The digital business model requires a dynamic network infrastructure, especially at the edge where end users and smart devices demand ever-increasing reach, resilience, and responsiveness. In this environment, SD-WAN solutions must leverage comprehensive network intelligence, actionable insights, and automated operations and management.

Analytics and Automation: Driving SD-WAN Success at the Network Edge

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Introduction

The foundation for any successful digital business model is a resilient and responsive technology infrastructure. Evolving business demands and extensive technology advancements have combined to form a far more complex and distributed digital infrastructure. While core datacenters, switched campus LANs, and routed WAN backbones continue to serve as critical central resources, it is the infrastructure edge that has risen dramatically in both capability and criticality as the digital business model has taken hold across all industries and organizations. In IDC's *Future Enterprise Resiliency and Spending Survey, Wave 12* (December 2021), 57% of respondents indicated that they are adopting data stewardship, security, and network strategies that maximize edge contributions to business processes.

Unfortunately, the many good reasons for this edge buildout are matched by concerning management challenges. Visibility and control must be extended across not only a more distributed environment but also an environment that is more diverse in terms of connections, systems, services, vendors, and endpoints. Remote operations and management responsibilities and requirements intensify as networking, security, and computing requirements build, increasing the pressure on an already overburdened IT staff. And with increased reliance on the internet and cloud services, more of the network infrastructure is falling outside the ownership and direct control of the enterprise IT organization and, particularly, the networking team.

Over the past few years, SD-WAN advancements have served to take on many of the challenges presented at the edge of the digital infrastructure — with one multifunction solution. Digital experience management, direct cloud service connections, advanced threat protection, secure access service edge (SASE) support, and flexible network connectivity are just some of the key capabilities of a solid SD-WAN solution.

AT A GLANCE

KEY TAKEAWAYS

Networking at the edge of the digital infrastructure is increasing in criticality and complexity. And yet, this network edge is being asked to do more, serve more, and protect more as the digital model accelerates. Serving as the lead networking solution at the edge is the SD-WAN — a singular solution being called upon not only to perform multiple roles but also to react readily and reliably to onrushing demands. The timing, precision, reliability, and efficiency of this reaction are determined by comprehensive intelligence, in-depth analysis, and directed automation.

Situation Overview

The rising complexity and criticality of the infrastructure edge increase the challenges, responsibilities, and risks in deploying and operating an efficient, resilient, and responsive SD-WAN environment.

Digital Acceleration and the Dynamic Network

IT organizations face three major challenges in meeting digital demands. And each issue becomes even more pressing in a highly distributed infrastructure where the edge equals (or even surpasses) the core in terms of digital responsibilities and value.

First and foremost, IT must best serve digital endpoints (e.g., end users and IoT devices) — no matter location, affiliation, function, or interaction. Here, digital experience measurement and management aimed at specific workloads and applications have become the primary indicators of overall IT service quality. Second, IT must make best use of available technologies, solutions, and services, driving both full utilization of existing technologies and rapid adoption of developing technologies. And third, IT must be best positioned to serve the accelerating requirements of the digital business model. Nowhere are these challenges more apparent than in and across the network, the unifying foundation of any organization's end-to-end digital infrastructure. And with the buildout of digital functions further and further out on the digital infrastructure, the network edge must be a particular focus for IT when optimizing the digital experience, resource utilization, and digital innovation.

Network Edge Responsibilities (and Risks) in the Digital Infrastructure

With digital-driven challenges and barriers come new responsibilities and risks relating to the digital infrastructure. Failure to deliver the best possible digital application experience results in user dissatisfaction. Failure to protect vital resources, exchanges, and information results in business loss. Failure to fully utilize digital infrastructure systems and services results in resource waste. Failure to readily adapt to new requirements results in digital stagnation. And failure to effectively properly manage, develop, and equip the IT staff results in declines in productivity, satisfaction, retention, and attraction.

Network analytics and automation serve to heighten responsibilities and lower risk associated with digital infrastructure management in the following ways:
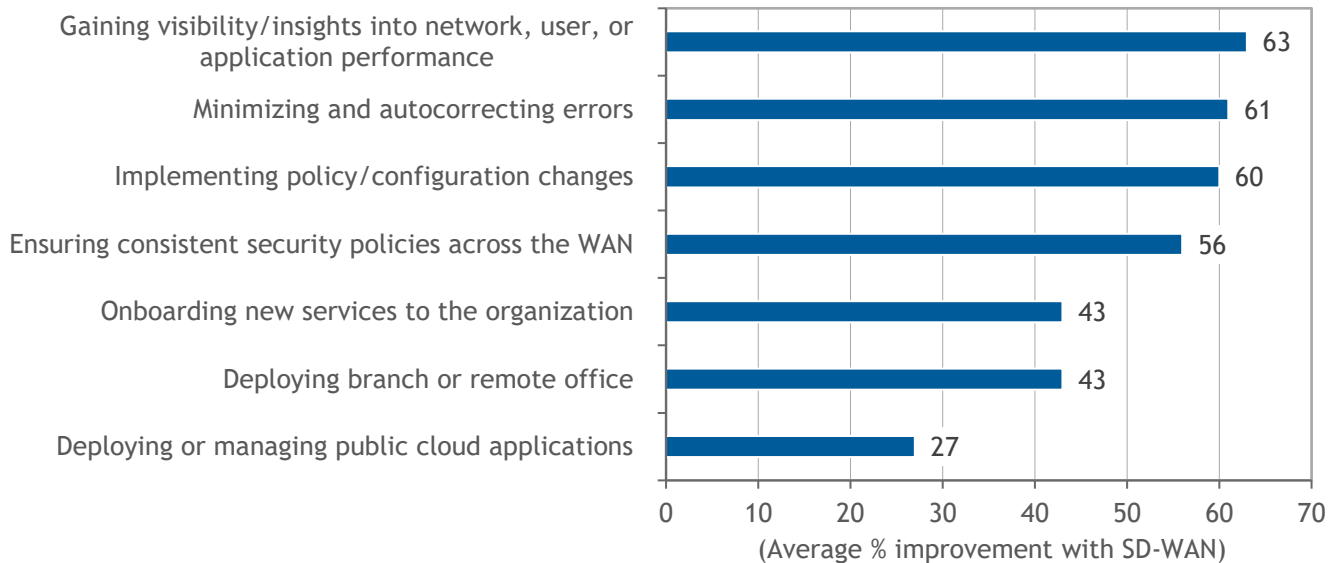
» **Ensure a positive digital application experience.** A positive experience is the ultimate measure of end-to-end service quality (and source of credibility) for IT organizations. IDC 2022 global survey research indicates that digital experience is a top 3 key performance indicator for IT organizations, alongside client engagement/loyalty and staff satisfaction/retention. Providing for the best possible user experience — for all exchanges, at all times, in all locations — must be prioritized. In an SD-WAN environment, the distributed status of end users and smart endpoints complicates digital experience management. Intelligence and insights must cut through this complexity to ensure remote users and devices receive consistent service levels.

» **Solidify cloud-first and multicloud environments.** In today's IT environment, business exchanges and transactions that do not leverage cloud services (e.g., IaaS, SaaS) are increasingly rare. In an SD-WAN environment, where direct cloud connections are becoming the norm, digital experiences and IT service levels are primarily determined by the quality of cloud service interactions. It is necessary for network analytics solutions to heighten visibility into and control over cloud services, resources, connections, and application performance. Here, intelligence presented from inside the cloud (via management instances), across the cloud (via synthetic transactions), and at the edge of

the cloud (via network edge management integration) enables a more complete view into cloud services and service levels. This clearer view into cloud and multicloud environments provides for more accurate cloud service oversight and validation, more provider accountability for meeting service-level agreements, more timely c loud-related problem identification and resolution, and more confidence in future cloud service expansion and expenditures.

» **Strengthen security posture and practices.** Network analytics and automation serve as key contributors to a strong security posture and threat mitigation efforts. IDC survey research indicates that one of the significant permanent changes in IT operations precipitated by the pandemic was a tightening of the bonds between NetOps and SecOps. This change has resulted in organizational realignments, common tool selection, increased management data sharing, and process improvements. Advancing SD-WAN technology developments and adoption certainly result from a closer coupling of both systems and staff supporting a secure connected environment at the network edge. Detailed network intelligence and insights play a major role in promoting the acceptance and effectiveness of a conjoined networking and security effort.

» **Drive operational and innovation excellence.** The digital business environment requires much more from the network and, as a result, much more from networking and network management solutions and staff. Networks must be more resilient and dynamic. Network management must be more precise and predictive. Nowhere are these requirements more evident than at the network edge, where SD-WAN solutions perform multiple key roles. Without complete visibility into and control over the network infrastructure, networked resources, cloud and communications services, and connected end users and devices, organizations are flying blind as they press forward on their digital initiatives. In the course of reporting on the state of the network, resolving a problem in the hyperconnected infrastructure, or evaluating the network's ability to support new workloads, organizations are finding that any limitations in network intelligence and insights constrain digital movements and heighten the risk of failures, slowdowns, or threats.

Network Intelligence and Insights Serving the Network Edge

The network edge is where network connections, distributed computing, cloud interactions, security mechanisms, data management, critical applications, and end-user devices and smart end devices are brought together to serve digital requirements of workers, processes, the IT organization, and the digital business model. The ability for SD-WAN solutions to use intelligence and actionable insights to serve present and future needs quickly and correctly is paramount for success at the network edge (see Figure 1).

FIGURE 1: *Operational Improvements Resulting from SD-WAN Deployment*

Operational area	Average % improvement with SD-WAN
Gaining visibility/insights into network, user, or application performance	63
Minimizing and autocorrecting errors	61
Implementing policy/configuration changes	60
Ensuring consistent security policies across the WAN	56
Onboarding new services to the organization	43
Deploying branch or remote office	43
Deploying or managing public cloud applications	27

(Average % improvement with SD-WAN)

n = 8

Source: IDC's The Business Value of Cisco SD-WAN, August 2022

The Far-Reaching SD-WAN

By their very nature, SD-WAN deployments form a distributed networking system, so comprehensive remote management serves as table stakes for enterprises. Any constraints in visibility and control imposed on centralized network engineering and operations staff render the SD-WAN solution less than fully effective — and the staff less than fully functional. Additionally, this visibility and control must extend beyond the SD-WAN solution itself, allowing for extended reach into such important measurements as digital application experience, cloud service conditions, and WAN utilization. Far-reaching management and measurement capabilities bolster resiliency and responsiveness — two primary determinants of success for an SD-WAN environment.

The Fast-Acting SD-WAN

Automation represents a top priority for IT organizations. In an IDC 2022 worldwide survey on observability and IT management, over 75% of respondents said they are using or planning to use observability intelligence and insights to support their automation efforts. In a separate 2021 study focused on network automation, the more successful organizations were using analytics to drive their network automation efforts, allowing them to realize greater returns than organizations that simply automated repetitive tasks. Tying analytics to automation enables the SD-WAN environment to respond readily and reliably to traffic changes, problems, security threats, and new workloads while minimizing staff demands. And SD-WAN solutions that operate using comprehensive network intelligence and insights can detect issues faster as well as more accurately and efficiently.

The Forward-Looking SD-WAN

Given the ever-changing nature of the network edge — with shifting traffic patterns and volumes, variable loads on components and services, increasing direct cloud interactions, and often sudden problems and threats — SD-WAN solutions that learn from collected data, do predictive analysis, and direct proactive management actions match up well to digital business demands for a more fail-safe and dynamic networking environment. With this forward and forecast view, an SD-WAN can avoid problems before they impact services (and staff). Resources can be more fully utilized as a result of the continual precise tracking of usage levels and component health. Risks of failures/slowdowns and infrastructure costs can be reduced by properly timing upgrades to on-premises systems and public cloud and communications services. Network intelligence and insights that promote proactive management bolster digital infrastructure resiliency and responsiveness.

SD-WAN: Improved Resiliency and Responsiveness via Analytics and Automation

As organizations across the world continue to expand SD-WAN deployments to optimize cloud connectivity and ensure user experiences, the acute need for advanced network-based analytics and automation grows. A recent IDC global survey asked respondents what their top motivations were for considering an SD-WAN deployment. Top responses included the ability to have more centralized policy management across the WAN, campus LAN, and datacenter; the opportunity to save money; and the ability to enhance operational efficiencies. Advanced network-based intelligence and insights are a powerful tool to help achieve these desired outcomes from SD-WAN. The following sections discuss the criteria organizations should evaluate when considering visibility and analytics platforms for SD-WAN.

Insights Across the Stack

SD-WANs fundamentally abstract the data plane (connectivity layer) from the control plane (management layer) of the WAN. In turn, network-based intelligence platforms should provide insights into both the underlay (e.g., the broadband, MPLS, or cellular primary or backup connections) and the overlay (e.g., the application-based policy controller fabric). Furthermore, visibility and analytics platforms should provide insights into multicloud connectivity, application performance, and user experiences.

Centralized Control

SD-WAN technology is commonly deployed across geographically dispersed sites. For example, a large multinational organization deploys SD-WAN to connect hundreds — if not thousands — of branch sites to cloud-based resources. Analytics and automation platforms must be able to scale to support the highly distributed nature of SD-WAN deployments. A cloud-based management platform that centralizes intelligence, correlates telemetry, and creates actionable recommendations is a powerful feature of network management.

Translating Insights into Action

Intelligence platforms not only should alert users of a problem but also should use artificial intelligence and machine learning (AI/ML) to provide recommendations on root cause analysis and guided recommendations on how to solve network performance or security issues. AI/ML-enhanced management platforms for SD-WAN can play another role too: Powered by real-time telemetry, these platforms can create an ever-evolving network optimization cycle where the management platform learns the optimal performance of the network and recommends ways to achieve, maintain, and continuously improve it. Foundational to the success of such a platform is having deep insights into network performance.

Armed with rich telemetry that can be analyzed and acted upon in real time, the management platform can automate to a greater and more efficient degree than manual processes would allow. This transforms network operations from a reactive model to a proactive model and enables IT staff resources to focus on more business-enabling tasks rather than troubleshooting network issues.

Cisco SD-WAN Solution: Intelligence and Insights for Network Edge Innovation

Cisco has a long heritage in enterprise routing and was one of the initial vendors in the burgeoning SD-WAN market. On the analytics side, Cisco's acquisition of ThousandEyes, integrations with Umbrella and Duo, and development of integrated AI-driven analytics combine to give the company's SD-WAN platforms significant visibility, analytics, and security capabilities. Cisco SD-WAN also has strong integrations for multicloud connectivity across the major SaaS and IaaS public cloud providers and interconnection vendors, boosting customer capabilities in cloud-first, hybrid cloud, and multicloud environments.

Cisco SD-WAN: Key Components and Capabilities

Cisco SD-WAN combines key network analytics and automation capabilities with a portfolio of networking systems that serve a range of customer environments. Cisco presents the existing SD-WAN solution as just the start of the journey to an even more intelligence-driven, well-defended, and highly dynamic networking environment over time (see Figure 2). That development should be welcome news to not only network engineering and operations staff but also the broader IT organization and lines of business.

FIGURE 2: *The Journey to Self-Optimizing Networks and Services*
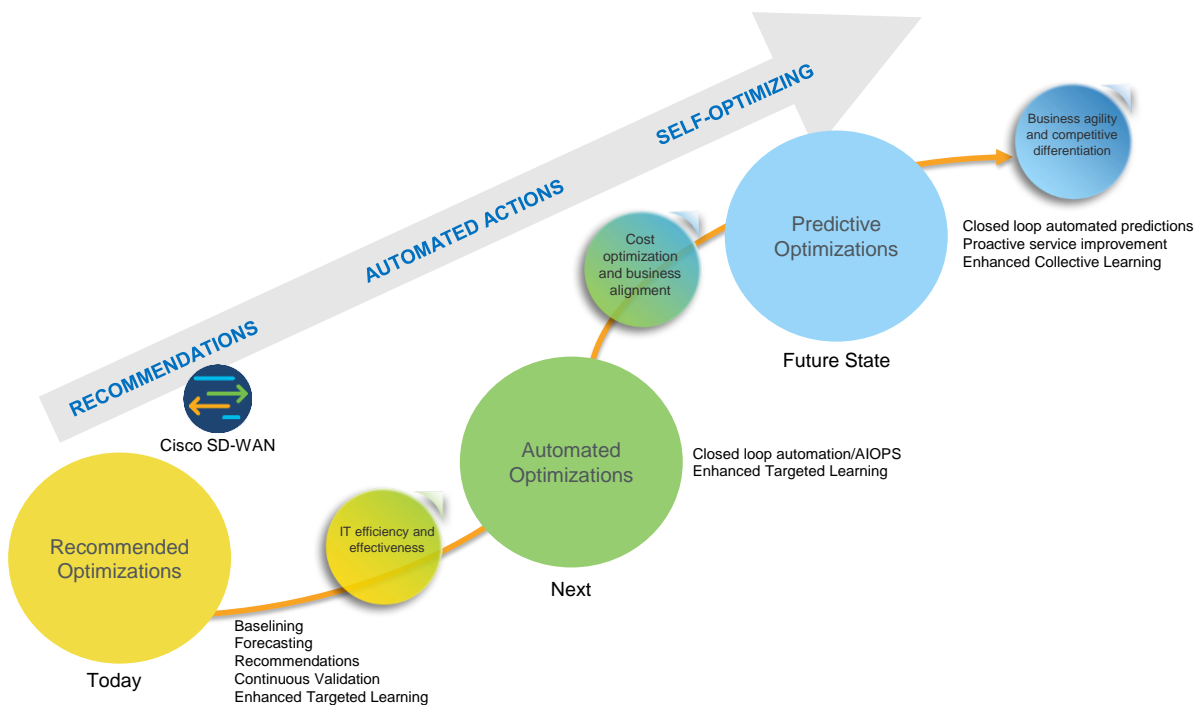
Source: Cisco, 2022

» **SD-WAN analytics and automation.** Cisco leverages three significant solutions in bolstering the monitoring and management of Cisco SD-WAN environments: vManage, vAnalytics, and ThousandEyes. Cisco vManage serves as the central network management system for deployment, configuration, monitoring, alert management, and troubleshooting. It is available as both an on-premises system and a cloud-based system. Cisco vAnalytics provides advanced SD-WAN analytics functionality such as aggregated performance, historical trends, complex correlations, and root cause analysis; it is delivered as a cloud-based SaaS solution. Cisco ThousandEyes solution comprises a cloud-based data collection and analysis engine and distributed software agents hosted within cloud and internet service provider networks, enterprise networks, and endpoint devices. ThousandEyes provides multilayer digital experience measurements that correlate network and application performance to give an end-to-end view of service and application delivery. In 2022, ThousandEyes WAN Insights added support for Cisco SD-WAN controller intelligence and predictive analytics capabilities, including further insights and future views into the SD-WAN environment.

» **SD-WAN systems.** Cisco SD-WAN offers a range of deployment options for customers, including on-premises hardware appliances running on the Cisco Catalyst 8000 Edge Platforms Family or the Cisco Integrated Services Router (ISR); the company also has a range of virtualized SD-WAN offerings that can be deployed on-premises or in the cloud. The primary management platform for Cisco SD-WAN is vManage. Recent innovations to the company's portfolio have focused on multicloud integrations, including direct connections to major IaaS cloud providers such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud; partnerships with interconnect providers such as Equinix and Megaport; and optimization for SaaS applications such as Microsoft 365 and Webex by Cisco. Another key component of Cisco SD-WAN is security; on-premises Cisco SD-WAN security includes SSL decryption, enterprise firewall, intrusion prevention, URL filtering, and malware sandboxing. Cisco SD-WAN also integrates with the company's cloud-based Umbrella and Duo platforms as well as the Cisco Talos threat intelligence platform, and Cisco SD-WAN has integrations with third-party on-premises and cloud-based security tools.

Sample Industry Use Cases

Network edge monitoring and management are vital functions when building and operating a resilient and responsive digital infrastructure across every industry and across organizations of all sizes. Detailed views and precise controls serve to support not only tactical and strategic IT initiatives but also key business priorities. The following examples highlight how Cisco SD-WAN analytics and systems combine to serve select industry verticals:

» **Financial services.** IDC's 2022 *Future Enterprise Resiliency and Spending Survey* found that improving employee productivity is the number 1 business priority for financial services firms, followed by increased business agility, cost savings, and customer satisfaction. As the main conduit for client engagement, the financial network infrastructure serves not only to connect clients and workers and resources but also to protect vital information, transactions, and assets. Cisco's analytics-driven SD-WAN solution provides the visibility and control necessary at the network edge to improve the productivity and impact of client-focused employees, accelerate digital initiatives, secure transactions and information, and boost the efficiency of connected resources — both public and private.

» **Healthcare.** In a 2022 IDC worldwide survey focused on digital infrastructure observability, healthcare respondents cited delivery of the best possible digital experience, insights into cloud services use, and AI/ML-driven analysis as their top 3 focal points for IT management. With healthcare moving aggressively toward a distributed and remote treatment model, detailed monitoring and precise management of the digital experience and cloud service utilization are paramount for patient care at the network edge. And both — along with other key healthcare IT

management initiatives (e.g., cybersecurity, automation) — are bolstered by heightened analysis intelligence (e.g., anomaly detection, root cause analysis, predictive analytics) driven by AI/ML capabilities. The Cisco SD-WAN solution leverages AI/ML-driven network analytics and automation necessary to deliver on the full promise of advanced healthcare practices in this digital era.

» **Retail.** IDC's 2022 *Future Enterprise Resiliency and Spending Survey* found that the cost and complexity of multigenerational systems and shortages of skilled staff are the two main barriers to success in building out a resilient digital infrastructure. As the network edge expands in capabilities and criticality, it is vital that systems and services deployed at the network deliver cost savings and enhance operational simplicity and staff productivity. By using detailed analytics and automation, Cisco SD-WAN solutions enable the delivery of consistent services, performance, and security across distributed retail locations while providing much-needed relief for the central IT staff deploying, maintaining, repairing, protecting, and enhancing the network edge.

Meeting Challenges in the SD-WAN Environment

SD-WAN requirements present multiple challenges for Cisco and other suppliers looking to leverage analytics and automation within the evolving network edge. Comprehensive and timely network intelligence — from both on-premises systems and public cloud/communications services — is critical for accurate analysis of conditions and components and can lead to precise automated actions. This analysis and automation must be augmented by AI/ML development focused on capabilities that drive not only greater accuracy and precision in the present, but also heightened staff productivity and predictive analysis into the future. Beyond the SD-WAN environment, analytics and automation at the network edge must serve IT observability and automation efforts across the digital infrastructure. Here, the challenge is sharing network edge intelligence and insights with other IT domains (e.g., SecOps, AIOps, DevOps) and absorbing data from outside the network edge (e.g., cloud services, core network, business applications). This systems integration must be led by the SD-WAN solution providers.

On the SD-WAN systems side, Cisco faces the challenge of positioning the company's two SD-WAN offerings in the Cisco portfolio. With Cisco SD-WAN powered by Viptela and Cisco SD-WAN powered by Meraki, Cisco can cover just about any use case, but it needs to provide clear guidance on which implementation is best for each to avoid confusing customers. Cisco also has an opportunity to further build integrations across its WAN and LAN portfolios, including across its SD-WAN portfolio and its line of Catalyst switches, WLAN equipment, and DNA Center software. The recent integration of Meraki and Catalyst switches is an example of the progress Cisco has made.

Conclusion

Network analytics and automation offers much promise in helping organizations overcome the challenges associated with managing an ever-expanding and increasingly demanding network edge. SD-WAN management responsibilities — such as understanding current conditions, resolving existing or developing problems, identifying onrushing threats, ensuring full resource utilization, and adapting readily to new demands — are bolstered by detailed network intelligence, in-depth analysis, and precise directed actions. In this hyperconnected digital era, network knowledge is a prime determinant of success in building, operating, and advancing a resilient and responsive network edge — an increasingly critical and complex component of the digital infrastructure.

SD-WAN management responsibilities are bolstered by detailed network intelligence, in-depth analysis, and precise directed actions.

About the Analysts

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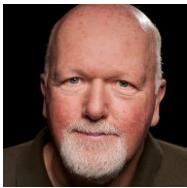
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MESSAGE FROM THE SPONSOR

The Cisco® SD-WAN Analytics solution aggregates a large volume of telemetry data and correlates analytics to provide insights. A highly visualized and intuitive user interface addresses the traditional challenges associated with network analytics for an improved user experience. By aggregating large volumes of telemetry data, establishing historical benchmarks, and correlating analytics to provide actionable insights across the internet, cloud, and SaaS, Cisco SD-WAN Analytics transforms network operations from a reactive model to a highly proactive one.

To learn more about Cisco SD-WAN Analytics solution go to: https://www.cisco.com/go/sdwananalytics

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