White Paper

# The Integrated and Automated Network Fabric: An Essential Element of Composable/Disaggregated Infrastructure

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Brad Casemore
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## IDC OPINION

Composable/disaggregated infrastructure (CDI) is designed to accommodate traditional and next-generation workloads through orchestration of disaggregated compute, storage, and networking into flexible, shared resource pools that can be available for on-demand allocation (i.e., "composable").

Sometimes overlooked or underappreciated, an integrated network fabric is an essential element of CDI environments, working in lockstep coordination with the other CDI elements to support both next-generation application (NGA) and traditional application workloads and to deliver on the need for infrastructure modernization, automation, and operational transformation.

In this white paper, IDC examines how Dell EMC responds to these requirements with its SmartFabric Services for the PowerEdge MX CDI platform, which simplifies and automates network life-cycle management so that general CDI administrators, as opposed to network specialists, can provision and maintain reliable and scalable network fabrics that contribute to operational agility and business outcomes.

## SITUATION OVERVIEW

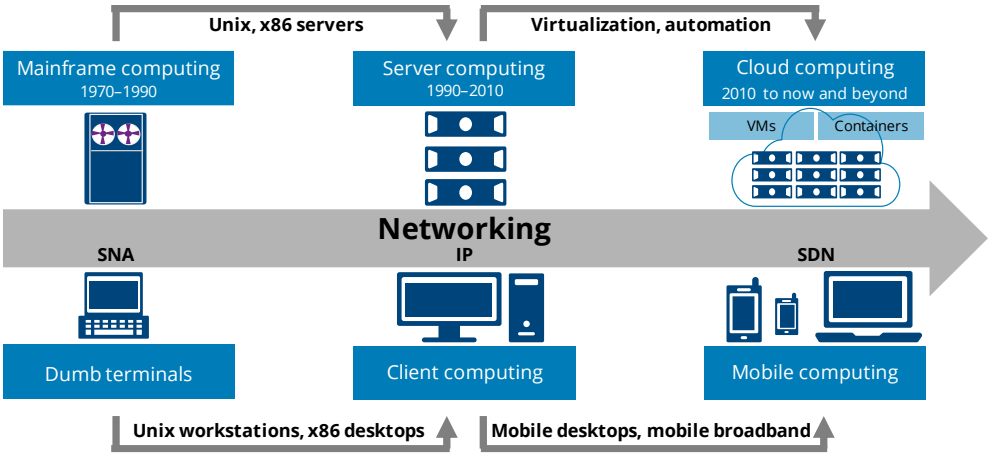
For a variety of reasons, networking has become increasingly important to the success of infrastructure modernization in enterprise datacenters. Too often, however, networking is taken for granted or underappreciated in the context of what IDC calls composable/disaggregated infrastructure. In fact, networking is indispensable to CDI. The network is a foundational component that must be deeply and holistically integrated into the CDI environment to ensure application performance, scalability, and operational simplicity. That last point is particularly important because networking for CDI should make no compromise in performance while being simple enough for non-networking specialists to deploy and manage.

To understand why networking has become so salient, we first need to understand the context, which, at a high level, involves digital transformation (DX) and cloud operating models. The imperative of DX continues to drive business initiatives and IT strategies as enterprises strive to remain competitive in increasingly digital industries and economies. As all organizations are compelled to become more like technology companies, DX initiatives allow them to create new business value and achieve competitive differentiation through increased efficiency and agility.

Many DX initiatives include investments in next-generation applications and technologies, typified by what IDC describes as the 3rd Platform (including technologies such as cloud, mobile, big data, and social business). Unlike traditional applications, NGAs, which include cloud-native environments, do not assume infrastructure resiliency, are stateless and horizontally scalable, are often developed with analytics-first design principles, utilize newer compute vehicles like containers, and are deployed using DevOps methodologies. Figure 1 shows the evolution of modern IT.

## FIGURE 1

### Evolution of Modern IT




Source: IDC, 2019

As businesses undergo these transformations, they must manage an increasingly complex environment in which newer applications coexist with traditional applications, despite different infrastructure requirements. Consequently, enterprises must modernize their IT infrastructure so that it can support a diverse application environment. Even as organizations move forward into a cloud-native world, they must accommodate and support traditional applications.

Composable/disaggregated infrastructure is designed to accommodate traditional and next-generation workloads through orchestration of disaggregated compute, storage, and networking into flexible, shared resource pools that can be available for on-demand allocation (i.e., "composable"). From a systems perspective, a CDI architecture includes two defining attributes: the ability to disaggregate IT resources into compute, storage, and network fabric pools and the ability to compose those disaggregated elements into elastic, on-demand resources via API. As such, intelligent software is needed to manage the integral assets and to compose the optimal configuration to support the application workloads.

In HCI and early CDI environments, the network fabric often was an overlooked and underappreciated element. In a CDI context, however, network infrastructure is critical to achieve the high-performance access, delivery, and response times needed for market leadership in the DX-driven world. Unfortunately, the network as traditionally constituted is prone to configuration and management issues that affect the speed and success of infrastructure transformation.

Enterprise customers and the industry at large now appreciate that there is an acute need for dynamic, scalable software-defined network (SDN) fabrics that are inherently capable of supporting rich data consumption and cloudlike elasticity. The imperative of digital transformation means that datacenter infrastructure, including the increasingly important network that ties everything together, must be comprehensively modernized, automated, and operationally transformed.

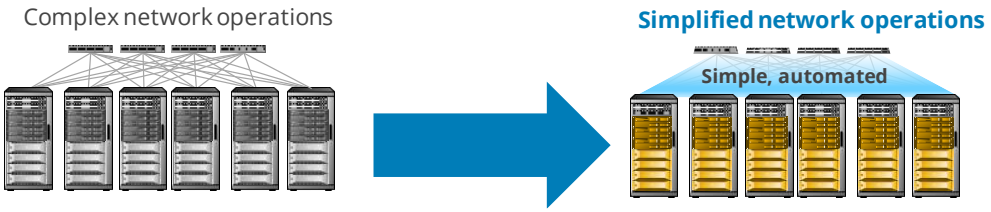
Previously underappreciated issues of network manageability, scalability, and efficiency must be overcome while allowing organizations to reduce the capital and operational costs and the risks associated with innovation. While the reduction of network operating costs is a key consideration, enterprises can also reduce capex costs by deploying newer, lower-cost fixed-port switches instead of more expensive chassis-based (modular) switches.

Network modernization can be achieved through deployment of scalable SDN fabrics that can provide integrated and unified intent-based management of leaf-and-spine switching elements (see Figure 2). This allows the network to scale dynamically in alignment with business requirements and application workloads, fully maximizing availability and uptime to achieve improved digital experiences and better business outcomes.

Network automation is essential for both operational agility and simplification. Complexity is the mortal enemy of agility, and the complexity inherent to networking has been an obstacle to business agility. With the rise of digital transformation and cloud operating models, there is a pressing need to simplify network operations by making configuration, deployment, and ongoing network management easier and faster. This extends to ongoing management and troubleshooting, including automatic detection of network misconfigurations and link-level failures. The result should be faster time to production and a dynamic fabric that can accommodate the changing needs of enterprise workloads.

## FIGURE 2

### Leaf-and-Spine Simplification




Source: Dell EMC, 2019

Through simplification of network operations and management, organizations can achieve even greater degrees of operational efficiency by reducing and gradually eliminating siloed operations that fragment and complicate management of compute, storage, and network infrastructure. In making network fabrics increasingly automated and easier to operate, enterprises also make it possible for administrators of CDI infrastructure to gain networking skills and manage the network as an integral infrastructure element rather than as a separate infrastructure silo. This helps move the organization toward a modernized and streamlined operational model that enhances organizational efficiency and overall agility.

Architecturally, the composable network fabric should offer a range of leaf-and-spine switches that can reliably meet current and future needs. For example, leaf switches should be capable of supporting 25GbE, and spine switches should be capable of operating at 100GbE. These bandwidth options give enterprises future-proof networking that can scale with their evolving requirements. The software that runs on the switches should allow seamless integration and orchestration with the composable infrastructure controller. Ideally, this network software should be open and modular, giving enterprises the option of leveraging features and capabilities that are aligned with their workloads and changing requirements.

## DELL EMC'S APPROACH TO FABRIC NETWORKING IN POWEREDGE MX

The Dell EMC PowerEdge MX CDI platform has been designed to support dense virtualization, software-defined storage, software-defined networking, AI, and big data workloads. Enterprises can customize compute and storage configurations to meet changing requirements. This dynamic and elastic hardware capacity protects against stranded or underutilized resources, thus improving performance and efficiency.

PowerEdge MX is designed to function as an inherently modular CDI platform, and its technology components encompass a range of options, including the MX7000 chassis, server and storage sleds, and integrated networking, all supported by Dell EMC Services and Dell Global Financing. The chassis can be configured to provide scalable modules of compute, storage, and the integrated network fabric. To accommodate upcoming networking technologies from 50GbE and 100GbE to the nascent Gen-Z, the MX7000 chassis has no midplane. This allows Dell EMC to support virtually any interconnect technology that may be developed in the future without concern for midplane upgrades or adjustments.

The result is a CDI platform that can accommodate traditional and emerging workloads in a cloudlike software-defined datacenter (SDDC). An associated benefit is the operational efficiencies that accrue from unified management software that simplifies infrastructure deployment and administration, including that of the integrated network fabric.

Compute and fabric control plane capabilities are addressed by processor technologies from Intel, with Intel Xeon Scalable Processors powering the servers and Intel Atom SoCs providing additional functionality in the network controllers (the fabric control plane). In addition, Intel provides the server-based XXV710 Ethernet network adapters that support connectivity at 25GbE as well as VLAN offload capabilities.

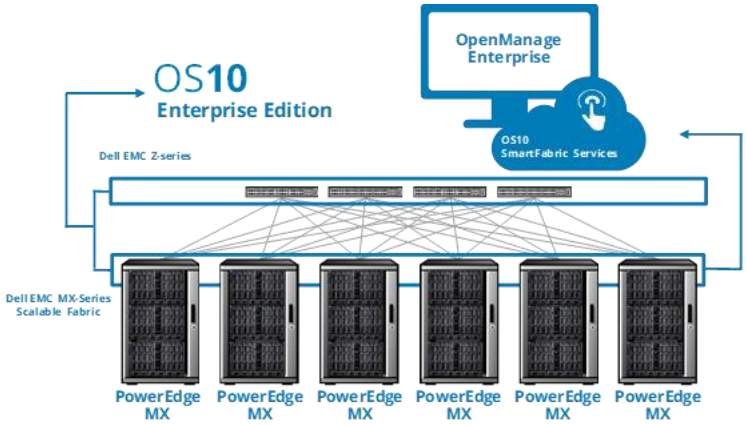
From the server, the network fabric comes into play. Responding to the need for modernized datacenter network infrastructure, Dell EMC SmartFabric Services for PowerEdge MX leverages a software-defined approach that unifies infrastructure elements to simplify the Dell EMC PowerEdge MX network fabric configuration, deployment, and management (see Figure 3). It automates network life-cycle management, eliminating time-consuming configuration and simplifying software upgrades, inventory assessment, and the other day-to-day management functions associated with datacenter switching. What's more, SmartFabric Services also addresses the need for modernized operations, allowing infrastructure admins, rather than network engineers, to automate and integrate scalable networking fabrics easily and quickly, thus breaking down the infrastructure silos that can inhibit operational agility and efficiency.

SmartFabric Services, part of the Dell EMC OS10 Enterprise Edition flagship networking operating system (OS), creates a fully integrated fabric across all parts of the PowerEdge MX infrastructure. With

SmartFabric Services, enterprises can automate the deployment of datacenter networking fabrics, enabling faster time to production for MX environments while retaining interoperability with existing datacenter infrastructure in brownfield environments.

## FIGURE 3

### Dell EMC SmartFabric Services for PowerEdge MX




Source: Dell EMC, 2019

From a benefits standpoint, Dell EMC SmartFabric Services for PowerEdge MX delivers:

- On-demand scalability, dynamically and elastically growing and contracting based on business requirements in the CDI environment and providing an intelligent, cloud-oriented architecture that increases the efficiency of the network and the overall datacenter
- Increased availability at scale (Robust and redundant fabrics and storage mean that a single failure does not cause a meaningful service disruption or outage.)
- Simplified management of networking fabrics, making it easier for IT generalists to create, administer, and operate the network fabrics without the need for expensive network expertise

To achieve those benefits, Dell EMC SmartFabric Services for PowerEdge MX provides the following capabilities and features:

- A single point of management across multiple PowerEdge MX7000 chassis and network interconnects
- A simplified I/O aggregation layer between the MX platform and the upstream network
- Life-cycle management of all network elements in the MX platform via the OpenManage Enterprise — Modular console
- Automatic detection and onboarding of new network modules, ensuring that the network fabric is automated in lockstep with the compute resources
- The capability to create multiple network domains in the same management domain
- Creation of switch uplinks and DCI infrastructure VLANs with a few clicks
- Physical topology validation
- Automated quality of service

- Elastic network provisioning
- Dynamic response to VM changes
- Policy-based port profile migration
- Integration with VMware applications and infrastructure
- Visibility and control through the vCenter and vRealize suites

Collectively, the result is an automated network fabric that is native to the Dell EMC PowerEdge MX CDI platform. In fact, Dell EMC SmartFabric Services automates the vast majority of the network configuration steps required in an MX environment, providing automated zero-touch operations for MX networks.

The Dell EMC SmartFabric Services building blocks include the following:

- The MX9116n Fabric Switching Engine and the MX7116n Fabric Expander Module provide low-latency 25GbE connections for up to 80 MX compute sleds (10 MX7000 chassis) with no port-to-port oversubscription.
- A range of 10/25/40/50GbE and 100GbE datacenter switches, part of a distributed architecture, constitute a scalable, purpose-built fabric for MX environments. The switches support industry-standard features and protocols for insertion into customers' multivendor environments:
  - For the spine, Z-series 100GbE switches provide MX intercluster connectivity.
  - Leaf-and-spine MX network switches support Dell EMC Open Networking with embedded SmartFabric Services or select third-party OS options.

The technology is supported by Dell EMC Services, including a range of deployment and support options that extend throughout the life cycle of the enterprise IT investment. Among the available services are those such as planning and design, deployment and integration, and education.

## CHALLENGES AND OPPORTUNITIES

With its SmartFabric Services as an integral element of the PowerEdge MX platform, Dell EMC not only faces challenges but also stands to benefit from a significant market opportunity driven by enterprise need.

Among the challenges are cultural and organizational inertia, represented by enterprise IT departments that are siloed and wary of change. These shops are particularly averse to architectural approaches and technologies that disrupt long-standing operational models and practices. A secondary challenge involves the competition Dell EMC faces in the CDI market.

On that point, though, opportunity is a significant countervailing factor. Indeed, IDC expects the CDI market to experience robust growth for the next few years. IDC forecasts that in 2023, the CDI market will be worth more than $4.7 billion (see *Worldwide Composable/Disaggregated Infrastructure Forecast, 2018-2023,* IDC #US44224418, August 2018).

Success in the CDI market will turn on how well vendors can help enterprise customers realize meaningful benefits, such as accelerated provisioning times, optimized IT resource utilization, and simplified IT operations. An integrated CDI network fabric – automated, intelligent, and eminently scalable – will significantly contribute to the realization of those benefits and can play a meaningful role in helping enterprises achieve agility and flexibility in a world being redefined by digital transformation.

## CONCLUSION

In this white paper, IDC has explained why an automated and modernized network fabric, capable of delivering both scalability and operational simplicity, is an invaluable element of any CDI platform.

Network modernization is addressed by a scalable SDN fabric that offers unified, intent-based management of leaf-and-spine switching elements, enabling the network to seamlessly tie the platform together and to scale dynamically in support of next-generation and traditional workloads. Network automation delivers simplified network operations, making configuration, deployment, and ongoing network management easier and faster. Network automation also contributes directly to operational transformation, simplifying management processes and breaking down the fragmented and isolated silos that divide compute, storage, and network infrastructure. Accordingly, CDI network fabrics can be provisioned and operated by CDI administrators rather than network experts, lowering costs and helping the enterprise adopt an operational model that enhances organizational efficiency and business agility.

Finally, IDC has addressed how Dell EMC SmartFabric Services for the PowerEdge MX CDI platform responds to the requirements for an integrated network fabric that delivers on the need for infrastructure modernization, network automation, and operational transformation. Presuming that Dell EMC can successfully address the challenges outlined in this white paper, IDC believes that SmartFabric Services for the Power Edge MX CDI platform will help enterprises achieve both the reliability and scalability and the agility and flexibility that their integrated networks will require to support traditional and next-generation workloads in the context of digital transformation.

## About IDC

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## Global Headquarters

5 Speen Street
Framingham, MA 01701
USA
508.872.8200
Twitter: @IDC
idc-community.com
www.idc.com

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