

PUSHING THE FRONTIER OF INTENT-BASED NETWORKING

Juniper Paragon Insights advances network monitoring and management so operators can deliver better service performance and customer experiences—even in complicated fiber-optic networks.

Challenge

The network's ability to collect high quality and large quantities of telemetry data has improved substantially. Network operators need an innovative solution that intelligently collects and deciphers meaningful insights from all this valuable data and carries out preventive actions to maintain the network performance and operation at peak levels.

Solution

Paragon Insights offers consistent and coherent operational intelligence across all network domains. The solution leverages machine learning and sophisticated algorithms to transform real-time analytics into usable KPIs for monitoring, diagnostics, and preventive measures to maintain overall network performance.

Benefits

By focusing on actionable insights, simplified consumption, and a programmable framework through the combination of telemetry, advanced algorithms, and machine learning, Paragon Insights democratizes network analytics, proactively performing corrective actions. Operations teams gain:

- Network visibility
- Closed-loop automation
- Cost efficiencies
- Enhanced visualization

Network operators have been waiting for network management and operating tools that offer visibility, insight, and automation. Advanced solutions have arrived that analyze critical network data, apply machine learning and algorithms to network problems, and provide automated support to ensure exceptional customer services. Intent-based networking is the next evolution of network management tools that will help service providers improve network resiliency, secure exceptional customer experiences, and lower overall operational expenses.

The Challenge

Network monitoring and management continue to challenge network operators. Having real-time network visibility and defined, relevant key performance indicators (KPIs) that establish a baseline of network and device health metrics are a necessity in every network. These KPIs help detect anomalies, perform device configuration and compliance management, monitor traffic flows, perform capacity planning, and much more.

Until recently, networks were built with high capacity but little intelligence. As a result, network devices are barely able to accept remote configurations or send back alarms and performance parameters to a network control center. Information from network devices has mainly been provided by SNMP and system logging, which does not provide full network visibility to perform root cause analysis and take any proactive actions to maintain service-level agreements (SLAs) for customers.

Recent technological advances enable substantial improvements in the collection of quality telemetry data. Now more effective remote configuration of devices and more effective data collection are possible with standard protocols and procedures such as RESTCONF, Network Configuration Protocol (NETCONF), NetFlow, as well as telemetry streaming using OpenConfig. These enhancements are creating a need to successfully collect, process, and obtain meaningful insights from all this valuable data.



The Solution: Juniper Paragon Insights

Addressing these challenges is where Juniper® Paragon Insights provides a major advantage over other network management tools. As a network health and diagnostic solution, Paragon Insights provides consistent and coherent operational intelligence across all service provider, cloud, and enterprise network domains, from network access to servers in the data center. It aggregates large volumes of time series telemetry data and provides a multidimensional view across the network and applications. These real-time analytics are automatically translated into actionable insights.

Features and Benefits

Paragon Insights provides highly automated diagnostics through the combination of telemetry, programmability, advanced algorithms, and machine learning. This unique combination unleashes the ability to correlate multiple data sources, establish operational benchmarks, determine anomalies, and perform proactive corrective actions—all critical to intent-based networking.

Network Visibility

Paragon Insights eliminates the operational barriers associated with traditional monitoring infrastructure, providing advanced multidimensional analytics across network elements that allow service providers, cloud operators, and enterprises to quickly move from a reactive to a highly predictive model that transforms network operations.

Closed-Loop Automation

Built-in advanced algorithms and machine learning correlate multiple data sources, establish operational benchmarks, identify outliers, and take corrective actions based on predefined KPIs. Playbook capabilities let you create highly customizable diagnostic and heat monitoring workflows, fostering greater collaboration and contributing to the health of the overall ecosystem.

Cost Efficiencies

Paragon Insights reduces overall costs. Machine learning and predictive analytics drive CapEx efficiency, enhancing resource planning and traffic engineering that enable service providers and enterprises to launch more innovative services. Paragon Insights also allows users to proactively optimize and adhere to established SLAs, driving OpEx efficiency.

Enhanced Visualization

A web-based GUI means specialized skills are no longer required to extract business value from traditional CLI-based interfaces. Highly configurable graphic capabilities simplify health reports for easy consumption.

Use Case

Advanced multidimensional analytics, machine learning, and closed-loop automation transparently reroute network traffic to prevent service disruption in fiber-optic networks.

A recent example of improved monitoring capabilities is the intelligent management of Juniper-validated 400GbE coherent optical modules (OIF 400ZR and OpenZR+ 400G MSA) and the real-time insights of the modules' working conditions. These modules provide the versatility of Ethernet with the optical performance needed for data center interconnects and metro, edge, and core networks. These modules illustrate how Paragon Insights monitors and automatically implements corrective actions during performance degradations. In this example, Paragon Insights tracks the KPIs from 400ZR optics and proactively instructs the network to route the traffic away from an interface that is showing indications of progressive optical signal degradation to another available port. The embedded intelligence can even act before the interface fails—ensuring that the traffic is unaffected.

In fiber-optic systems, the optical receiver sensitivity is an important parameter of an optical module. Reading a newspaper in poor lighting is a good analogy of optical sensitivity. The better your sight, the less light is needed; the smaller the print, the more light is needed. More light also makes it easier to read more information on a page. Likewise, optical receivers capable of decoding 400GbE need sufficient light to read the “small-print” signal, known as receiver sensitivity. In other words, the receiver sensitivity indicates how strong the signal needs to be at the receiver to decode the signal.

Optical signal power can fluctuate over time due to external conditions. When the receiver is unable to correctly decode the data, the link becomes unstable and eventually goes out of operation. Hence signal power is a critical KPI for monitoring optics. Experts carefully design networks such that the signal power is always kept in an intended range. However, when the signal drops below the intended value, the system will generate a notification. Depending on circumstances, the problem could be with the receiver, or as in most cases, dirty connectors, fiber issues, or both.

Paragon Insights continuously monitors the received power of optics and generates an appropriate alarm. It also anticipates degradations and takes proactive actions to prevent service disruption.

Another critical parameter in fiber-optic systems is the optical signal-to-noise ratio (OSNR). To understand OSNR, consider a conversation at a rock concert where you must speak much louder for another person to hear. The same is true for optical

transceivers that require the signal power to be well above the noise floor to decode the signal. Noise sources come from other transceivers and optical amplifiers placed along the transmission line. Note the subtle difference to the first example describing receiver sensitivity challenges. A received power signal may be well above the receiver sensitivity but the transceiver is still unable to decode the signal, because the received signal contains a significant noise component and does not meet the OSNR specification.

In other words, while the effect on the receiver is the same—not being able to correctly decode the received signal—the root cause for signal degradation is very different. The signal quality is impaired due to the noise that stems from active components like amplifiers rather than passive networking gear like fiber cable or connectors affecting the signal power. By combining insights into the composition of the signal quality, intelligent network automation solutions can infer the root cause. The built-in advanced algorithms and machine learning in Paragon Insights correlate these multiple data sources, establish operational benchmarks, identify outliers, and take corrective actions based on predefined KPIs.

Summary—Visibility, Insight, and Automation at the Optical Layer

By combining the power of fine-grained telemetry and analytics with workflow automation, Paragon Insights predicts and mitigates deteriorating conditions, automates root cause analysis, and performs corrective actions even before a link failure occurs. As everyone knows, a 400GbE link failure

creates a huge network disruption and customer dissatisfaction. With Paragon Insights, operators can quickly identify critical conditions and transparently re-route traffic around the impairment. Should the fault materialize, no traffic is affected and customer experiences remain positive.

When operators have Paragon Insights, they can leave behind traditional network monitoring tools and gain an advanced network automation platform that delivers better service performance and customer experiences. Paragon Insights is the next evolution of network management tools that help service providers improve network resiliency, lower OpEx, and secure exceptional customer experience.

Next Steps

To learn more about intent-based networking, read these related articles:

- [Five Reasons Why Network Monitoring Is Important for Business](#)
- [Network Telemetry Framework](#)

About Juniper Networks

At Juniper Networks, we are dedicated to dramatically simplifying network operations and driving superior experiences for end users. Our solutions deliver industry-leading insight, automation, security and AI to drive real business results. We believe that powering connections will bring us closer together while empowering us all to solve the world's greatest challenges of well-being, sustainability and equality.



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