastructure with the growth of the number of devices, number of GUI operators and northbound operations support systems (OSS) clients. Enables geographically distributed data centers to operate on the same Junos Space fabric. In case one data center is not operational, the secondary data center can still provide full management capability to continue operations.
Autodiscovery (AD) and inventory of network devices	<ul style="list-style-type: none"> Using IP address range, IP subnet and hostname, Services Activation Director-Network is able to connect to and bring in the complete physical inventory of the managed devices. Extends network discovery to MPLS VPN roles including ATM and OCx. 	<ul style="list-style-type: none"> Provides a complete and accurate device inventory of line cards, PICs, interfaces, Junos OS version, chassis type, and serial number that is accessible in one single place. Improved pseudowire support is available.
Automated MPLS and network resource management	<ul style="list-style-type: none"> Leveraging Juniper best practices, there is a set of predefined network signature rules that help with the MPLS role, UNI, NNI, and VLAN ID pools assignment. Once these rules are applied to the discovered network devices, automatic role assignment, UNI selection and corresponding VLAN ID tagging occur. 	<ul style="list-style-type: none"> When configuring carrier Ethernet services, a large number of network resources typically need to be allocated and tracked for a given MPLS service. Provisioning Ethernet services at scale becomes fast and efficient by automating network resource allocation.
Service design	<ul style="list-style-type: none"> Leveraging Juniper MPLS best practices, Services Activation Director-Network has predefined service offering designs for E-LINE and ELAN-VPLS services. Service designers can further customize a carrier's predefined service offering designs. 	<ul style="list-style-type: none"> Time to market is shortened, providing a turnkey service model that can be leveraged rapidly. Custom service definitions allow for flexibility in service provisioning
Multihoming	<ul style="list-style-type: none"> VPLS multihoming connects a customer site to multiple PE routers. 	<ul style="list-style-type: none"> Redundant connectivity is provided in the event of a PE router-to-CE device link failure or the failure of a PE router.
Point-and-click provisioning	<ul style="list-style-type: none"> Simple point-and-click provisioning allows the operator to easily select the endpoints for activating a customer VPN. MPLS services supported are carrier Ethernet E-LINE and ELAN-VPLS. 	<ul style="list-style-type: none"> Removes all possible manual configuration errors. Provides one centralized location to track all customer VPN services (E-LINE, ELAN-VPLS). Reduces MTTR when troubleshooting customer connectivity issues.
Configuration pre-validation	<ul style="list-style-type: none"> Before deploying carrier Ethernet services, pre-validation is done to determine if there are any conflicts with selected network parameters in the network—VLAN IDs, VC ID, Route Targets (RTs) collision, uniqueness of Route Distinguisher (RD). 	<ul style="list-style-type: none"> All of these network pre-validations provide a certain level of assurance that the service intended by the operator has no conflicts and is configured correctly without errors.
Configuration post-validation	<ul style="list-style-type: none"> Services Activation Director-Network validates at a configuration level to determine if the intended configurations are present on all targeted devices. 	<ul style="list-style-type: none"> Ensures that the service configurations are present as intended by the operator.
Operational validation	<ul style="list-style-type: none"> In order to ensure that carrier Ethernet services are operational, two validation levels are executed—control plane and data plane validations. 	<ul style="list-style-type: none"> Provides the operator with a clear assurance that carrier Ethernet services are indeed working.
Create, Read, Update, and Delete (CRUD) functionality	<ul style="list-style-type: none"> CRUD is applied to resource management for MPLS VPN service deployment. IP address pool handling is available. Provides automation of attributes such as AS#, RD pools. 	<ul style="list-style-type: none"> Customers can easily assign IP address selections, reducing multiple manual steps. Improves handling of additional L3VPN attributes.
Synchronization management	<ul style="list-style-type: none"> Services Activation Director-Sync allows configuration of PTP and SyncE interfaces across Juniper devices 	<ul style="list-style-type: none"> Network-wide consistency in management of synchronization - a critical requirement for 3G/4G/LTE networks
Performance monitoring	<ul style="list-style-type: none"> Services Activation Director-SLA facilitates fault monitoring of ports, interfaces and services and provides network performance data 	<ul style="list-style-type: none"> Provides early warning about network problems and allows service providers to meet SLAs
OSS/BSS integration	<ul style="list-style-type: none"> All the applications in the Junos Space Services Activation Director provide REST API for northbound OSS/BSS to access the applications and orchestrate other services 	<ul style="list-style-type: none"> Simple interface to achieve platform extensibility, multivendor support and service orchestration

Juniper Networks Services and Support

Juniper Networks is the leader in performance-enabling services that are designed to accelerate, extend, and optimize your high-performance network. Our services allow you to maximize operational efficiency while reducing costs and minimizing risk, achieving a faster time to value for your network. Juniper Networks ensures operational excellence by optimizing the network to maintain required levels of performance, reliability, and availability. For more details, please visit www.juniper.net/us/en/products-services.

About Juniper Networks

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at www.juniper.net.

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