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SigmaUptime

volume 17 number 2

IT at the EDGE

With its Virtual Edge Platform, Dell EMC continues to enable decentralized IT infrastructure.

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IT at the EDGE

With its Virtual Edge Platform, Dell EMC continues to enable decentralized IT infrastructure.

Cloud, virtualization, mobility, artificial intelligence and other emerging digital technologies can create immense business opportunities, yet they also place a strain on conventional IT architecture. To fully exploit the possibilities of these technologies, organizations need an IT environment that is more flexible, efficient and responsive than ever before.

For decades, IT has been built upon centralized infrastructure in which all computing resources are consolidated and delivered from a central location. By keeping responsibility for all IT functions within the organization, this centralization ensured highly consistent and reliable IT services. However, the case for centralization is much less compelling today.

As organizations shift more resources and workloads to the cloud, they no longer need to physically house their infrastructure. In fact, with mobile workers needing access to applications, data and other resources from a variety of locations, centralization can actually hinder operations.

Beyond the Data Center

To accommodate these requirements, industry analysts expect organizations to shift to a far more decentralized IT framework — one based on multiple cloud platforms and services, with extra computing resources pushed to the network edge in proximity to various connected devices and sensors, and all of it orchestrated with software-defined networking principles.

According to Gartner, around 10 percent of enterprise-generated data is currently created and processed outside a tradi-

"There is a real need among service providers and enterprises to update network operations to address distributed and cloud-based applications and capitalize on changing economics enabled by cloud models."

tional centralized data center or cloud. The research and consulting firm predicts this figure will reach 75 percent by 2022.

"Organizations that have embarked on a digital business journey have realized that a more decentralized approach is required to address digital business infrastructure requirements," said Santhosh Rao, principal research analyst at Gartner. "As the volume and velocity of data increases, so too does the inefficiency of streaming all this information to a cloud or data center for processing."

VEP Links Resources

Dell EMC is facilitating this decentralized approach with the recent release of its Virtual Edge Platform (VEP) 4600, a software-defined wide-area network (SD-WAN) solution designed to connect edge computing resources to the cloud via universal customer premises equipment (uCPE). The VEP 4600 is essentially a 1U network-oriented server that is powered by Intel's "Skylake" Xeon D-2100 processor, which is optimized for virtual networking and software-defined environments.

The device offers maximum deployment flexibility by extending Dell EMC's Open Networking concept, allowing mix-and-match SD-WAN and virtual network functions (VNF) software from innovative third-parties. Initially, Dell EMC is offering three validated solutions that provide turnkey SD-WAN capabilities using software from Silver Peak Systems, VeloCloud Networks and Versa Networks. Architected and tested to Dell EMC standards, these offerings enable customers to quickly deploy cost-effective SD-WAN solutions.

"There is a real need among service providers and enterprises to update network operations to address distributed and cloud-based applications and capitalize on changing economics enabled by cloud models," said Tom Burns, senior vice president, Networking & Service Provider Solutions, Dell EMC. "By infusing Open Networking into access networks to the cloud with the Virtual Edge Platform family, Dell EMC can help customers modernize infrastructure and transform operations while automating service delivery and processes."

The system includes up to 128GB of memory and two 10 Gigabit Ethernet ports. According to Dell EMC, it can deliver twice the improvement in packet processing, twice the memory bandwidth and up to four times the memory capacity of traditional systems.

Pushing Innovation

Dell EMC says the VEP 4600 is built to move network packets like an edge router, so it could replace such hardware in some network architectures. Gartner predicts that by 2020, more than half of the organizations performing WAN edge infrastructure refreshes will swap traditional routers for an SD-WAN appliance.

The VEP appliance continues Dell EMC's strategy of pushing its technology to the edge. For several years, the company has offered Intel-powered edge gateways that connect legacy systems with a variety of Internet of Things (IoT) devices and systems. Ruggedized with a variety of input/output connections, they aggregate data and support analytics at the edge of the network.

Dell EMC's edge portfolio also includes the PowerEdge server family. The latest versions of these four-socket servers are specifically designed to address the workload requirements of SD-WANs and edge computing environments.

"As the bedrock of the modern data center, customers expect us to push server innovation further and faster," said Ashley Gorakhpurwalla, President, Server and Infrastructure Systems, Dell EMC. "As customers deploy more IoT solutions, they need highly capable and flexible compute at the edge to turn data into real-time insights."

DELL EMC

LET THE TRANSFORMATION BEGIN

Dell EMC's Virtual Edge Platform (VEP) is a first-to-market software-defined wide area network solution (SD-WAN) designed to help speed digital transformation by connecting the enterprise edge to the cloud. Built with advanced intelligence for network virtualization and software-defined architecture, the Dell EMC VEP4600 provides an open Intel® architecture-based platform to support multiple simultaneous virtual network functions (VNF) such as routing, firewalling and deep-packet inspection, which means you can consolidate numerous proprietary physical devices into a single appliance.

Contact Sigma to learn more about using VEP to accelerate your digital transformation goals.

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By some accounts, the Internet of Things (IoT) will comprise roughly 200 billion connected devices and sensors within the next couple of years. Industry analysts say edge computing solutions are the key to effectively processing and analyzing the massive data volumes that will be generated from these disparate sources.

Edge computing improves IoT efficiency by shifting computing resources to the network's edge in close proximity to data-collection sources such as mobile devices and IoT sensors. Variously known as cloudlets, micro data centers or fog nodes, these edge resources address some of the challenges created when organizations run increasingly data-heavy workloads in the cloud.

Some suggest that edge computing could eventually replace the cloud model. For example, Thomas Bittman, a vice president and distinguished analyst with Gartner Research, claimed in a recent blog post that "the edge will eat the cloud."

"The agility of cloud computing is great — but it simply isn't enough," Bittman wrote. "Massive centralization, economies of scale, self-service and full automation get us most of the way there — but it doesn't overcome physics — the weight of data, the speed of light. As people need to interact with their digitally assisted realities in real time, waiting on a data center miles (or many miles) away isn't going to work."

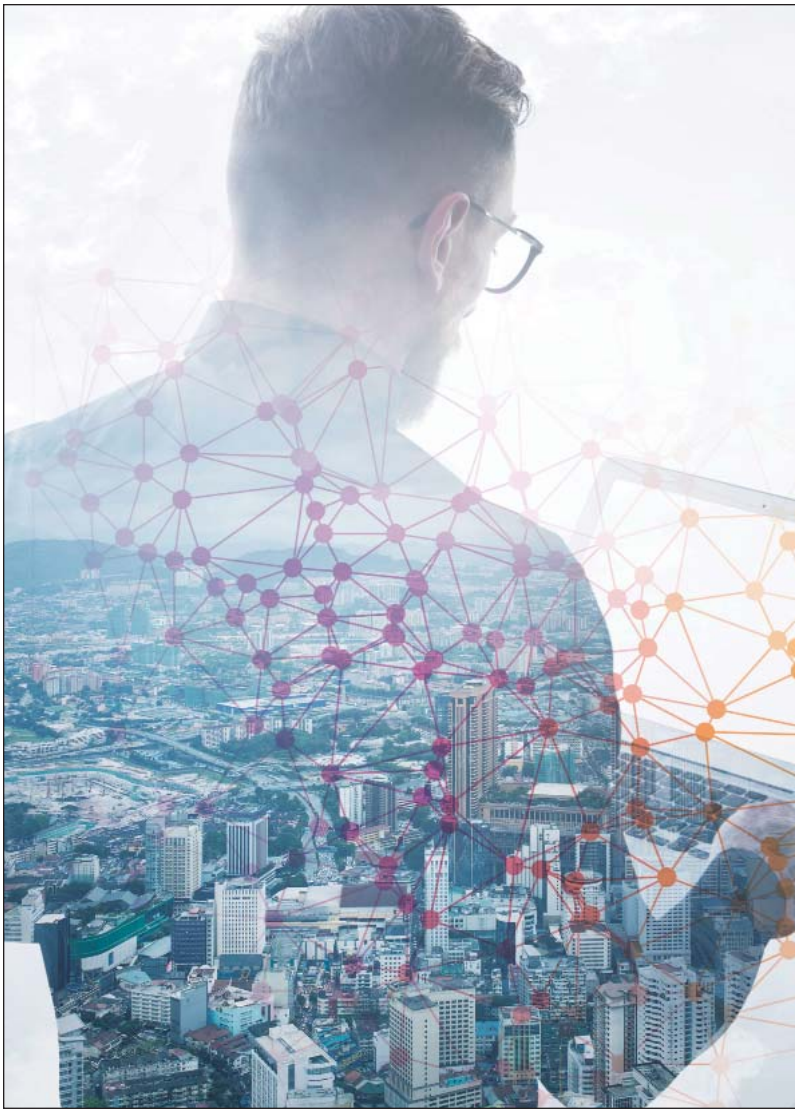
Long-Distance Runaround

The cloud model transformed computing by centralizing data processing and storage inside large server farms from which organizations can access applications, services and data across Internet links. It is a proven model that creates significant operational benefits while dramatically reducing spending on on-premises infrastructure.

Cloud service latency — the delay between a client request and a cloud service provider's response — has always been present, but it hasn't been a huge deal. For most workloads, these delays have been mostly imperceptible. That is beginning to change, however.

With the rapid growth of mobile computing and the IoT, billions of connected devices will soon be collecting and accessing data at the edge of the network. Transferring that data back and forth to far-flung cloud data centers is creating issues with network congestion and latency.

In a landmark 2013 study, computer scientists at the University of California-San Diego and Google found that applications running on cloud computing systems run up to 20 percent more efficiently when the data they need to access is located nearby. They tested applications running in a warehouse-sized cloud server installation, then compared



those results with tests on similar servers running in isolation rather than as part of a cloud.

The researchers found that apps running on the isolated servers ran significantly faster and more efficiently. This is partly because these servers have multiple processors that aren't being shared across multiple workloads. However, they also found that latency was reduced due to the proximity of data resources. Apps requesting data from remote cloud servers had to wait longer for the data they requested to arrive.

A number of factors contribute to distance-based latency in a cloud environment, including the number of router hops or ground-to-satellite communication hops between an organization and its cloud provider's data center. Packet delays on virtual servers are another source of latency, as are larger workloads.

Studies have demonstrated that even the subtlest network delays can negatively affect business operations. A Google study found that a 20-millisecond delay can result in a 15-percent increase in web page load times. Slower load

Data's New Frontier

Edge computing limits latency by reducing the distance between processing power and data sources.

times are bad for business. Google found that a half-second delay will cause a 20 percent drop in traffic. Amazon found that delay of one-tenth of a second can cause a 1 percent drop in sales.

Close to the Edge

The edge computing model aims to reduce such delays through the use of small-scale data centers that put processing resources a single hop away from end-users. "Edge" data centers are cropping up in Tier 2 and Tier 3 markets across the U.S. — cities such as Cleveland, Ohio, Nashville, Tenn., Pittsburgh, Pa. and St. Louis, Mo. — bringing dynamic content and cloud services physically closer to customers. Data can be cached locally so that it travels a shorter distance, resulting in improved performance.

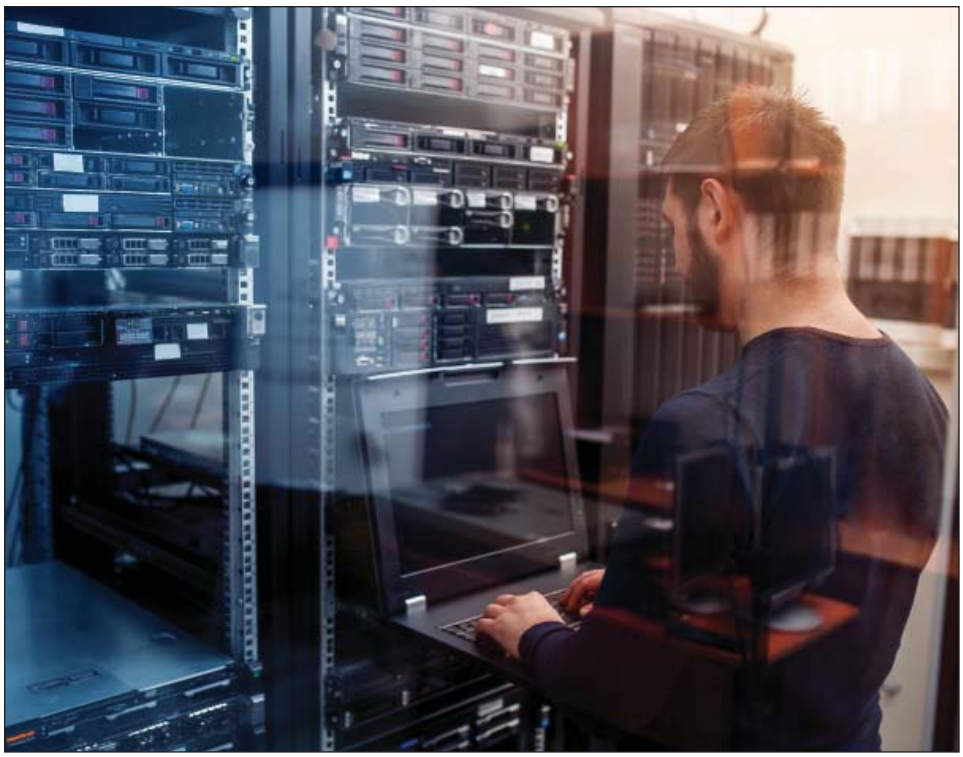
While location is a key feature of edge data centers, it isn't the only one. To be considered an edge data center, the facility must reach at least half of the customers in the market, and serve up at least three-quarters of the dynamic content those customers consume. Otherwise, it's just a data center in a smaller city that hasn't moved the Internet edge.

Edge computing preserves bandwidth and reduces network congestion by limiting the flow of data between the data center and the cloud. Single-hop data transfers will be particularly useful for running real-time services and improving mobile data analytics. According to analysis from Market Research Future, the global market for edge computing is expected to grow at a 35 percent annual rate through 2023, reaching a total valuation of $33.75 billion.

"In our digitally connected world, businesses and consumers have a low threshold for interruptions to service," said Chris Hanley, senior vice president, Data Center Systems, Schneider Electric. "Edge computing solves real-time data transmission issues by bringing bandwidth-intensive content and latency-sensitive applications close to the users or data sources to ensure reliable connectivity."

Enterprise NFV

Network functions virtualization cuts costs, streamlines management and creates a more agile IT infrastructure.



Corporate networks do a lot more than shuttle data from one place to another. In addition to routing and switching, the typical LAN provides services such as load balancing, WAN optimization and firewalling. Traditionally these services have been delivered by dedicated hardware appliances installed on the network.

That hardware-centric model is slowly giving way to a software-oriented approach that builds upon key virtualization concepts. Network functions virtualization (NFV) replaces dedicated appliances with software running as virtual machines on commodity servers. As a result, NFV enables organizations to reduce the amount of hardware in their network environment and the costs and complexity that go along with it.

NFV is closely related to software-defined networking (SDN), which also involves the decoupling of network services from hardware. However, SDN is focused on the control of the network — policy-based management of network devices is handled by software, enabling a centralized view of network resources and a high degree of automation. NFV is concerned with the optimized delivery of network services through virtualization and consolidation.

Developed by a group of telecom network operators, NVF is primarily used by service providers. According to the most recent analysis from IHS Markit, the carrier NFV market is expected to see a compound annual growth rate of 30 percent through 2021. The report notes that 82 percent of service providers are extending NFV to customer sites with universal customer premises equipment (uCPE).

Enterprises are also starting to take a look at NFV. A new report published by Market Research Future notes that the need for on-demand provisioning of network services for private clouds is driving adoption of NFV in the enterprise.

How It Works

In essence, NFV works the same way as server virtualization — a hypervisor separates operating systems and applications from hardware, so that one server can run multiple virtual workloads. The guest virtual machines share the physical resources of the server. With NFV, a network hypervisor encapsulates the software that delivers the virtualized network functions (VNFs), which run on a commodity hardware platform. One NFV platform can host multiple VNFs.

NFV Management and Organization (MANO) is a framework for provisioning, managing and orchestrating VNFs, and controlling and managing the compute, storage and network resources that support them. The reference architecture was developed by the NFV MANO working group of the European Telecommunications Standards Institute Industry Specification Group. It works with a variety of VNFs so that

users have the flexibility to choose the resources deployed on the NFV platform.

All of this is highly complex, and designed for a service provider environment. However, enterprise-class solutions are emerging that provide a fully integrated and optimized software stack that can run on various physical platforms. A graphical user interface makes it easy for network managers to provision network services based upon predefined templates. Software automatically installs the VNF on an available virtual machine and configures it according to established profiles.

Faster, Easier

Like server virtualization, NFV enables organizations to reduce capital investments in hardware, and the power and space requirements that go along with it. NFV also decreases management complexity — network administrators gain a consistent, unified platform that eliminates the need to learn multiple device interfaces and operating systems. As a result, enterprises can cut capital costs by 50 percent and operational costs by up to 70 percent with NFV, according to ZK Research.

NFV increases IT agility by enabling administrators to spin up network services on demand instead of purchasing, installing and testing a different appliance for each function. It also improves resource utilization by eliminating the need to provision multiple appliances as a hedge against downtime. At the same time, NFV improves network availability by reducing maintenance windows and allowing faster response to issues.

Organizations with remote office/branch office operations typically derive the greatest value from NFV. Traditional network appliances require a "truck roll" to each site for implementation and configuration. With NFV, network services can be deployed in minutes and managed remotely across all locations.

Industry analyst reports on NFV adoption focus on the service provider sector, which currently accounts for almost all of the market. However, experts are seeing signs that NFV is making inroads into the enterprise environment.

"Increase in the implementation of software-defined networking and network function virtualization solutions will have a significant impact on the adoption of network infrastructure among data centers worldwide," said Abhishek Sharma, a lead data center research expert from Technavio.

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