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Network Modernization: Essential for Digital Transformation and Multicloud

IDC OPINION

Network modernization and transformation, from the datacenter to the wide area network (WAN) and the branch, are necessary and integral facets of broader enterprise efforts to comprehensively modernize IT infrastructure and processes in service to digital transformation (DX).

As applications have become increasingly important to business outcomes, and as the application landscape has been redefined by cloud and multicloud, the network must adapt architecturally and operationally. This change must occur in the datacenter, where fixed boundaries have been redefined by cloud, and at the branch, where application-driven connectivity requirements and operational needs have similarly been recast by cloud adoption. The focus now is on intelligent network automation and increased programmability, which provide the agility, flexibility, security, and elastic scale that cloud applications require.

In this white paper, IDC examines why extensive network transformation must accompany digital transformation and explores how IBM seeks to help enterprises address changing architectural and operational requirements from the multicloud datacenter network to the WAN.

SITUATION OVERVIEW

Digital transformation remains a driving imperative for organizations worldwide. Enterprises across industries and geographies are digitizing to achieve greater agility, operational efficiency, and competitive advantage. Every organization is becoming more like a technology company as digital experiences and digital proficiency grow in importance.

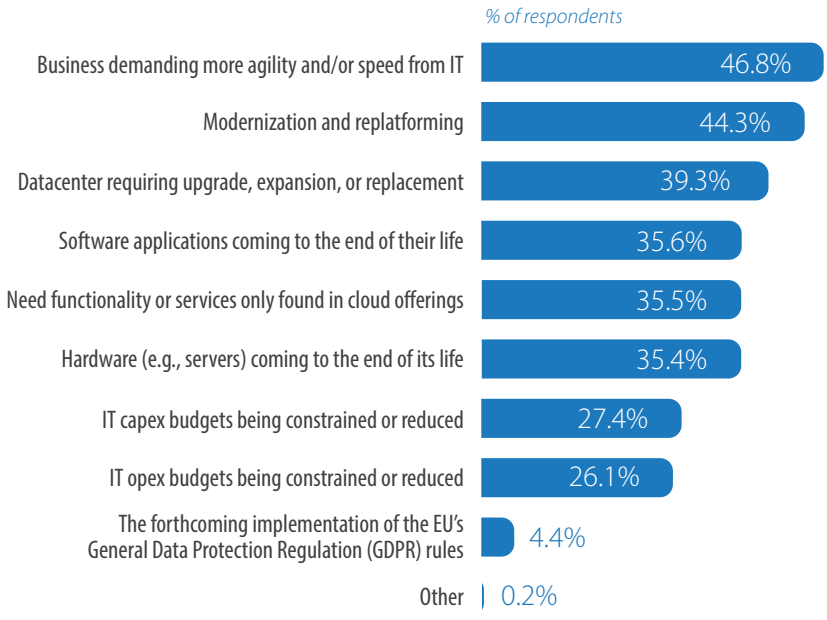
While most organizations have come to value the critical importance of digital transformation to their long-term success, they sometimes have less appreciation for the integral role that optimized IT with a modernized network infrastructure and operational practices plays in enabling the fulfillment of digital transformation initiatives. That said, the network's growing importance comes into clear view when one examines the role of cloud in DX strategies.

Cloud is a key means by which organizations pursue and realize digital transformation. Cloud adoption occurs within the larger context of transformation of the IT department and the need for IT agility. Indeed, IDC expects spending on cloud IT infrastructure to exceed spending on traditional IT infrastructure on an annualized basis in 2020, confirming the new reality of hybrid IT and cloud.

In IDC's 2018 *CloudView Survey,* respondents were asked to cite trigger factors or events that have been (or would be) most important in leading them to use or seriously consider using cloud services. About 47% of respondents cited the business demand for more IT agility and/or speed, about 44% cited modernization and replatforming, and 39% referenced the requirement for a datacenter upgrade, expansion, or replacement. This data confirms that cloud is perceived as an enabling mechanism for the realization of digital transformation (see Figure 1).

FIGURE 1 Average Annual Benefits per Database

Q. Which of the following trigger factors or events have been (or would be) most important in leading you to use or seriously consider using cloud services?



n = 5,740 Source: IDC's CloudView Survey, April 2018

Enterprises are also increasingly adopting multicloud within the framework of their DX strategies. More than 90% of enterprise respondents to IDC's *CloudView Survey* indicated that they would evolve their digital transformation strategies to encompass multicloud postures this year (2019). (IDC defines multicloud infrastructure as enterprise use of two or more infrastructure clouds.)

IDC has found a direct correlation between the number of clouds leveraged by an enterprise and the degree of complexity associated with its multicloud challenge. Indeed, multicloud management, including the management of the network infrastructure on which multicloud depends, remains a significant enterprise priority. While the promise is compelling and motivations are many, the adoption of multicloud presents risks as well as rewards.

CLOUD DRIVES NEED FOR COMPREHENSIVE NETWORK MODERNIZATION

Network modernization is essential to enterprise success in the cloud era. The network, after all, is the backbone and nervous system connecting the various distributed datacenters — on-premises, colocation facilities, IaaS public clouds, and SaaS services — to the network edge, which includes employees at branch offices and customers and partners worldwide.

Cloud, as both a destination for workloads and a set of highly efficient operating practices, provides a foundation for enterprise agility and flexibility, but it also challenges the network to support and deliver distributed applications and data, which are of unprecedented importance and value in the context of digital transformation.

Consequently, network modernization must be far reaching and comprehensive, extending from the core, made up of datacenters and clouds, through the enterprise campus and out across the WAN to branch locations and remote sites.

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In the prior client/server era, the datacenter network was exclusively on-premises, but multicloud means that the datacenter (and the network that supports it) becomes inherently distributed and more complex to provision and manage. Even in the on-premises datacenter, in the context of relentless digital transformation, the network must become more agile, automated, flexible, programmable, and open. In other words, cloudlike network infrastructure and operational models apply everywhere, not just in public clouds. Indeed, cloud is at least as much an operational model as it is a destination (or destinations).

As virtualization continues to grow — now accompanied by containerization and microservices — its implications are being felt throughout the datacenter. It is now understood that traditional datacenter network architectures were designed to accommodate client/server applications residing on physical servers, characterized by single tenancy and relatively predictable north-south traffic patterns. These traditional network architectures were not designed for virtualized or containerized applications with intensive east-west (server-to-server and rack-to-rack) traffic flows. Neither the traditional three-tier network (core, aggregation, and access) nor manual, CLI-based network management practices were built to accommodate cloud-native application environments or to facilitate cloudlike operational agility. While virtualization initially exposed the limitations of traditional networking, cloud computing has made those limitations untenable.

Meanwhile, in the campus, there is a similar need to escape the constraints of the CLI and to use programmability and automation to improve the agility and responsiveness of provisioning and ongoing network operations. Similarly, as in the datacenter, there is a greater need for pervasive visibility to expedite troubleshooting and remediation of network and security issues that can result in disruptions or outages.

Over the WAN, the need for modernization is particularly acute. In this context, network resources that support digital initiatives are under intense scrutiny. The traditional enterprise WAN was built primarily to accommodate traffic patterns for applications that resided exclusively behind the firewall in enterprise datacenters. As such, it was not architected for the cloud, nor was it intended to facilitate digital transformation. Instead, legacy WANs were designed and constructed to support branch-to-datacenter and branch-to-branch traffic, not to support increasingly critical branch-to-cloud application traffic. Furthermore, the traditional WAN was poorly suited to the security requirements associated with distributed and cloud-based applications.

An additional complication is that legacy WANs — difficult to configure, deploy, and manage — are inherently incapable of supporting the business agility that is prized in the context of digital transformation.

Traditional hub-and-spoke WAN architectures usually necessitate backhauling internet-bound traffic from branch offices to the datacenter, then out to where applications reside in the cloud before going back through the datacenter and on to the branch. This is costly and inherently inefficient, ultimately compromising application performance, business agility, and employee productivity.

The rise of hybrid IT and multicloud also has significant implications for the WAN and the branch. That's because WAN requirements, technical and operational, have been just as redefined by SaaS and IaaS applications as have those of the distributed datacenter.

In IDC's 2018 *U.S. Enterprise Communications: Connectivity Survey,* respondents were asked to cite three issues that had or were having the greatest impact on their WAN and datacenter operations and strategy. Topping the list was cloud computing, including SaaS and IaaS, cited by nearly 35% of all respondents. Next in line was network bandwidth and connectivity between datacenters, cited by more than 31% of respondents.

ADDRESSING THE MODERNIZATION CHALLENGE ACROSS THE NETWORK

Datacenter and Multicloud SDN

Networks and those who operate them face daunting modernization challenges, but fortunately, solutions have been developed to address cloud requirements.

In the datacenter, software-defined networking (SDN) has emerged as an architectural approach to datacenter networking in the cloud era. SDN essentially is an architectural model that can help better align network infrastructure with the needs of application workloads through automated (more agile) provisioning; programmatic network management; application-oriented, networkwide visibility; and, where needed, direct integration with cloud orchestration platforms. These capabilities can translate into significant operational savings while providing organizations with a means of achieving faster time to revenue. In that sense, SDN can help position the datacenter network as an enabler of business outcomes related to increasingly critical applications rather than a cost center. It can also help network operators reposition themselves as digital transformers rather than CLI jockeys.

That said, even datacenter SDN has been compelled to evolve further to respond to the rise of multicloud. As the parameters of the datacenter network are redrawn by cloud technologies and operating models, network modernization must occur wherever applications reside, including the on-premises datacenter and out to public clouds. A comprehensive approach to multicloud SDN can ensure that consistent network and security policies are simply and declaratively defined and then consistently enforced across a hybrid IT and multicloud landscape.

Cloud-native applications, based on containers and microservices, further complicate the picture and drive a need for modernization of datacenter network infrastructure. From a networking perspective, containers and microservices have particular requirements, and SDN platforms must be able to accommodate them. Any SDN fabric implemented to support containerized microservices must have automated agility, elasticity, flexibility, programmability

Source: IDC, 2018

(including API support and plug-ins), and network security suitable to those environments. In many cases, the network will be required to extend from Layer 2 to Layer 7, the application layer, where open source technologies, including service meshes, are destined to play an integral role.

Enterprise Campus SDN and SD-WAN

SDN in the enterprise campus, often referred to as SD-LAN, provides a means of automating and verifying otherwise error-prone CLI-based network provisioning and configuration processes. What's more, SD-LAN can bring much-needed agility and flexibility to networking on sprawling enterprise campuses, including both wired and wireless networks. SDN on the enterprise campus can assist in implemented segmentation and microsegmentation for zero-trust secure postures while contributing to faster troubleshooting and remediation of network-related incidents that affect employee productivity.

While those benefits are undeniably compelling, the need for network modernization has been felt even more keenly on the WAN. SD-WAN has emerged as a solution for modern enterprises dependent on the cloud and on a workforce requiring "anytime, anywhere" application access.

Borrowing from the principles of SDN in the datacenter, SD-WAN decouples the application from underlying network transports, providing the flexibility to run any application over any transport or combination of transports, which can include MPLS, business- and consumer-grade broadband internet, and 4G/5G. Consequently, SD-WAN is about WAN transformation for the cloud era, helping ensure that branch offices and remote sites are configured consistently to connect users to applications while ensuring security and optimizing network and application performance and lowering complexity and costs.

A typical SD-WAN offering includes an application-based policy controller, analytics and telemetry for application and network visibility, a secure software (virtual) overlay that abstracts underlying networks, and an SD-WAN forwarder or router at the branch. These technologies are combined in SD-WAN to provide application-driven intelligent path selection across heterogeneous WAN transports (MPLS, broadband internet, LTE, etc.) based on policies centrally defined on the controller.

IDC research indicates that the need for SD-WAN is acute for a growing number of enterprises, especially as they migrate to public cloud services and seek to strengthen their degree of customer engagement. In IDC's October 2018 worldwide *Software-Defined WAN Survey,* 95% of enterprise respondents indicated that they expected to deploy SD-WAN within two years.

According to IDC's February 2019 IT Strategy and AI Adoption Survey, respondents cited optimizing and enhancing application availability and performance and user experience as one of the most important aspects of AI-enabled network automation.

AI-SUPPORTED NETWORKS AND OPEN, STANDARDS-BASED TECHNOLOGIES

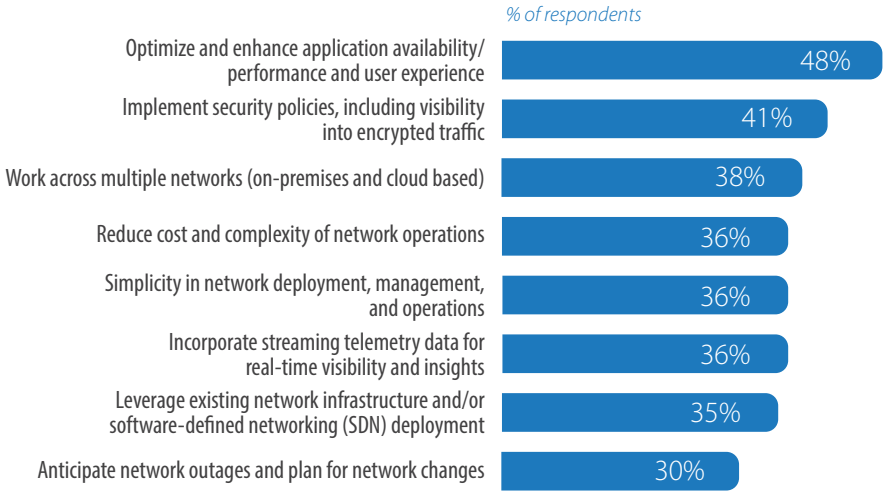
In the cloud era, enterprises also perceive considerable value in having AI-enabled network automation across all places in the network. According to IDC's February 2019 IT Strategy and AI Adoption Survey, respondents cited optimizing and enhancing application availability and performance and user experience as one of the most important aspects of an AI-enabled network. Also cited frequently was implementing security policies, including visibility into encrypted traffic (see Figure 2).

As organizations grapple with the implications of digital transformation and the need to effectively harness hybrid IT and multicloud amid an ongoing skills shortage relative to new processes and technologies, they are demanding approaches that mitigate complexity and deliver simplicity. After all, complexity is the enemy of agility, a paramount objective in the realm of digital transformation.

Open architectures and standards-based technologies are also valuable because they provide choice and flexibility, allowing for the seamless adoption of new technologies to meet evolving requirements.

FIGURE 2 Optimization of Applications/User Experience Plus Security Are 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.)*



n = 301 Source: IDC's IT Strategy and AI Adoption Survey, February 2019

IDC ANALYZE THE FUTURE

The Value of Consultative Expertise and Guidance

Many organizations don't know where to begin as they seek to modernize their networks for DX and cloud and find themselves daunted by the breadth and depth of the challenge. They are overwhelmed by the complexity of the task and by the growing number of potential solutions available on the market. What's more, many organizations struggle to understand how their evolving application environment maps to new requirements in network infrastructure and network operations. For these customers, consultation and engagement with a knowledgeable, trusted partner is a valuable first step on the journey to successful network modernization.

Engagement with a trusted partner can help them understand how their networks can be modernized and how such modernization can be achieved pragmatically within the bounds of existing technology investments and the skill sets and comfort levels of existing IT and network personnel.

IBM'S APPROACH TO NETWORK TRANSFORMATION

IBM integrates new and existing network technologies across hybrid clouds and all of IT, taking a vendor-neutral approach, based on open standards, to address customer requirements. That said, IBM's vendor neutrality does not mean that the company lacks an informed perspective and a point of view on how each vendor's offerings can address a given customer's challenges and use cases.

In SDN, IBM has partnerships with technology vendors such as VMware (NSX), Cisco (ACI), and Juniper (Contrail Enterprise Multicloud), giving customers choice in how they address network modernization for hybrid and multicloud environments and achieve flexible workload placement across a distributed landscape. Moreover, as noted previously, IBM brings insight and perspective on how these vendor portfolios can be applied to solving specific challenges that customers face.

In addition, IBM's SDN Services can assist enterprise customers in building a highly programmable network fabric that extends from datacenter networks and clouds to SD-WAN and SD-LAN at the branch. IBM adheres to a consultative approach that helps customers define and implement modern SDN networks that have the flexibility, resilience, and openness to accommodate evolving cloud strategies.

The SDN and network modernization services that IBM provides are discussed in the sections that follow.

Network Consulting

This involves development of a strategy for the future network, including identification of any gaps that might inhibit SDN deployment, determining overall automation needs, defining an orchestration strategy, and developing a road map. IBM Network Services was positioned as a market leader in *IDC MarketScape: Worldwide Network Consulting Services 2019 Vendor Assessment* (IDC #US44532219, July 2019). In that document, IDC noted that IBM's strengths include network security, operational efficiencies, and digital transformation, as well as a consultative expertise that yields customization for specific industries and customer requirements.

Software-Defined Networking

IBM's SDN Services helps enterprise customers build a highly programmable network fabric that spans SDN datacenter/cloud (SDN-DC), SD-WAN, and SD branch networks (SD-Branch/SD-LAN). This core-to-edge approach to carrier-neutral solutions for SDN/SD-WAN covers device integration, cloud-based application delivery, security options, and other network services.

IBM Client Innovation Centers help customers build, integrate, and test SDN solutions prior to deployment in production environments, simulating real-world conditions to proactively identify and resolve potential issues and to help teams gain familiarity with the new technology.

Managed Network Services

For efficient management and operation of SDN environments, IBM offers customizable, modular, and catalog-based remote network monitoring, management, and reporting services.

IBM managed services for SDN can help ensure that a new network will continue to work as intended well into the future. IBM can also provide ongoing support services directly or help enterprises gain the skills to maintain and operate networks themselves.

Cloud Network Intelligent Control

IBM's Cloud Network Intelligent Control Center (CNICC) is a control point for integrating and managing multivendor virtual network functions and services. Leveraging intent-based orchestration and software-defined methods, it reduces hybrid cloud network integration complexity and improves implementation cycle time while offering selection based on unique network needs. CNICC delivers value across the full life cycle of a network, including design, transformation, and management.

You can find more information about IBM's products by clicking this link: https://www.ibm.com/services/network

CHALLENGES/OPPORTUNITIES

For the enterprise customer, the opportunity lies in better aligning the network architecture and operations with the needs of the organization. This occurs through enhanced network support for the applications and workloads that provide engagement and value to customers, partners, and employees. The challenge is to transform the network from being perceived as a cost center and a rigidly siloed IT discipline, with its own arcane practices and inherent operational complexities, into a meaningful facilitator of business outcomes and business value, more closely connected with other IT departments and with the strategic charter of the organization.

For IBM, the opportunity involves becoming a trusted partner to these organizations as they pursue network modernization as a linchpin of digital transformation. By helping organizations plan and execute their network modernization initiatives, from the on-premises datacenter out to public clouds, as well as branch offices and remote sites, IBM can become a key resource and trusted partner. Many organizations, as mentioned previously, require such assistance because of the nature of the challenges, which often involve the acquisition of new skills or the utilization of new technologies.

In that network transformation invariably occurs as part of broader transformation initiative, involving not only other forms of infrastructure but also operational processes, IBM is well placed to offer value across the entire transformation spectrum, ensuring that the network is well aligned with overall outcomes and objectives.

The challenge for IBM is to demonstrate that it has the expertise and the technology portfolio to help customers navigate this new realm of network modernization and transformation. IBM faces competition in this area, and it must establish itself as both a thought leader and an exemplar of practical network modernization.

CONCLUSION

Digital transformation and the enterprise's embrace of multicloud are redrawing the boundaries of the datacenter and consequently redefining what's required of both datacenter networks and WANs. In this context, network modernization and transformation are necessary to ensure

that the network can accommodate and support the needs of distributed workloads and digitized business.

Network agility is prized in the cloud era, and it is achieved through the ability of SDN and SD-WAN to provide intelligent, application-oriented automation. Flexibility and choice are similarly valued, and they are achieved through adoption of products and technologies that are open and standards based. Nonetheless, many enterprises acknowledge they have a need for SDN and SD-WAN, but they are unsure of how to proceed or uncertain about which products and technologies are best suited to their hybrid IT and multicloud strategies. Consequently, they seek to work with a trusted partner that can help them assess, select, deploy, and manage the right approaches to network modernization for their environments.

IBM's services portfolio for software-defined network modernization is designed to help customers pursue network transformation that aligns with their broader IT and digital transformation initiatives. If IBM continues to successfully meet the challenges outlined in this white paper, it will remain well placed to help its customers build modernized, intelligent networks that offer the agility, flexibility, programmability, elastic scalability, and security required to support distributed applications and workloads in a multicloud world.

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