Redefine Data Center Economics with Active Fabric

A Dell Point of View

April 2015

Table of Contents

Table of Acronyms

Acronym	Meaning
SDN	Software-defined Networking
DCB	Data Center Bridging
FCoE	Fibre Channel over Ethernet
NVO	Network Virtualization Overlay

1.   Executive summary

The innovations that led businesses through the Internet and into the Cloud Era were made possible by the advancement of open innovations in the server and software industries. Open x86 architectures unleashed unparalleled innovation over multiple generations of micro-processor technology. Similarly, the open software industry provided revolutionary advancements in nearly every facet of business and industry. Server virtualization has further unleashed value by enabling on-demand resource availability, asset efficiency and business continuity.

In contrast, the networking industry has yet to benefit from such open innovation initiatives. While groups such as the Open Networking Foundation promise revolutionary change, legacy networking vendors have been slow to adapt, as these new open approaches seek to drive out the proprietary technologies of the past.

Dell stands in stark contrast to these vendors. From its beginnings making desktop computing more accessible to more people, to pioneering the open x86 server, Dell has innovated with a relentless focus on delivering customer value, even if that means toppling outdated paradigms. Dell is poised to do the same today with networking.

Today's networking technologies are more primitive than any other domain of IT; the closed, proprietary nature of the industry favors overpriced solutions for buyers and exorbitant margins for vendors. Now is the time for a new approach which phases out a closed, proprietary legacy and ushers in a new, open networking paradigm better suited to the needs of modern business.

To answer this challenge Dell has delivered a revolutionary new open networking architecture so innovative that Gartner defined it as an entirely new category of switching:

"a new style of network switching has emerged, which Gartner is referring to as "brite-box switching." Dell was the first mainstream vendor to support this approach. Network decision makers can reduce cost, improve management and enable long-term innovation using "brite box" switches versus traditional switching approaches." - Gartner[1]

While open switching is a powerful innovation, a comprehensive open architecture is needed to deliver real solutions and tangible benefits. Dell's Active Fabric architecture is another direct response to this growing need for networking solutions to support the needs of today's data centers.

Active Fabric is both innovative and practical, based around a set of open, flexible platforms that deliver benefits from the latest innovations in networking. Active Fabric is also designed with embedded virtualization and automation "smarts," enabling plug-and-play simplicity and providing a software technology framework that simply works. In addition, Active Fabric is complemented by solutions that further drive efficiencies within data center networking. All of these combine in an open approach that can redefine data center networking.

---

[1] Gartner, The Future of Data Center Network Switches Looks 'Brite', 12/1/2014

2.   Evolving business—evolving networking

Technology is rapidly evolving to deliver new levels of automated intelligence empowering new levels of business agility and execution. For example, in today's financial markets, intelligent algorithms are capable of executing trades according to pre-defined criteria thousands of times every second. These capabilities are enabled by a new wave of automation technology which allows organizations to deploy new solutions with a touch of a button. Emerging models like this are not unique to financial markets, nor are their applications limited to particular industries. Technologies that automate execution give organizations the chance to exploit a sea of new opportunities, providing competitive edge. Those without these capabilities could be left behind.

At the root of new compute capabilities is the network. The network is the foundational element that enabled the Internet a decade ago and today enables technologies that are fundamentally changing the nature of business, like cloud, Web 2.0, virtualization, and big data. With these new technologies and business realities comes a revolution in the way networking technologies are designed, built and delivered.

2.1   Changing traffic dynamics

Today's modern data center traffic commonly flows from server to server—following an east-west pattern. This shift represents a fundamental change in the data center network status quo. In legacy IT environments, typically that same volume of traffic flowed from client to server, or north-south. (Figure 1)

However the vast majority of enterprise networks are still designed for client-server traffic, the exact opposite of what is needed for modern applications. Organizations attempting to undertake today and future applications with legacy infrastructure begin at a disadvantage that can only grow as their applications grow.

Figure 1: Changing Traffic Dynamics

Beyond the changes in traffic patterns, new enterprise applications demand new capabilities like dynamic resource reservations, programmability and elasticity. These features are not possible in legacy networks and require a new approach to deliver on the demands of today's hypercompetitive business climate.

2.2   Transformation of the data center core

While most enterprise IT vendors are positioning expensive proprietary large modular platforms to deliver new capabilities, leading cloud providers have already delivered these features over robust low-cost fixed platforms leveraging new software networking capabilities at the server edge. Consequently, deployments of large modular chassis have been consistently declining for years, a trend which is predicted to continue[2].

The rise of fixed platforms is rooted in a new wave of innovation in the rapidly growing market for standard networking chipsets. The growing market for network chipsets and components is projected to continue to outperform proprietary solutions in nearly all significant measures for years to come[3].
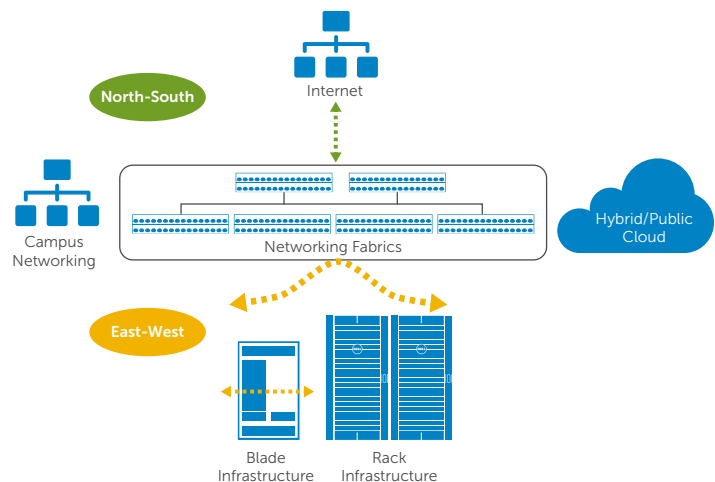
---

[2] Dell'Oro, L2/L3 Ethernet Switching Report, Q1 2013

[3] Dell'Oro, L2/L3 Ethernet Switching Report, Q1 2013

A Dell Point of View

2.3 Mass market adoption of 40GbE

To meet new bandwidth demands, network infrastructure must support higher performing interfaces to economically aggregate network traffic. Today 40GbE technologies have been adopted by all major networking vendors, thus driving down the cost of bandwidth and making high-bandwidth applications accessible for more organizations. The rapid adoption of 40GbE is projected to occur largely in the low-cost fixed platforms as opposed to the large modular platforms. (Figure 2)

Dell was an early leader in this market, among the first to deliver 40GbE technology. Today Dell offers the most dense, efficient, cost-effective 10/40GbE platforms in the market.
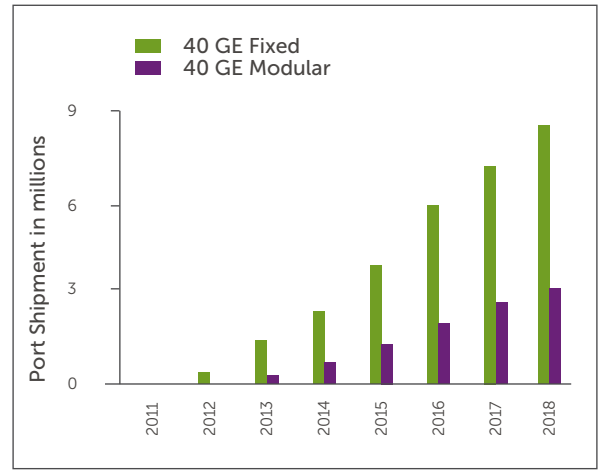

Figure 2: Rapid growth of 40GbE recent and projected.[4]

2.4 Convergence

New software architectures are making it possible to simplify operational roles and deliver converged management offerings that can bring formerly isolated infrastructure teams together

Converged infrastructure brings together key elements—networking, servers, storage, software and services—into a single, conceptual whole that is powered by software and is not constrained by legacy technology (Figure 3). Network virtualization—abstracting network functionality from the underlying physical resources and making it available programmatically through software automation—is essential to driving greater flexibility and agility in converged infrastructures.
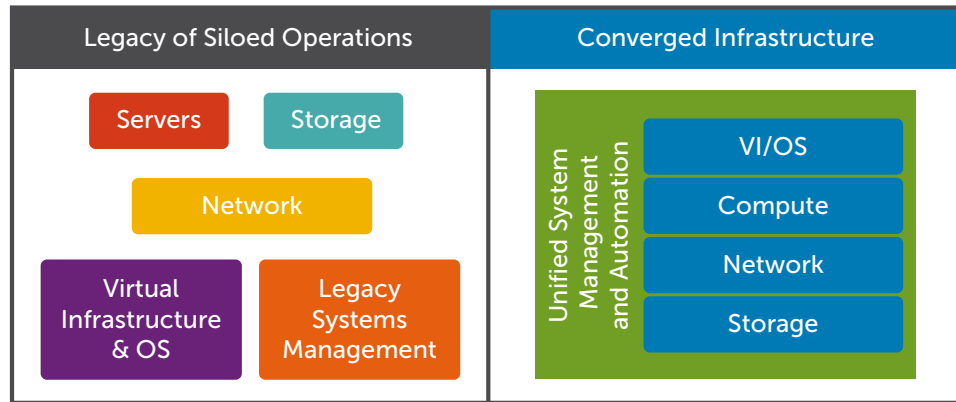

Figure 3: Siloes and inefficiencies driven out by converging infrastructure

Converged infrastructure is a unifying concept that delivers servers, storage, networking, virtualization and management tools as pre-integrated systems. With converged infrastructure, enterprise IT can optimize their infrastructure based on application needs rather than integration needs, delivering significant gains in efficiency.

2.5 Journey to the future ready network

The marginal benefit of simply virtualizing a server is waning. For IT modernization to happen, organizations need to look first to optimizing the network.

The imperatives for networking era are clear: The network must adapt to deliver new levels of performance, efficiency and elasticity with entirely new economics. IT infrastructure can no longer be divided into siloes with the fractured management and primitive automation tools of the client-server era. IT infrastructures must operate as single cohesive system to deliver the agility that businesses demand.

---

[4] Dell'Oro, Ethernet Switch Forecast Summary, July 2014

3.   Active Fabric—Optimized network for the future ready data center

Increase your agility with dense, efficient, elastic computing with Dell's Active Fabric solution. Active Fabric was designed with a focus on the next generation of applications and workloads that enterprises need to deploy effectively to stay competitive (Figure 4).

With Active Fabric, you can virtualize, automate and orchestrate networking functions and services and
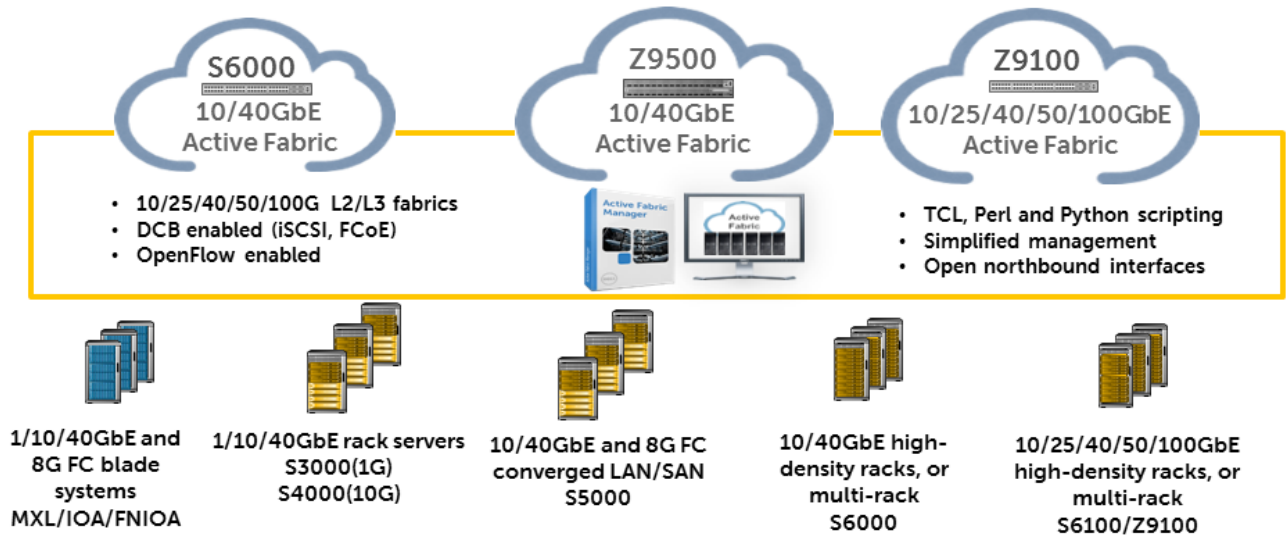

Figure 4: Active Fabric solutions designed for the needs of varied environments

align resources to real-time business events by offering extensive platform development capabilities, open northbound interfaces and robust support for software-defined networking.

Active Fabric leverages industry-leading dense and efficient fixed-form-factor platforms. Fixed-form-factor switches have been recommended by Gartner as an alternative to chassis-based switch architectures that can reduce capital costs up to 70% and operational expenses by up to 30%.[5]

In addition, Active Fabric is built on open standards for maximum interoperability, allowing organizations to augment their existing infrastructure to add needed capabilities without disruption. This interoperability provides not only choice—an important consideration in a field where vendor lock-in is the norm—but also flexibility, so IT can quickly align infrastructure with the needs of the business.

3.1   Optimized for performance

Active Fabric provides a flat, fast, any-to-any multipath network architecture that is flexible and ideally suited for the growing amount of east-west traffic in today's virtualized data centers and private clouds. Active Fabric solutions flatten the traditional data center network architecture using high-density and low-latency, fixed-form-factor 10 - 100GbE switches that can be deployed quickly and easily while reaching to hyperscale proportions. In addition to the leaf/spine architecture, a collapsed spine approach is now also possible. Enabled by very high density, multi-rate (1 – 100GbE) spine switches, minimal latency can be achieved with one hop spine switching. (Figure 5)

---

[5] Rightsizing the Enterprise Data Center Network, 3/20/13.
http://www.dell.com/Learn/us/en/uscorp1/secure/gartner-enterprise-data-center-network

Leaf-Spine	Collapsed Spine

Spine

Leaf

Dell Active Fabrics™
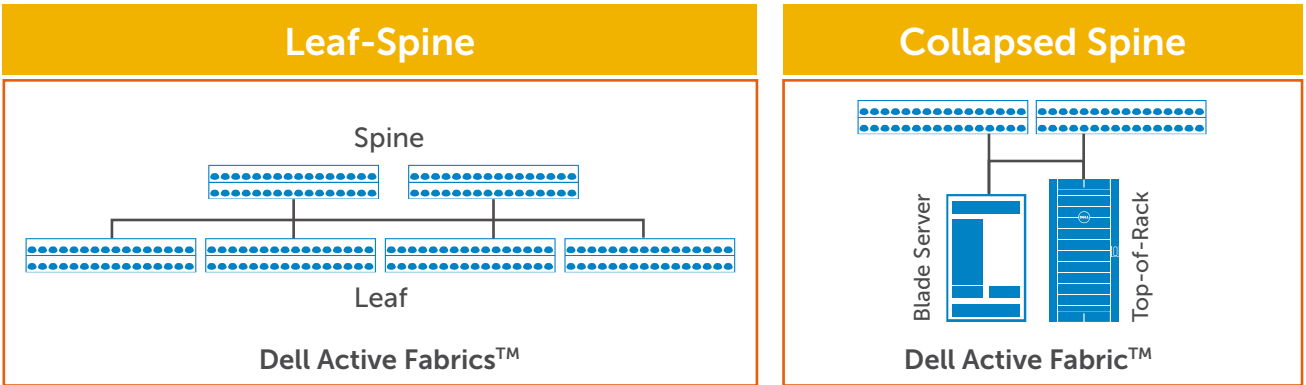
Blade Server Top-of-Rack

Dell Active Fabric™

Figure 5: Data Center Fabric Evolution

3.2 A more cost-effective fabric

Dell has taken a different approach by transforming the network, focusing on fixed form factor switches within the leaf/spine topology. Customers are able to reduce both their initial capital expenses and operating expenses dramatically through an Active Fabric approach. (Figure 6)

77%
Less power than comparable Nexus 7k/5k solutions

Industry Leading Power, Cooling & Density:
• 77% Loss Power*
• 79% Less Heat Output*
• 59% Less Racks Units*

59%
Average savings with active fabric solutions

• **Uses fixed form factor switches** for simple economical scale-out solutions
• **Optimised** for east-west traffic flows, virtualization and convergence

86%
Reduction in time to design and deploy network fabrics

• **Active Fabric Manager** single pane of glass GUI-based management
• **Automates** the design, deployment and monitoring of fabric installations

* Based on a Dell study comparing Active Fabric solution with comparable Cisco Nexus series designs

Figure 6: Active Fabric provides industry-leading power, cooling and density

3.3 Completely SDN-ready—with a flexible, unbiased approach

Dell has always focused on enabling customers to do more with their technology. Innovating on open standards-based foundations is one way that Dell maximizes choice for customers, freeing their networks from the constraints of proprietary, locked-in architectures.

Dell's approach to SDN is similarly focused on helping customers maximize choice and retain flexibility to do more with the technology they already have. Rather than force customers to choose a particular SDN path, Dell allows customers to evolve at their own pace, leveraging their preferred approach to virtualizing the network, with platforms that can accommodate a variety of SDN tools and techniques.

Dell is one of the only vendors to offer a complete and unbiased approach to SDN[6] encompassing networking virtualization overlays (NVO) and control plane solutions. It is based on Dell's Open Networking, bringing disaggregated networking technologies to the modern enterprise to maximize capability and choice and control plane solutions.

[6] http://i.dell.com/sites/doccontent/business/large-business/en/Documents/Dell-Networking-SDN-POV.pdf
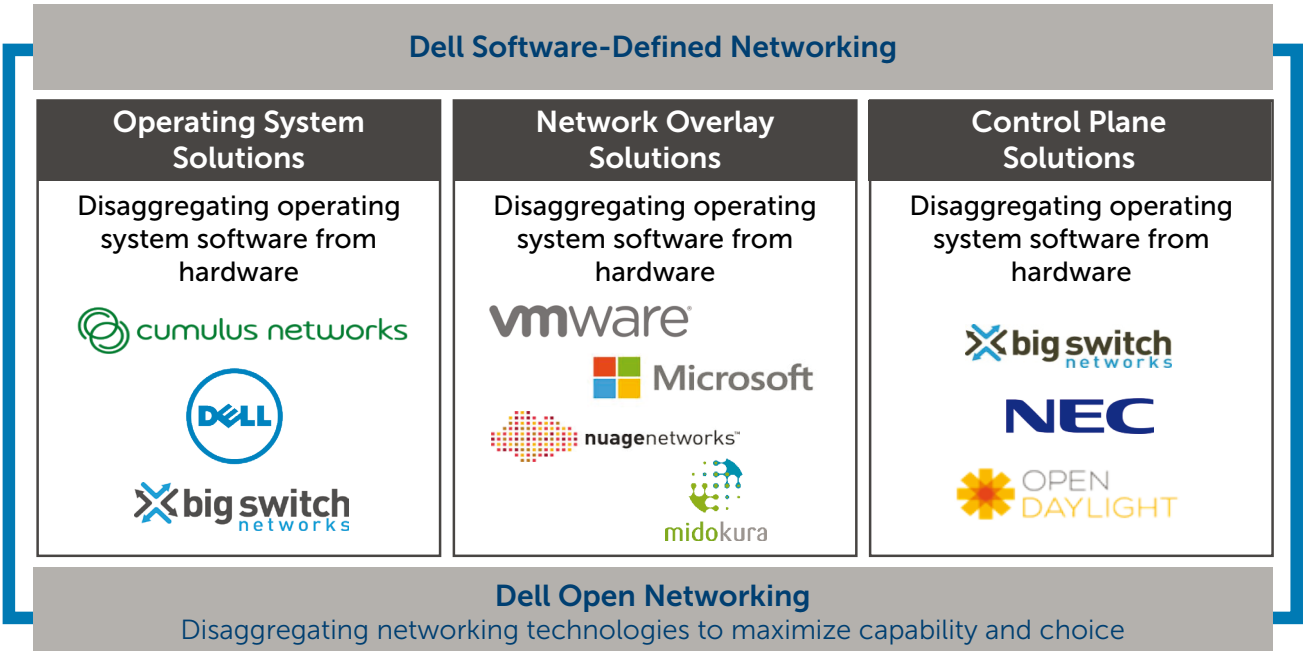
Figure 7: Dell Software Defined Networking

- Active Fabric is designed for SDN, with support for NVO leveraging the leading hypervisor solutions from Microsoft, VMware and OpenStack.
- Active Fabric supports Open Flow-based controllers from leading vendors.

4.   New solutions for the future ready data center

The future ready data center demands greater efficiencies not just in network architectures, but in data center network operations. Dell leads the way in optimizing the enterprise, with a transformational approach that starts at the platform level and spans design and deployment, all the way to the endpoints on the network fabric—servers and storage.

4.1   Optimizing the network with Active Fabric

Unlike legacy data center network vendors encumbered by a legacy of monolithic modular chassis and multi-tier architectures, Dell has no "legacy" portfolio to protect. Instead, Dell recognized early the industry trends pointing toward increased optimization for new data center traffic patterns and shifting priorities for IT organizations. Dell has become a leading networking solution provider to Web 2.0 and cloud operators, delivering streamlined and agile platforms with the dynamic and highly automated networking features that today's enterprises need to succeed. Active Fabric is built to address these needs—is now helping a new generation of organizations achieve their goals.

4.2   Simplifying the complex with Active Fabric Manager

Data center networks are increasingly moving toward fabric-based architectures in order to achieve better results from initiatives like virtualization, LAN/SAN convergence and cloud. However, the process of designing a fabric is not trivial. It involves taking into account a variety of parameters like the number of endpoints (servers and storage) and uplinks, scalability needs, acceptable over-subscription across the various tiers of the fabric, workload profile and needs for mobility, just to name a few. The process typically requires extensive network expertise and can be quite time-consuming, as well as error-prone.

Now data center operators have a simple way to design, deploy, and monitor network fabrics. Active Fabric Manager (AFM) from Dell is unique, first-of-its kind software that automates the tasks associated with designing, building and monitoring fabrics, eliminating many manual processes and reducing the time it takes to deploy fabrics by up to 86% compared to manual deployments. With AFM, users can now design and deploy L2 and L3 fabrics within a matter of minutes without executing a single CLI command.

Unlike traditional network management tools which focus primarily on monitoring performance of various network elements, AFM has been built from the ground-up as an automation and orchestration tool for the entire fabric, allowing operators to save time and eliminate manual tasks associated with fabric design and deployment. Using a simple design wizard and a few user inputs, AFM provides the most appropriate fabric topology for the need, eliminating guesswork and errors. And operators can be assured of the results—all designs are derived from a set of pre-defined templates that have been validated for deployment.

Once the switches are racked, stacked and cabled according to the wiring diagram generated by AFM's design wizard, the network administrator can complete the remaining tasks from AFM's Web GUI without having to issue a single CLI command. This is a significant improvement over other approaches that require execution of numerous CLI commands.

AFM provides a user-friendly solution for deploying complex fabrics, putting within reach for a greater number of data centers the type of advanced network architectures needed for innovation in today's highly virtualized environments.

4.3   Maximizing value with pre-integrated solutions

Building a data center network that delivers all the efficiencies needed for the future ready data center means getting more "bang for the buck" beyond the network as well. Active Fabric—like all Dell Networking solutions—is designed for simple 'plug and play' interoperability with Dell Active Infrastructure solutions. Not only can operators reap the performance benefits of Dell servers and storage, they can also reap the benefits of streamlined operations and performance efficiencies by connecting those servers and storage with Active Fabric.

5.   Conclusion

Dell offers a refreshing approach to delivering enterprise technologies. Rather than manipulate and contort legacy systems, Dell optimizes technologies for enterprise workloads. Now customers can avoid the complex, discontinuous and expensive approaches crowding the technology landscape today. By utilizing Dell's complete enterprise solution stack, they can embark on a proven path for data center transformation.

At the foundation of data center transformation is the network. With Dell Active Fabric, customers can advance their networking initiatives with entirely new levels of customized performance while fundamentally redefining their data center economics.

Start your enterprise transformation today: Contact Dell to schedule a network assessment with an expert who can help you maximize efficiencies in your network.

To learn more about Active Fabric and the broad portfolio of Dell networking solutions, visit Dellnetworking.com.

Redefine Data Center Economics with Active Fabric

A Dell Point of View