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Introduction

In today’s data centers that support virtualization, Big Data, and cloud, the network can be a prime contributor to efficient operations or a bottleneck preventing a company from realizing the full benefits of these critical applications.

What many IT departments find when managing the large environments to support today’s workloads is that old approaches to network infrastructure are often costly and hard to administer, make inefficient use of data center space, and can introduce latencies that degrade application performance.

To address these issues, Dell recently introduced the Dell Networking Z9500, a 10/40 GbE data center core fabric switch that offers the energy-efficiency, high density per rack unit, manageability, scalability, and pay-as-you-grow licensing needed to meet data center requirements today and in the future. The Z9500 allows a clean break from legacy networking and delivers a modern approach, built from the ground-up to simplify and accelerate application, infrastructure, and operational transformation.

Why the traditional networking approach breaks down

For years, traditional network architectures were based on a series of switches designed to handle common traffic patterns. In some configurations, there could be up to six tiers of network infrastructure (i.e., core, distribution, access, Fibre Channel SAN directors, management, and distributed virtual switches). At a minimum, a data center would employ core, distribution, and access switches.

This type of configuration worked well when most of the traffic was generated by client/server and basic Web applications. In particular, with these applications, most of the traffic running over the network (so called North-South traffic) traveled up through a core switch and then back down to a second device in a similar manner.

However, using such a multi-tiered network architecture can introduce inefficiencies and latencies with today’s workloads. In virtualized and cloud environments, there is a lot of server-to-server traffic as virtual machines (VMs) and workloads are shifted to different machines to keep performance up, maximize use of computing resources, and minimize the impact of downtime due to maintenance or hardware failures.

Similarly, with Big Data workloads, there often is a lot of traffic between servers and storage devices. In many cases, large datasets need to be moved into server memory or onto server flash drives so analysis can be performed.

As much as 80 percent of the traffic inside data centers is this device-to-device traffic (so called East-West traffic). Multi-tiered networks are not well suited to this traffic and cannot scale to handle this traffic. In a sense, the network gets in the way when running such traffic loads on this type of network.
One major challenge in many networks with lots of East-West traffic is high latency. For example, moving a VM from one server to another in a network designed for North-South traffic requires that the VM pass up through a series of switches and then down a comparable series of switches to reach the destination server. The same traffic flow must occur with data for analysis being moved between a storage device and a server. The resultant latencies can lead to poor application performance. In many networks, VMs moved between servers in the same rack must have the associated data sent out of the rack to the core switch and then back. Such traffic flows can also impact performance in other ways. For example, moving a heavily loaded VM through even a dedicated 10Gb link can saturate the link, denying other traffic to pass through the same link.

A second problem relates to management and the inability to scale. In most multi-tiered networks, servers must be essentially hardwired to storage elements. Making a change, say moving a workload from one server to another, would require reconfiguring connections and thus involving server, storage, and networking experts. That, and management of the infrastructure alone, is time-consuming. In addition, the manual nature of the work makes mistakes from human error quite common.

One additional potential problem is the lack of built-in resiliency. Resiliency is achieved only by adding many more redundant switches. This is not practical. There are added CAPEX and OPEX costs. And most data centers simply do not have the capacity (space, power, and cooling) to add spare switches to the mix.

What's needed in today's data centers?

For traffic loads in today's virtualized data centers, there is a need for a more distributed network architecture. The architecture must be flatter (fewer layers or tiers of switches) and be capable of easily scaling out.

A network must reduce the number of hops a VM must pass through when being moved from one server to another. Similarly, data moving between a storage device and server should not need to move up a progression of switches and down another just to run an analysis.

A more distributed, flatter network requires a core switch that can accommodate many ports. Rather than passing through tiers of switches, traffic would be collapsed and pass through one switch that serves all devices.

A network must be architected so that East-West traffic between servers in the same enclosure stays within the chassis. And traffic should leave an enclosure only if it is destined for a server or device outside the enclosure.

Increasingly, there is interest in networking technology that virtualizes the connections between server, network, and storage elements. Such virtual connection technology promises to simplify deployments and makes it easier to scale networks to meet growing demands.

Dell as your technology partner

The Dell Networking Z9500 is ideal for this new network architecture.

The Dell Networking Z9500 Fabric Switch is the highest-density per rack unit (RU), fixed-form-factor, data center switch in the market today with a full suite of L2/L3 routing and switching protocols. The Dell Networking Z9500 switch is designed to address data center 10/40 GbE aggregation requirements through centralized core or distributed core architectures for high performance enterprise data centers, cloud computing, provider hosted data centers, and enterprise LAN cores.
The Dell Networking Z9500 is ideal for high I/O workloads such as Web 2.0, high performance computing, virtualization, and cloud. In particular, the Z9500 combined with Dell’s AFC software and minimal tier approach optimizes server-to-server communication, greatly reducing latency within the network and the overall datacenter. Additionally, the 3RU form factor Z9500 switch delivers up to three times the density per RU and throughput of more than 10 Tbps, with half the latency compared to Dell’s previous generation switches.

The Z9500 offers ultimate flexibility with 132 40GbE ports and expandability to 528 10GbE ports. Most important, the switch is future-ready, offering a “pay-as-you-grow” licensing for 36, 84, or 132 ports in a fixed-form-factor switch. This allows companies to build fabrics for small scale data centers and increase fabric capacity as compute demand grows.

With these characteristics, the Z9500 is highly adaptable and can serve as the core in vastly different networking scenarios, including:

- **Micro scale fabric:** A mid-sized company with a modest sized data center could start with a 36 or 84 port configuration and add capacity as the data center expanded over time.

- **Macro scale fabric:** In more demanding networking environments, the Z9500 could be used as a centralized core switch, leveraging the unit’s high port densities to build large L2 networks. This would enable denser, more energy efficient, and low latency deployments.

- **Hyper scale fabric:** For very large data center environments, the Z9500 could serve as a distributed core fabric. By leveraging the switch’s high port densities, a company could build massively scalable architectures with 40GbE interconnects inside the fabric. Such a hyper scale environment could support well over 100,000 servers.

In most large data centers, power is a problem. Companies are either spending vast amounts of money for electricity to power and cool the center or they have maxed out in electrical capacity and can no longer expand. The Z9500 addresses these power issues. It is highly efficient electrically, consuming approximately half the power per port of comparable products from leading competitors.

In addition, with the introduction of the Z9500, Dell also announced a new release of its Dell AFC software. The AFC is a programmable SDN and application services platform for cloud infrastructures.

AFC is targeted for enterprise data centers with OpenStack deployments and as an optional component of Dell OpenStack-Powered cloud solutions. The update offers a single, integrated solution to provide on-demand virtualized network services to OpenStack with fully automated,
unified lifecycle management of the physical infrastructure.

The new release simplifies infrastructure management in several ways. The software offers:

- Automated discovery and zero-touch provisioning of switches
- Automated topology discovery and forwarding optimization with inherent multipathing
- Network virtualization services for on-demand provisioning from OpenStack.

This support is critical for future-looking companies. OpenStack and the OpenFlow communications protocol hold significant promise to advance the infrastructure economics, operational, and technical capabilities of modern businesses. However, each can be highly complex and difficult for enterprise IT to adopt. Cloud administrators need a way to simplify networking configurations while enhancing network functions for cloud-based services. Dell AFC serves as a fundamental building block on both enterprise control software and as a key element of accelerating Network Functions Virtualization (NFV) deployments with its integration into OpenStack. (NFV is a network architecture concept that proposes using IT virtualization-related technologies to virtualize entire classes of network node functions into building blocks that may be connected, or chained, together to create communication services.)

Dell is helping bring innovative NFV solutions to market by spearheading industry consortiums such as CloudNFV and collaborating with industry partners including Red Hat. Just as SDN is increasing network flexibility, reducing costs and driving efficiency within enterprise networks, NFV can equally transform data centers by utilizing an open, disaggregated, cloud-based approach.

Complementing the switch and management software, Dell offers service and support that can help companies modernize their networks and economically manage them.

Dell Consulting services can help companies determine how a different network architecture might improve operations. Dell Consulting offers help ranging from proof-of-concept testing in its solution centers to bringing into play its real-world experiences in supporting a wide range of customer implementations.

The switch is backed with Dell ProSupport, which is Dell’s premium support service that offers 24/7 direct telephone and online access to advanced-level technicians based locally. Dell ProSupport can help companies not only cut costs and increase productivity across a multivendor environment, but also lessen the burden on IT staff who are probably already managing too many day-to-day administrative tasks. In addition to the 24/7 call and online support, the service offers remote and on-site support with four- and eight-hour parts and labor response options; incident-based third-party software assistance for data center and end-user applications, OS, and firmware troubleshooting; and emergency parts and labor dispatch, in parallel with troubleshooting, for issues identified as severity level one.

With this total solution of hardware, software, service, and support, Dell can help customers upgrade data center network architectures to meet new demands imposed by virtualization, changing traffic patterns,
and the nature of today’s workloads. By using standards-based technologies, Dell delivers architectures that help advance legacy systems, prevent vendor lock-in penalties, and future-proof infrastructure for an easier transition to SDN, cloud-based services, and emerging technology approaches such as NFV.

Simply put, the Dell Networking Z9500 fits into Dell’s broad “transform and modernize your network” strategy. This is a strategy with the goal of making networks easier to deploy and manage, as well as meeting the performance needs of today’s traffic loads.

For more information about the Dell Networking Z9500 and Dell networking solutions, visit: www.Dell.com/Networking

“Using a traditional multi-tiered network architecture can introduce inefficiencies and latencies with today’s workloads.”