A modern datacenter network must be simpler to provision, deploy, and manage — transparently responsive to the needs of application developers, ITOps, and the business.

Modernizing Datacenter and Edge Networks for Cloud-Era Centers of Data

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Introduction

Cloud has had an enormous impact on digital transformation (DX) and IT strategy, not just as a destination for workloads but also as an operating model for networks. Cloud has had this impact due to a new set of software-defined technologies.

The traditional enterprise datacenter, an on-premises entity that once contained all enterprise applications, has been superseded by a distributed and virtualized datacenter, inclusive of the on-premises datacenter but extending out to colocation facilities, public clouds, and an increasing number of edge environments.

This shift carries significant implications for infrastructure and operations, both of which must be modernized to align with cloud-centric application requirements and operating models. While modernization of compute infrastructure is understandably important, the transformation of network infrastructure is equally critical because the network serves as the IT nervous system that carries and supports increasingly valuable applications and data.

It's a paradox, in fact, that while the network is more important than ever, it also must become less visible and more transparent, supporting and delivering applications and workloads while staying out of the way of the application developers and business processes that are increasingly intertwined. This highly functional unobtrusiveness must also extend to how networks are managed and operated.

IDC predicts that, by 2023, more than 55% of enterprises will replace outdated operational models with cloud-centric approaches that facilitate, rather than inhibit, organizational collaboration, resulting in better business outcomes. For the model to work, however, outdated organizational structures and operational models must be eliminated. This will result in the replacement of traditional functional IT silos with collaborative, multidisciplinary teams aligned with software development processes. These collaborative teams will increasingly leverage a common set of automation, actionable data, and business-driven workflows, complementing constant process iterations and improvements.

AT A GLANCE

KEY STATS

According to IDC research, by 2023:

» 70% of enterprises will run varying levels of processing at the IoT edge.

» About $16 billion will be spent on IoT infrastructure.

» More than 50% of new enterprise IT infrastructure will be allocated to edge environments.

WHAT'S IMPORTANT

The traditional enterprise on-premises datacenter has been superseded by a distributed and virtualized datacenter that includes colocation facilities, public clouds, and an increasing number of edge environments.

There's no question that the datacenter must be reimagined and redesigned to account for the new distributed datacenter, which could also be described as multiple centers of data. All facets of the distributed datacenter, including the existing on-premises datacenter network, should undergo significant modernization initiatives to deliver the agility, flexibility, elastic scale, seamless integration, inherent security, and simplified management that cloud requires.

This means the network must be capable of supporting modern applications and hybrid IT strategies, from the on-premises datacenter out across the WAN to support cloud workloads and optimized application access at branch offices and other remote sites. In addition, consideration must be given to proliferating edge environments that accommodate both IT and OT use cases, where processing and analytics will need to be carried out locally to support low-latency and other business-critical applications.

As enterprises execute their cloud strategies, they invariably find that infrastructure transformation, including modernization of the network infrastructure, is both acutely required and highly challenging. In IDC's 2019 *Datacenter Operational Survey,* enterprise respondents identified "improved network performance" as one of their top 2 priorities relating to hybrid IT and multicloud environments. Similarly, in IDC's 3Q19 *Cloud Pulse Survey,* 59% of enterprise respondents indicated that "integrated network processes across cloud providers" would be an important area for cloud investments during the next two years.

At the edge, too, challenges proliferate and contribute to the complexity, including the issue of application latency for applications and services that must be processed locally rather than being sent to the cloud for processing. IDC predicts that by 2023, 70% of enterprises will run varying levels of processing at the IoT edge. According to IDC projections, about $16 billion will be spent on IoT infrastructure in 2023. Further, IDC expects that more than 50% of new enterprise IT infrastructure will be allocated to edge environments, and these edge environments will have to be connected reliably and securely to datacenter and cloud networks.

Reasons for Network Modernization

Hyperscalers and cloud giants have led the way in demonstrating the operational efficiencies and business benefits that accrue from having a software-defined and workload-driven approach to network modernization. Those organizations have built and operated datacenter networks at unprecedented scale and operational efficiency.

Admittedly, enterprises aren't hyperscalers — as they are in different businesses, have different needs, and generally have fewer resources at their disposal — but digital transformation still compels them to modernize their networks through adherence to cloud models and best practices. What they need, then, is for hyperscale network innovations to be adapted, repackaged, and simplified by the vendor community to accommodate enterprise consumption, deployment, and day-to-day operations spanning the distributed datacenter.

Increasingly, software processes, such as development workflows and CI/CD pipelines, are the drivers of infrastructure and operational modernization, and networking benefits from being aligned with those processes. Several requirements must be met, including the need for speed (agility), reduced time to service delivery, risk reduction, and flexible consumption (e.g., the option to deploy a half rack of standardized hyperconverged infrastructure [HCI] at a couple dozen "mini" edge datacenters). Flexible consumption requires lighter, more resource-efficient IT infrastructure that can still provide the necessary processing and connectivity (compute, SSD, and 25GbE networking) for edge environments that support applications that include VDI and business intelligence/analytics.

Most enterprises also have a need to maintain traditional datacenters while transitioning to modern datacenters at the edge, both as adjuncts to existing datacenters and as greenfield buildouts in distributed edge environments. After all, even though modern applications based on containers and microservices will multiply in the years to come, IDC research confirms that today, hybrid IT is the predominant posture of large enterprises worldwide. In an IDC *Cloud Pulse Survey* conducted in June 2020, enterprise respondents indicated that about 50% of their applications would still be running in on-premises datacenters in two years, signifying that risk-averse IT teams will continue to implement changes gradually.

Enterprises currently attempt to meet this challenge across often disjointed network architectures spanning places in the network (campus, datacenter, edge), resulting in fragmented architectures that are not optimized to satisfy application and service needs. Enterprises also manage separate and disconnected orchestration systems, accompanied by siloed IT operations teams. The situation is exacerbated by an approach to network operations that remains manual and device centric.

Yet, as we have noted, networks are increasingly critical to business success, which means network modernization is an imperative. These networks not only must contribute to an organization's DX strategy but also must proactively support an organization's increasingly valuable applications. Failure to recognize the salience of modern networks — and the significant challenges presented by hybrid architectures — can result in infrastructure and operational issues that compromise business outcomes. Modern networks that enable and support hybrid IT must provide simplified deployment and operations, elastic scale (scale out), and consistent network and security services across the distributed application landscape. In surveys and discussions with enterprises worldwide, IDC notes that the complexity of networking across hybrid environments often is a major inhibitor to business agility and outcomes as well as to the realization of hybrid IT strategies. It is an area where enterprises seek assistance from trusted technology partners.

Additional networking requirements for modern datacenters include the following:

» Consistency from the datacenter to the edge, including a consistent edge-core operating model (unified underlay, core, extensible Ethernet, and support for WAN, edge Wi-Fi, and 5G environments)

» Software-defined, application-centric automation/orchestration, also known as infrastructure as code (IaC), enabling ITOps to have a network that is fit for purpose in the cloud era

» Full stack solutions and integrations, including lightweight IT footprints for edge use cases (including support for HCI, SAP, private clouds, infrastructure as a service [IaaS], and so forth)

» Streamlined operations across IT teams, ensuring operational alignment focused on the support and delivery of applications, whereby provisioning of infrastructure and integrated processes result in less friction and fewer delays in supporting the releases and ongoing iterative enhancements to applications and services

Taken together, these are the attributes and capabilities that a modern datacenter network should provide.

Benefits of Modern Datacenter Networks

Modern datacenter networks, architecturally simple and extensively automated, can provide a range of compelling benefits:

» **Simplify and speed IT provisioning to accelerate application/service delivery.** A modern datacenter network should provide an agile, flexible foundation for cloudlike operational simplicity, which yields faster application and service delivery.

» **Achieve faster time to revenue and better support for business outcomes.** As a result of enabling faster application and service delivery, the modern datacenter network has a material impact on a business' top and bottom lines, transforming from a cost center into a key means of achieving business outcomes.

» **Increase operational efficiency of ITOps and NetOps.** As the network facilitates greater agility, flexibility, and resilience, it also enables increased operational efficiencies, irrespective of whether it is managed by ITOps or NetOps personnel.

» **Implement consistent management processes across centers of data, along with alignment across formerly isolated operational silos.** A modern, well-integrated datacenter network is inherently extensible, providing consistent policy definition and enforcement across hybrid IT and multicloud environments, including datacenters, colocation facilities, intelligent edge environments, and public clouds.

» **Improve alignment between developer needs and DevOps processes.** The modern datacenter network will also be capable of seamlessly aligning developer needs and DevOps processes as well as addressing the concerns and meeting the requirements of application owners and DevOps teams, providing the tangible benefits they need while remaining transparent and unobtrusive.

Considering HPE Aruba

How HPE Aruba Addresses the Modern Networking Challenge

The HPE Aruba datacenter networking portfolio is designed to provide simplified operations and accelerated provisioning through integrated IT solution stacks that are built to efficiently expedite application and service delivery.

Operational simplicity is addressed by a cloud-native software architecture that provides a consistent operational experience with a common network operating system (AOS-CX) spanning datacenter, campus, and edge environments.

Procurement is similarly designed to offer simplicity. A single SKU includes software features that address campus and datacenter use cases, while new hardware platforms support 10/40GbE and 25/100GbE speeds in various form factors to accommodate a mixture of compute and storage workloads.

Accelerated provisioning is the objective of HPE Aruba's software-defined fabric automation, network visibility, and extensible API integration, using common IT management stacks and tooling. Automated network infrastructure, particularly for recurring and routine tasks, results in faster server-side network provisioning and simpler network deployments via zero-touch or one-touch provisioning.

Support for integrated IT solution stacks ensures networking can be applied to validated use cases such as HCI, HPC, and SDS, with options for hybrid cloud and IaaS delivery. These stacks can serve to further simplify and speed application and service delivery and mitigate risk while reducing the time and specialized expertise required to provide business-critical IT infrastructure inclusive of networking. In these scenarios, costs are aligned with consumption, and enterprises have the option of selecting on-premises pay-per-use IT models.

Products that support these benefits include:

- » Aruba Fabric Composer

    - Aruba Fabric Composer is an intelligent, API-driven, software-defined orchestration solution that simplifies and accelerates leaf-spine network provisioning and day-to-day operations across rack-scale compute and storage infrastructure.

    - Aruba Fabric Composer software can orchestrate disparate switches as a single networking fabric, simplifying operations and troubleshooting. The software is aware of underlying infrastructure and applications, giving it the ability to automate a variety of configuration and life-cycle events.

Aruba Fabric Composer also integrates with popular third-party datacenter orchestration systems as well as with HPE server and storage hardware and software infrastructure elements. The integration enables visualization of the entire datacenter infrastructure and automation of event management processes throughout the datacenter network life cycle. It integrates with VMware vSphere environments as well as with the VMware NSX network virtualization overlay. Validated and pre-engineered integrations with Nutanix and HPE SimpliVity HCI platforms, as well as with HPE GreenLake, offer enterprise customers cloudlike opex consumption models for deploying an operating datacenter network infrastructure.

- » Aruba CX Series Switches

    - CX 8360 series fixed switches come in various port densities and include 10/25GbE and 40/100GbE. The line includes a datacenter-class switch with 12 ports, which is well suited for organizations and environments that have high-performance requirements but don't need a switch with higher port densities, which is often the case in distributed and edge datacenters.

    - The CX series switches run the AOS-CX operating system, which has been designed to support AIOps. In addition, the CX series switches provide support for VXLAN overlays, with integrated routing and bridging (IRB) and Ethernet VPN (EVPN), and provide distributed analytics with the Aruba Network Analytics Engine (NAE).

    - The CX 8360 series complements the other switch series in the CX portfolio, including the Aruba CX 8325 for ToR (leaf) and aggregation/spine deployments (10/25/40/100GbE), the Aruba CX 8400 for modular datacenter core applications, and the Aruba CX 6300M for out-of-band management.

Full IT Stack Integrations

According to Aruba, it offers an advantage over traditional network-only vendors with its HPE GreenLake Hybrid Cloud services and infrastructure as a service to support customer workloads — on premises, fully managed in a pay-per-use model at the edge, in colocations, and in the datacenter.

Aruba networking technology underpins an increasing array of these new service offerings, including VM-as-a-Service, Container-as-a-Service, and SAP HANA-as-a-Service.

In addition to these cloud and as-a-service options, customers have the option to leverage an array of pre-engineered and tested HPE and Aruba integrations for more traditional on-premises, customer-managed options. These ready-to-deploy, custom IT datacenter solutions are designed to simplify and speed IT service delivery and mitigate risk while reducing the time and expertise needed to deploy complex solutions.

These new integrations span a wide range of compute, storage, HCI, HPC, mission-critical, virtualization, and cloud offerings, including HPE ProLiant DL/DX servers, HPE SimpliVity, HPE Nimble, HPE Synergy, Cray Shasta, Cray ClusterStor, and SAP HANA as well as solutions from VMware and Nutanix.

Challenges

Datacenter networking is a competitive space with entrenched incumbents. Many enterprise customers perceive risk in displacing incumbent vendors, envisioning pitfalls in areas such as familiarity of products and technology, having to learn new ways of doing things, and having to upgrade new skills. Many customers are also considering how to execute hybrid IT strategies and ramping up migration of applications to clouds, making a focus on the on-premises datacenter a secondary concern.

Traditional network engineers and operators are sometimes reluctant to consider network automation approaches that might erode their perceived value or potentially compromise their job security. This entrenched cultural resistance to change, in organizations where it exists, can be a powerful force that is difficult to overcome.

IDC finds that nonetheless, most organizations are looking to modernize their datacenter networks, putting an emphasis on architectures and infrastructure, as well as network operations models, that can help them gain cloud-centric agility, flexibility, elastic scale, and operational simplicity. Datacenter network modernization is a growing part of the market, representative of most enterprises, and it is where HPE Aruba is pursuing adoption of its datacenter network portfolio.

Conclusion

It is readily apparent that datacenters must be modernized to remain relevant in a world where cloud technologies, operational models, and processes are predominating. For the datacenter network, the implications are profound.

Datacenter network modernization requires automation for agility as well as flexibility to support modern and traditional workloads and heterogeneous infrastructure. In addition, there is a strong requirement for extensibility and API-based programmability to integrate with cloud orchestration and management platforms and other datacenter infrastructure (compute and storage) as well as with edge environments. Datacenter network modernization requires pervasive, real-time visibility that facilitates fast troubleshooting and remediation, which in turn support a more proactive operational posture.

> Datacenters must be modernized to remain relevant in a world where cloud technologies, operational models, and processes are predominating.

The network architecture and its operational model should be better aligned with the needs of ITOps, DevOps, and application developers. To serve those constituencies, the network must be simpler to provision, deploy, and manage — transparently responsive to the needs of application developers, IT Ops, and the business.

The network is more important than ever, a critical digital conduit through which applications, data, communications, and transactions flow. That said, the networks of the past cannot meet the needs of the present and certainly not those of the future. If HPE Aruba can successfully address the challenges cited in this document, its approach to modern datacenter networks should be well received to gain traction among enterprises that are pursuing meaningful infrastructure and process modernization for the cloud era.

About the Analyst

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Brad Casemore is IDC's Research Vice President, Datacenter Networks. He covers networking products and related technologies and platforms typically deployed in the datacenter. Mr. Casemore also works closely with IDC's Enterprise Networking, Server, Storage, Cloud, and Security programs to assess the impact of emerging IT and converged and hyperconverged infrastructure.

MESSAGE FROM THE SPONSOR

Aruba Data Center solutions are built on a cloud-native, microservices-based platform (AOS-CX) that provides the scalability and resiliency needed for mission-critical distributed edge environments. Our strategy is to deliver solutions that help accelerate service delivery and deliver a cloud-like operational experience for operators who need to rapidly provision both traditional and emerging edge data center infrastructure. HPE and Aruba solutions further help customers to simplify IT (compute, storage and network) operations by integrating directly into their existing data center IT operational frameworks to further speed infrastructure provisioning, and reduce the time, effort, and expertise it takes to deploy complex IT solution stacks.

To learn more about how Aruba Data Center solutions can help you refine and accelerate your edge-to-cloud strategy, visit *https://www.arubanetworks.com/solutions/data-center/*

IDC Custom Solutions

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