

WHITE PAPER

EXPERIENCE- DRIVEN NETOPS

**Continuous, End-to-End
Validation of SD-WAN
Performance from the End-
User Perspective**



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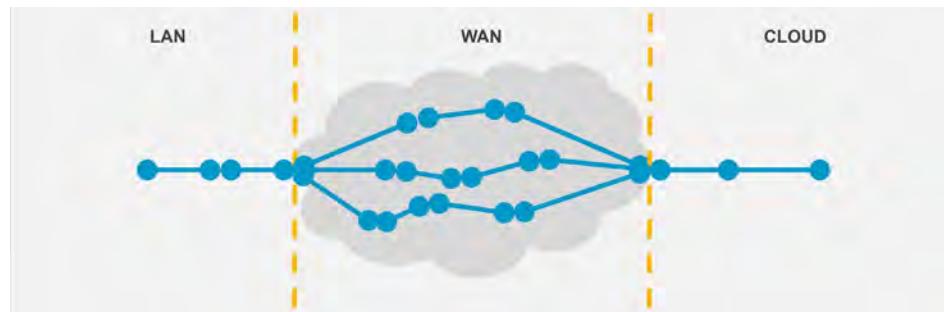
Network teams as well as their networks have undergone evolutionary changes. In recent years, these teams have expanded their networks, established support for a new breed of remote workers, and accelerated cloud, SaaS, and SD-WAN adoption. Consequently, the digital experience these teams deliver is now much more reliant on the internet than their own data centers. The new reality is that network operations teams need end-to-end visibility of performance and application delivery on any network infrastructure, anywhere in the world—whether they own that infrastructure or not.

CHALLENGE

Years ago, most internet traffic was driven by web browsing. Email, payroll, accounting, file storage, and more were all accessed in corporate server rooms. Branch offices were connected to the main corporate building via dedicated circuits, which delivered the necessary application and internet connectivity.

Over the years, these server rooms moved out to their own dedicated facilities, now known as data centers, which extended the network. And recently, in some part driven by the pandemic, more and more of those same applications that used to live in data centers are moving to cloud and SaaS providers. In the process, teams are increasingly adopting SD-WAN to enable secure and cost effective access to those applications.

Figure 1: SD-WAN application delivery traverses many networks. Gaining true end-to-end visibility is very difficult when most of these networks are owned by ISPs and cloud providers.



Today, network traffic spends much more time on the internet than in an organization's own data centers. 87% of traffic traverses the internet now¹ but 67% of network operations teams cite internet and cloud network paths as monitoring blind spots.² Network traffic has expanded well beyond the four walls of the data center. The internet is the new network now.

OPPORTUNITY

87% of traffic traverses the internet now but 67% of network operations teams cite internet and cloud network paths as monitoring blind spots.

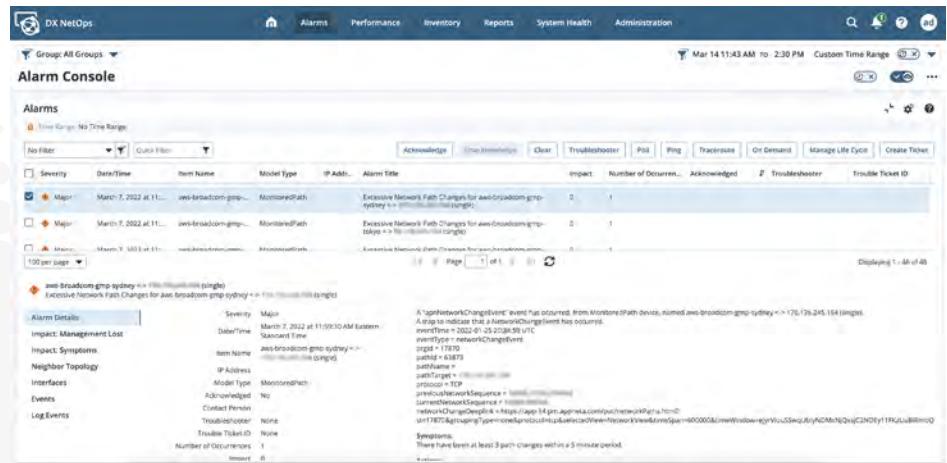
SD-WAN technologies offer many benefits. These technologies enable teams to reduce costs, secure application delivery, improve network resiliency, and route traffic dynamically based on performance. But since SD-WAN traffic is delivered over multiple networks outside of the realm of the enterprise data center, network teams are blind to 75% of the network delivery path. Consequently, teams lack the ability to fully capitalize on the benefits of SD-WAN.

Additionally, the end-user experience is how most enterprises and communication providers are graded today. Without complete visibility into the performance of the entire SD-WAN delivery path that shapes the application experience, there is no way to optimally meet service level agreement (SLA) guarantees for customers.

Compounding matters is the fact that SD-WAN controllers can make automated route changes based on performance. These changes need to be validated by network operations to verify they don't have any impact on the end-user experience. These teams also need to correlate any performance changes with SD-WAN events like failovers, configuration changes, and more.

A real-world example would be an insurance call center that receives a customer claim inquiry immediately after a car accident. The application used to produce accident claims is hosted in a SaaS environment and the insurance representative is working from home over a virtual private network (VPN) that is connected into the company's data center. SD-WAN is used to access SaaS environments hosting their critical apps. The representative cannot access the claims

Figure 2: Internet routing change alarm delivers real-time visibility into SD-WAN network path degradation and pinpoints the ISP responsible for the performance issue.



**“What is not measured,
cannot be improved.
What is not improved, is
always degraded.”**

—William Thomson
Kelvin

system, and isn't sure whether there's an issue with the home wireless network, the local ISP, the company's data center, SD-WAN or the application in the SaaS environment.

The representative regretfully informs the customer that they cannot process the claim at this time due to the claim application being inaccessible and advises the customer to call back later.

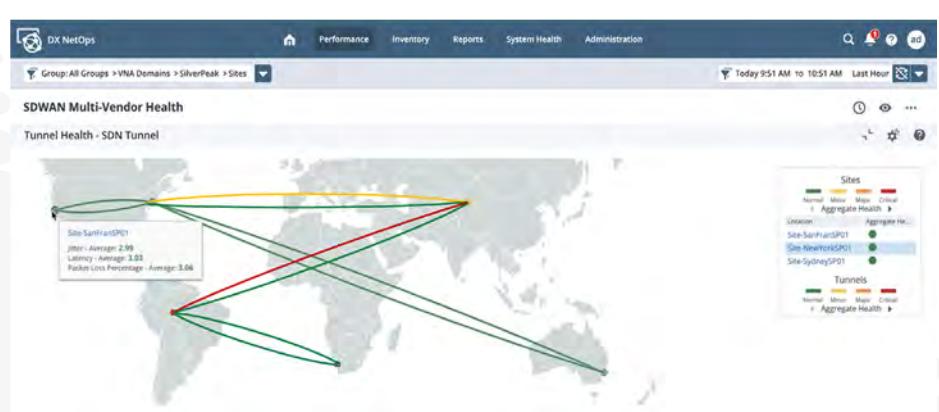
This cannot happen in today's world. A network operations team needs to be responsible for the entire application experience, even if it is delivered over infrastructure they do not own. In order to realize successful network transformations to internet, cloud, SaaS, and software-defined technologies, teams must gain visibility into every single aspect of the entire network delivery ecosystem and validate the end-to-end application experience over any networking technology, anywhere in the world. If issues arise, they must be able to isolate any problem area, including those issues arising within the ISP or SaaS provider network.

SOLUTION

DX NetOps by Broadcom Software provides unified, high-scale, vendor-agnostic capabilities for network operations center (NOC) management and monitoring. With the solution, teams can track the health and performance of the LAN, wireless infrastructure, data center, and customer edge, including both traditional and software-defined technologies.

AppNeta by Broadcom Software enables teams to gain vendor-agnostic, end-to-end connection visibility from the perspective of the end user. The solution offers coverage that spans across all networks, regardless of technology, location, or ownership. With AppNeta's capabilities for active testing and synthetics, teams can gain deep insights into the network delivery experience along the WAN path. This includes key insights into hop-by-hop performance across ISPs and cloud networks. The solution also provides capabilities for ensuring the resilience of the network paths that connect end users and systems to applications and services, within and beyond the four walls of the data center.

Figure 3: Multi-vendor SD-WAN health and performance visibility unified into one network operation dashboard.



CONTINUOUS SD-WAN PERFORMANCE VALIDATION FROM THE END-USER PERSPECTIVE

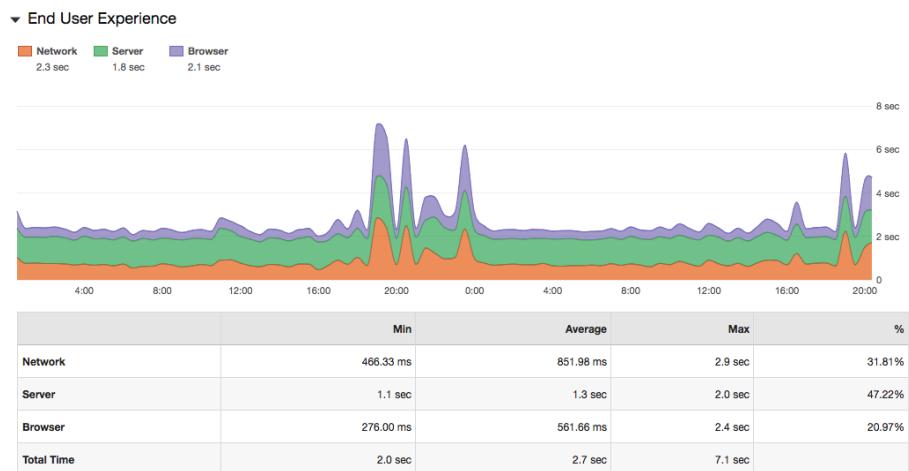
Broadcom Software offers the only solution in the industry that truly delivers end-to-end visibility into the performance of SD-WAN infrastructure. The company's applications deliver the following capabilities:

- Compare controller and end-user performance perspectives to understand if the actual end-user experience was consistent with SD-WAN policy service level objectives (SLOs).
- Track the consistency of actual performance with the overlay performance measured by the SD-WAN.
- Expand operational visibility and overcome vendor shortfalls related to data accuracy and timing.
- Improve mean-time-to-resolution (MTTR) with end-to-end performance visibility and validation.
- Validate the experience and end-to-end network delivery of SD-WAN applications, including both data and voice.
- Leverage continuous, low-overhead, active testing of the delivery path from the perspective of layer 3 and layer 4 networks.
- Improve mean time to innocence (MTTI) by identifying the specific ISP or cloud provider responsible for end-user experience degradation.
- Gain improved visibility into ISP and cloud provider performance over time using baselines and capacity projections.

By integrating AppNeta inventory, events, and performance data into DX NetOps network monitoring software, teams can gain a seamless operations experience that leverages industry best practices and best-in-class triage and alarm correlation workflows. With the solutions, operations teams can easily triage not only up/down issues but end-user experience issues across the entire path of SD-WAN network transactions.

DX NetOps' SD-WAN overlay monitoring is strengthened by AppNeta's ability to monitor each hop of the underlay across monitored and unmonitored network infrastructure, and across any vendor and network type. This provides a unified view that enables customers to compare the perceived performance of the SD-WAN from the controller's perspective as well as performance of the SD-WAN from the application and end-user perspective. In addition, AppNeta offers high-resolution data collection, routinely gathering data every minute and, in degraded conditions, every 15 seconds. This significantly increases the operations team's reaction time and MTTD (mean time to detect) when problems are having an impact on applications and the end-user experience.

Figure 4: End-user experience spikes stemming from the network layer of a synthetic script.



Since SD-WAN controllers make automated changes based on performance, Broadcom Software provides continuous, low impact, active testing of SD-WAN network delivery, and it gathers data more frequently when issues are detected for fast root cause analysis. This active testing helps validate that automated changes do not have a negative impact on the end-user experience and it also helps operations adhere to their SLOs and SLAs. Additionally, the solution offers continuous monitoring that helps correlate performance changes with SD-WAN events. This enables IT to rewind and look at what was happening before and after events have occurred.

USE CASE

"I need to validate my SD-WAN policies and performance with end-user experience to ensure I am maximizing my SD-WAN, ISP, and cloud investments."

AppNeta

- End-user experience across SD-WAN
- Comparative view across all transports
- High-resolution performance testing
- Vendor agnostic SD-WAN performance

DX NetOps

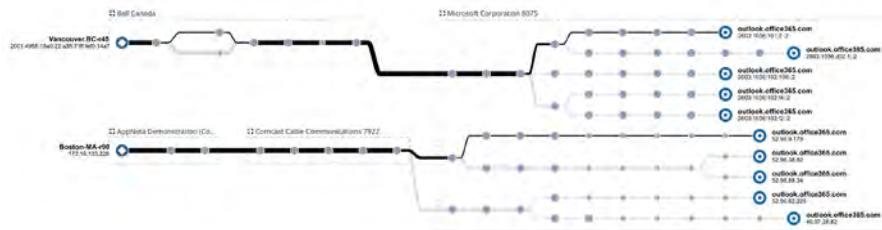
- Controller view of SD-WAN overlay performance
- Underlay performance
- SD-WAN policy performance
- Unified SD-WAN/LAN visibility

Real-time SD-WAN Validation

- Validate performance from controller vs actual network delivery performance
- Fast-track overlay performance validation to eliminate delays in vendor reporting
- Identify patterns in performance over time focusing on high-usage and business hours
- Identify problematic transports or service providers using deviation from normal baselines & projections

DX NetOps network monitoring software leads the industry in ensuring SD-WAN availability from the controller, policy, overlay, and edge perspective. AppNeta adds the ability to understand performance related to the underlay and the actual paths traffic is taking across ISP and cloud provider networks. This gives teams a

Figure 5: Example of routing differences detected between multiple locations over time for an Office365 SaaS environment.



true end-to-end perspective and it also gives operators and SD-WAN engineers the ability to validate actual performance with control plane measurements. Bringing this data together provides a complete perspective, enabling analysis of baselines, deviation from normal, and business hours.

CONCLUSION

If you can prove the user experience is reliable, then you can more effectively ensure resilient network delivery.

At Broadcom Software, we believe a connection in today's digital world is actually a network connection that should be experience proven. If you can prove the user experience is reliable, then you can more effectively ensure resilient network delivery.

This is where Broadcom Software is taking its award-winning network monitoring solutions, moving well beyond basic device-specific visibility, such as whether a router is up or down, top talkers, and so on. Broadcom Software is enabling network monitoring that employs end-user experience metrics to determine if the network is in a good state or not—for any user, on any device, on any network, anywhere.

Sources

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² Intelligent Tech Channels, "Spire Solutions signs with Gigamon to accelerate response times," Mark Bowen, July 29, 2019, <https://www.intelligenttechchannels.com/2019/07/29/spire-solutions-signs-with-gigamon-to-accelerate-incident-detection-and-response-times/>



To learn more about Broadcom's award-winning network monitoring solutions, schedule a demo with our team.

About Us

Broadcom Software is one of the world's leading enterprise software companies, modernizing, optimizing, and protecting the world's most complex hybrid environments. With its engineering-centered culture, Broadcom Software is building a comprehensive portfolio of industry-leading infrastructure and security software, including AIOps, Cybersecurity, Value Stream Management, DevOps, Mainframe, and Payment Security. Our software portfolio enables innovation, agility, and security for the largest global companies in the world.

For more information, visit our website at: software.broadcom.com