

White Paper

Simplified Datacenter Network Automation: The Missing Piece in DX Strategies

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IDC OPINION

The traditional datacenter network – hardware centric and managed via CLI – has long been an inhibitor to the agility of datacenter infrastructure and operations. Given its manual operational regimen, the datacenter network has also been subject to configuration errors that have affected application availability and performance, which are critical to business outcomes in the larger context of digital transformation (DX).

Enterprises increasingly recognize the value of datacenter network automation, including as a means of bolstering business resilience and continuity, but they need more than a partial approach represented by a mix of automated scripts and configuration automation tools. What's required is a comprehensive approach to network automation that provides operational simplicity as well as a single source of truth for integration and networkwide policy management, giving network operators a way to harness the network as a unified entity rather than a collection of disparate devices spread across a hybrid landscape.

From a business perspective, the result should be an automated datacenter network that is aligned with other automated infrastructure in the datacenter – better able to support and deliver business outcomes associated with the applications and workloads that it carries.

SITUATION OVERVIEW

In the context of digital transformation, applications are more important than ever, increasingly serving as the means by which organizations transact business and engage with customers.

Understandably, enterprises are demanding greater agility and speed throughout their digital processes, including the workflows involved in the creation, deployment, and management of applications. While developers and DevOps teams have moved to CI/CD processes and other agile means to expedite development workflows, they are often inhibited by a reliance on their organizations' slower-moving underlying infrastructure. Responsiveness and quick turnarounds are required for resource requests, but the reality of infrastructure provisioning is another matter. Cumbersome provisioning processes consume too much time, hobbling developers and constraining the applications now at the forefront of digital business. The ultimate result is a drag on business agility.

This situation is exacerbated by the rise of cloud, which represents not only a destination for workloads but also an operating model and a set of technologies. Cloud models and processes have become key means through which digital transformation is realized, and developers and DevOps teams have embraced them for the agility, flexibility, and speed they confer.

In the datacenter, the network has been especially notable as an inhibitor to agility, long compromised by a hardware-centric, CLI-oriented approach to provisioning, configuration, and managing various network elements. In many respects, the network remains a silo unto itself, an isolated island still defined by manual processes that are complex and time consuming, subject to configuration errors that can bring down networks and the applications that traverse them.

Indeed, IDC estimates that the mean cost of enterprise downtime, frequently caused by network outages, is \$250,000 per hour. That number applies across all industries, organizational sizes, and geographies. Depending on the organization, however, the actual cost of downtime can vary widely. For example, large financial institutions, which have heavy transaction loads, can incur downtime losses measured in millions of dollars per hour. That said, an "average" organization experiencing a relatively short 8-hour outage would lose approximately \$2 million as a result of downtime.

Decades-old network operations (NetOps) practices, now outdated and out of step with cloud processes and principles, have prevented network infrastructure and the network professionals who manage it from aligning with the automation-driven capabilities of other forms of datacenter infrastructure, namely, virtualized compute and storage. These practices also have prevented network infrastructure and its operators from meeting the agility needs of developers in a business world redefined by digital transformation and cloud.

The Future of Datacenter Network Automation

In the enterprise datacenter, network automation has emerged gradually, but it is often fragmented, partial, and piecemeal, frequently represented by automated scripts and configuration automation tools. These have applicability and value in some use cases, and they are useful tools for network engineers beginning their automation journey, but they have their limitations and only scratch the surface of what's required. One significant limitation of these tools is their inability to adequately accommodate and abstract evolving datacenter networking environments, especially over time, as playbooks find it increasingly challenging to keep pace with application-driven network automation requirements.

What is needed is an approach to network automation that provides operational simplicity as well as a single source of truth for integration and networkwide policy management. Such solutions must simplify the automated management of datacenter networks so that operators can define and automate network and security policies across the network as a single entity rather than on a box-by-box basis. This also provides a solid foundation for comprehensive datacenter network automation, extending throughout the network life cycle, from day 0 to day n, resulting in closed-loop network management processes that leverage mechanisms such as AI and ML to make the network better serve the needs of the applications and workloads that traverse it.

Ultimately, as it evolves, this approach to datacenter network automation will result in autonomous or self-driving datacenter networks, capable of using data and AI-based cognition to deliver a network automation that can be trusted to plan, design, validate, provision, manage, self-heal, and optimize network in an infinite virtuous cycle. These capabilities will be a boon to datacenter networks and their

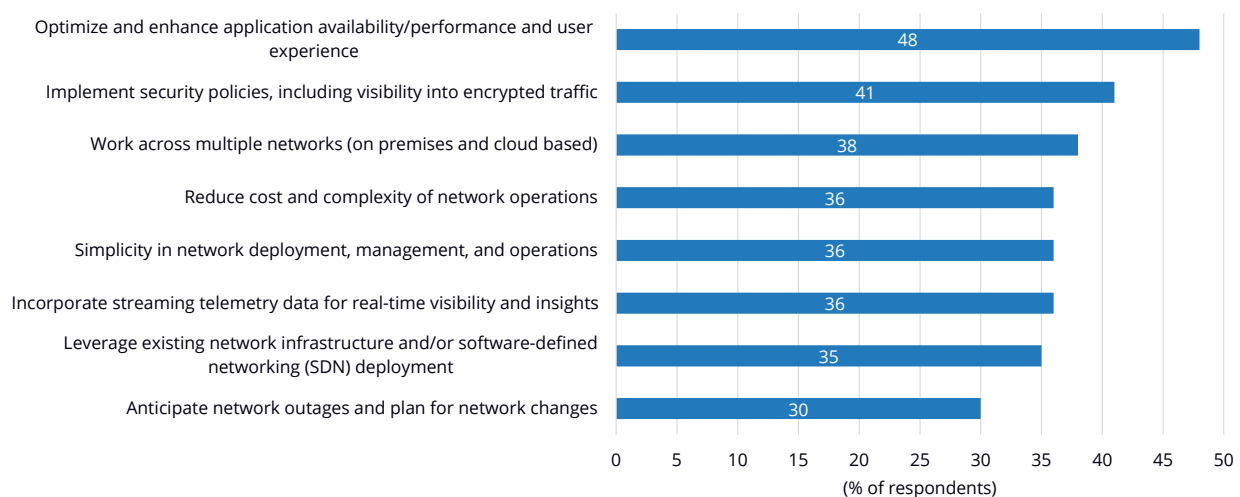
operators, which receive sometimes unwarranted blame whenever issues arise that affect application performance.

Along these lines, as shown in Figure 1, IDC's 2019 *IT Strategy and AI Adoption Survey* found that enterprises are looking to AI-enabled network automation to address several challenges, including optimizing and enhancing application availability and user experience, implementing advanced security policies, achieving effective and consistent operations across on-premises and cloud environments (hybrid/multicloud), reducing the cost and complexity of network operations, and bringing greater simplicity to network, deployment, management, and ongoing operations.

FIGURE 1

Top Priorities for AI-Enabled Network Automation

Q. *What do you see as the most important aspects of an AI-enabled network automation solution? (Pick three.)*



Source: IDC's *IT Strategy and AI Adoption Survey*, February 2019

The same survey found that 43% of respondents indicated they had implemented AI-enabled network automation to some degree, while another 34% indicated that they planned to implement AI-enabled network automation. Respondents reported they were doing so to achieve lower costs, increased agility, higher availability, and better overall security. Major drivers were the need for improved application and network performance and the desire for reduced complexity.

Enterprises pursuing datacenter network automation typically have done so incrementally, but a galvanizing vision is necessary at the outset, including an understanding that policy-based datacenter network automation must encompass more than box-by-box provisioning. Ideally, network automation must provide insights and validation mechanisms for day 0 planning and design, followed by automation of day 1 deployment and provisioning across the network as a whole, supplemented further by day 2 management and monitoring, and finally augmented and consummated by day n optimizations, which then feed back into the refinement of policies and procedures that automate the next iteration of the network life cycle.

Through it all, intelligent network automation must be simple to consume, deploy, manage, and refine. This simplicity involves abstracting inherent complexity, which otherwise would impair operational agility. Complexity is compounded by the fact that the cloud-era datacenter is necessarily distributed, no longer a fixed geographic entity on enterprise real estate. As the datacenter has expanded into centers of data – now distributed across on-premises datacenters, colocation facilities, and public clouds – the datacenter network is similarly redrawn and redefined to serve a distributed mandate. This is necessarily complex, involving far-reaching connectivity to applications and workloads in IaaS clouds, each of which has different connectivity models and API-based network services. These clouds, as well as on-premises environments, also encompass heterogeneous infrastructure and applications, spanning traditional applications on virtual machines and modern containerized applications.

Amid this unprecedented application complexity and diversity, network operators need a means of automating the network that begins with the principle of application primacy. They require a network automation platform that delivers a simplified approach to defining and implementing application-based network and security policies, as well as actionable, application-oriented insights into network availability, performance, responsiveness, and intrinsic security.

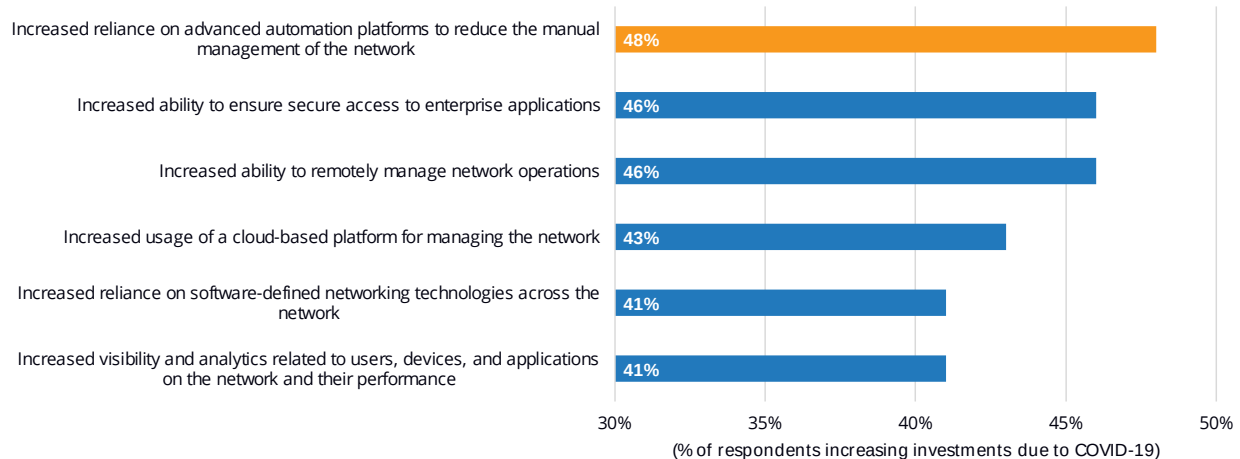
Such an approach to application-based automation of a datacenter network that may extend across hybrid and multicloud environments will also help the network, and those who operate it, better align with and service the needs of developers and DevOps teams. In this context, policy-based and application-driven automation of the datacenter network can help accelerate the velocity of the DevOps delivery pipeline, whereas manual network processes entail friction with DevOps and result in time-consuming processes that translate into the antithesis of business agility. To be sure, in IDC's 2019 *U.S. DevOps Survey of Large Enterprise Organizations*, 61% of respondents cited manual processes as their greatest process bottleneck.

Finally, as the world slowly recovers from the COVID-19 pandemic and the economic hardship that has followed in its wake, IDC has noted that business resilience and continuity have been cited as long-term enterprise IT priorities. From a datacenter networking perspective, while some effects of COVID-19 will not leave a permanent mark, IDC strongly believes that the pandemic has driven a long-term requirement for datacenter network automation and multicloud networking. Indeed, network automation was cited as the top area for network investments in IDC's *Future-Proofing Enterprise Networking Survey*, conducted in June 2020 (see Figure 2). Both network automation and multicloud networking can help organizations keep the lights on and their businesses running even in the event of another major crisis that prevents people from getting into on-premises facilities.

FIGURE 2

Network Automation Tops Areas of Increased Network Investment in Post-COVID World

Q. *In which of the following areas, if any, will your organization increase investments as a result of new business operations that are required because of COVID-19 or in a post-COVID-19 world?*



n = 254

Source: IDC's *Future-Proofing Enterprise Networking Survey*, June 2020

Benefits of Datacenter Network Automation

Benefits of having this intelligent approach to datacenter network automation are many:

- **Greater agility, flexibility, security, and resilience in support of application delivery and integrity:**
 - Datacenter network automation, properly defined and implemented, invests the network and its operators with the agility, flexibility, security, and resilience that assures the delivery and integrity of all-important applications.
- **The ability to contribute meaningfully and measurably to business outcomes, including the release of new applications, product launches, and new customer-facing services:**
 - Following logically from the benefit described in the preceding bullet point, the ability to contribute meaningfully and measurably to business outcomes is particularly relevant in giving the network and the professionals who operate it a new, vital prominence that directly aligns with the purpose and business outcomes of digital transformation. Indeed, comprehensive network automation can contribute materially to business outcomes such as faster delivery of applications and digital services, quicker product launches, and enhanced customer engagement and experiences.
- **Focus on what the business needs strategically from the network instead of on what siloed network elements demand from IT operations:**
 - To its detriment, datacenter network infrastructure and its practitioners have often been disconnected and divorced from other infrastructure and IT teams, as well as alienated

from the needs of the business. The network has been widely seen as a collection of siloed devices that are complex and costly to manage, incapable of responding at speed to the dynamic needs of the business. Policy-based network automation can alter that perception, resulting in a new reality in which the network emerges as an autonomous entity that moves in seamless, smooth alignment with other infrastructure and the dynamics of the business.

- **Increased operational efficiency and NetOps productivity:**
 - An associated benefit is that the policy-based datacenter network automation also results in increased operational efficiency and greater NetOps productivity, helping transform network operations from a perceived cost center into a modern NetDevOps cohort fully aligned with the workflow-based processes of IT colleagues and business units as well as DevOps practices.
- **NetOps alignment with DevOps and CI/CD processes:**
 - An alignment of automated network infrastructure and operational workflows with those belonging to other forms of infrastructure and DevOps and CI/CD processes results in expedited application-oriented workflows.
- **The capacity of the network to support and enhance hybrid IT and multicloud strategies:**
 - Datacenter network automation can help the network fulfill its rightful multicloud mandate as the digital nervous system for the cloud era. A device-based, manually operated approach to managing a multicloud network is destined to fail. Conversely, a comprehensively automated network, throughout its life cycle and everywhere it reaches, becomes the flexible foundation for a successful multicloud strategy.

VMWARE'S APPROACH TO DATACENTER NETWORK AUTOMATION

VMware's approach to network automation involves an integration of vRealize Automation with NSX Data Center to support rapid application rollouts with consistent networking and security services across hybrid application environments, helping organizations achieve faster time to market, operational savings, and productivity gains.

This approach to application-based network automation ensures that policy is provisioned, managed, and retired in alignment with workloads, eliminating operational bottlenecks in the process. The goal is agile, consistent network and security policy across traditional workloads and modern containerized applications, regardless of whether they reside in on-premises datacenters or in public clouds. As such, these capabilities extend to multicloud and modern application environments, including Kubernetes infrastructure.

Ease of deployment and simplified usability enable VMware's extensible datacenter network automation capabilities to meet the need for greater network agility, flexibility, security, and resilience across a distributed and increasingly complex application landscape. Consequently, those responsible for the network, both NetOps and cloud architects, can play a valuable role in ensuring that the network provides business value by fulfilling its end of the bargain in helping speed the delivery and ensure the timely success of new applications, rapid product launches, and customer-facing services. Through application-based datacenter network automation, the network is better aligned with and directly contributes to business requirements and tangible outcomes by supporting and adapting to application requirements.

Similarly, VMware's combination of vRealize Automation and NSX Data Center also provides datacenter network automation that helps the network, and its operators, find common cause and alignment with developers, DevOps, and cloud architects, achieving a consensus of interests and standardized environments that protect against configuration drifts and other inconsistencies and irregularities, including security vulnerabilities, associated with less automated approaches.

Together with NSX Data Center, vRealize Automation can allow enterprises to embrace and apply network automation to extend network and security policies across modern applications, heterogeneous environments, and multiple clouds. Even if workloads move between clouds, consistent network configurations follow them and automatically update, mitigating the need for manual adjustments for managing the network environment.

CHALLENGES/OPPORTUNITIES

For enterprises and for VMware as a vendor of network automation, a significant challenge is represented by a culture of traditional network operators that can be skeptical and resistant to automation and software-defined approaches. This can be, and has been, overcome in many organizations by demonstrating that intelligent network automation confers opportunities and tangible benefits rather than threats. Network operators that embrace intelligent network automation can recast the network and their role in a context that is directly relevant to the business and its objectives, including the business outcomes discussed previously in this white paper.

Another related challenge involves the misperception that network automation can be daunting and difficult. To the contrary, as explored in this white paper, intelligent network automation, while addressing and resolving considerable underlying complexity, can and should be simple to consume, deploy, manage, and maintain. It ultimately makes the complex simple.

CONCLUSION

With the rise of cloud applications and operating models, and the need to support cloud-native applications as well as traditional applications across a hybrid/multicloud landscape, the imperative has never been greater for a comprehensive approach to datacenter network automation that can deliver on the requirement for simple and consistent definition and enforcement of network and security policy across on-premises datacenters and public clouds.

The benefits of such an approach, as discussed in this white paper, include not only valuable operational efficiencies and the cost savings that accrue from them but also significantly improved workload and network security, a huge reduction in manual network configuration errors that can result in vulnerabilities and outages, better integration of NetOps with DevOps, and a simplified means of extending consistent network and security policy across multicloud environments that include both traditional and modern application infrastructure.

Organizations that have not properly and fully automated their datacenter networks have learned that business agility is dependent on the speed and adaptability of the underlying infrastructure. Conversely, organizations that have adopted and implemented application-oriented, policy-based datacenter network automation have found that it delivers a consistent and extensible digital nervous system that can support the applications of workloads they have today as well as those they will deploy in future, both on premises and in public clouds.

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