

# IS DELL DRIVING THE OPEN FUTURE OF NETWORKING?

## EXECUTIVE SUMMARY

While enterprise computing and storage have both gone through a standardization metamorphosis, enterprise networking has lagged. Enterprise networking remains one of the few areas of proprietary vertical integration in IT. But the need for businesses to move faster and be more agile is putting pressure on IT to adjust to strategies that will help their businesses keep pace with the frenetic rate of change.

With this backdrop, businesses are looking towards open networking and standardization to help knock the proprietary components out of the stack, reducing cost while simultaneously increasing flexibility. Open networking helps businesses to be more agile, keeping them competitive in today's and tomorrow's challenging markets. Open protocols, open operating systems, and network abstraction are impacting the face of networking by bringing a much-needed change of direction. And along with this new openness, there is an opportunity for companies to reconsider not only **how** they deploy networking, but also **who** they choose as their partner. As the market moves away from proprietary solutions, companies that drive standardization and open architectures stand to be the true gainers in the market.

Today, [Dell](#) has a small footprint in enterprise networking equipment, similar to the position it once held with both PCs and servers. Through standardization and driving a competitive product with better value, Dell grew to be a leader in both of those categories. Now Dell could be poised to become stronger in the networking world by following the same strategy, as open networking is causing a similar inflection point as in previous markets.

## TODAY'S CUSTOMERS LACK CHOICE AND FLEXIBILITY

Today's business world is moving faster; companies need to be able to respond quickly, seize opportunities, and drive the market. Unfortunately, many companies are finding that they can't move fast enough, because their infrastructure is holding them back. With public cloud options like [Amazon Web Services](#), where provisioning and activation can happen in minutes, internal IT departments under the microscope. Business decision makers are asking why their businesses can't have the same

level of internal IT service as they can purchase from outside companies. One of the largest contributors to IT's inability to move quickly today is the state of the network communications infrastructure. While everything else is accelerating in the business world, this status quo of networking is preventing enterprises from achieving their true potential.

The general lack of feature velocity is plaguing networking as well. While servers and storage have become fully virtualized, the networking world has not done a good job of delivering that type of innovation. Where virtualized compute and storage offer more fluid resources that can be deployed and changed easily, networking is still too hard-wired and inflexible.

Part of this problem goes back to networking equipment vendors who are innovating only for proprietary solutions and not bringing innovation to open solutions. Their customers are trapped in a proprietary vertical stack, and there is little competition to bring new features or innovation to the networking OS. Datacenters have seen a wealth of standardization options with industry-standard components, virtualization, and software-defined solutions for servers and storage. Unfortunately this standardization has not extended to networking in the same manner. Open source rules the cloud, and operating systems built on [Linux](#) run a large portion of enterprise datacenter compute applications. But when it comes to network switches and routers, too many networking vendors are afraid to open up for fear of cannibalizing their very healthy product margins or reducing the barrier to switching that they have worked so hard to maintain.

The state of products today is a result of years of proprietary neglect by an industry that has maintained a vertical "black box" of technology with mutually-dependent hardware and software locking in customers. The sunk cost of training and management created roadblocks; these obstacles made deploying new resources difficult, made changing capabilities even harder, and made switching vendors almost impossible. This scenario meant that when a business saw a new opportunity, they did not have the flexibility to go after it, because getting new IT services online took too long and cost too much. With so many manual processes and physical keystrokes on antiquated tools, IT just couldn't provision in time to meet the needs of the business. As companies have discovered, [even the simplest change in configuration can result in outages and downtime](#), leaving IT in a position where not touching anything is the preferred approach.

When products are proprietary—with high barriers to switching, stifled innovation, and limited competition—high prices are the end result. This situation may not be bad if you

are a networking vendor. However, as an end customer, vendors' high margins lead to a long list of projects that will never get funded because of limited budgets. Despite recent business acceleration, IT budgets have not kept pace. Over the past 5 years, [GDP growth for most countries has been on the rise](#), but the percentage of companies that see IT budgets increasing has not even crossed the halfway point. Despite economic growth, [almost 60% of IT managers](#) still believe that their IT budget will either go down or stay the same, so the IT budget gap continues to lag the economy.

IT departments don't view lower prices as a savings that puts money back in their pockets. Instead they see savings as a pool that helps fund more projects. Finding a more cost-effective networking solution can help IT departments ultimately deliver more services back to the business.

## HOW OPEN NETWORKING IS CHANGING NETWORKING

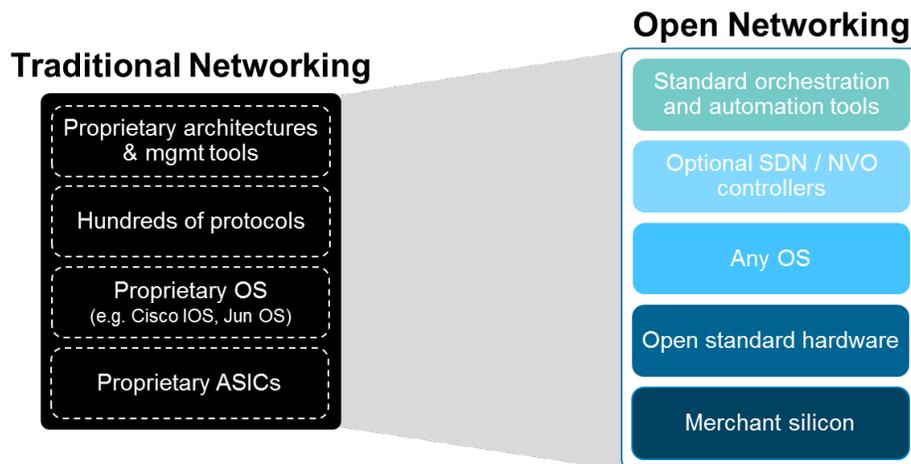
In network servers, life began with a vertically integrated stack that started with customized silicon all the way up through customized applications that sat on the server and were designed specifically for that stack. Companies like IBM and Digital owned the full stack and “sanctioned” any application that they did not specifically own. As standards came into play, x86 CPUs and other standardized components allowed servers to become more open—eventually allowing a range of operating systems and applications to run on top. This openness allowed the market to expand greatly, and more competition meant more choice and better pricing for businesses. Eventually the open nature of standardized platforms joined forces with open source operating systems and applications, thus giving businesses even more compelling value propositions for their datacenters.

There is a need to bring real innovation to networking, break the chains that have held it back, and put customers back in control of their IT. Open networking is a trend that is changing the face of networking—for the better—by bringing more interoperability and choice to the market. When customers have choice, pricing becomes more competitive and products become more innovative. Open networking can be most exemplified in three key areas.

- Open Protocols
- Open Operating Systems
- Network Abstraction

All of these pieces help break the monolithic proprietary stack and introduce new options at every level.

**FIGURE 1: OPEN NETWORKING MOVES FROM THE PROPRIETARY AND BRINGS CHOICE**



### *OPEN PROTOCOLS*

The start of any discussion on open networking needs to begin with open protocols, as these are the elements that allow for communication between devices. TCP/IP is the most pervasive standard protocol in networking today; it allows packets of data to move seamlessly across a wide variety of devices and applications. A new, open networking protocol called [OpenFlow](#) is available today, and it is empowering the movement to open networking. This layered protocol sits on top of TCP and helps separate the control plane from the data plane, allowing applications at a centralized server or switch level to determine the routing path. This means that packets can flow directly between switches instead of having to take the north-south path back to the core router for their routing directions. This flow results in more efficient data movement and greatly reduces north-south traffic bottlenecks on the network.

Open protocols are important because they break the first stranglehold on the network: the core router. Because the core router was the spiritual “heart” of the network, the choices that customers made about core technology eventually filtered out across the whole network. If you used Cisco for your core, you were more likely to use Cisco for the switches out at the edges of the network, even though it made little financial sense. But with core prominence being deemphasized by open protocols and network

virtualization, businesses now have more flexibility downstream. In addition, customers are seeing flatter spine and leaf switching fabrics as a cost effective alternative to the traditional three-tier core-based network.

*“As technology has advanced and fixed form factor solutions have proven lower cost, lower latency with a higher degree of reliability, we have become believers that the spine and leaf fabric design which Dell Networking has based on open standards is not only here to stay but, in fact, has a substantial advantage over competing solutions such as proprietary lock-in fabrics.”*

–Shane Stakem, Senior Director, Network Operations, Joyent Inc.

### OPEN OPERATING SYSTEMS

For years, the network switch has been a tightly controlled entity with the equipment OEMs providing both the hardware and the network operating system. Recently, Linux-based network operating systems for switches have become more commonplace with a choice of open options that disaggregate the OS software from the hardware. Now that choice is becoming more available, IT can decide on the “best of breed” solution that most closely meets their needs. Options like [Pica8](#), [Cumulus](#), and [Big Switch](#) are gaining market visibility. Having choice will help drive better value in the market by putting pressure on traditional vendors who have not begun to open up their platforms.

As the industry has shifted to standardized silicon and standardized hardware platform components, a Linux-based OS alternative or an open OS untethered from the hardware becomes a more viable option. While networking makes this transition, there will be a need for continuity between existing vertical stacks and new open network OS choices, so customers can bridge between their legacy systems and their future open network. With an open software stack running on standardized hardware, there is a more flexible opening for routing and network control applications to run directly at the centralized switch or server level. This leads to the final piece: network abstraction.

*“The future is SDN-based with open software and hardware. We need a practical way to get from here to there. Currently, we purchase Dell and Big Switch Networks products independently. Having them team for a fully integrated, tested and supported solution is ideal. To me, it’s a great example of the new Dell investing in research and development to help us bridge the gap between traditional networking and SDN.”*

–Jim Bottum, CIO Clemson University

### *NETWORK ABSTRACTION*

Among the three components of enterprise compute servers, storage, and networking, only networking has not taken the plunge into fully virtualized systems. But as application patterns are changing—driving more east-west traffic on the network—IT is reevaluating how it deploys networking. This reevaluation is opening an opportunity for network virtualization (and virtual overlays) through [Software Defined Networking \(SDN\)](#).

SDN takes advantage of protocols like OpenFlow that spilt the control plane from the data plane and allow for network functions to be decentralized. This software control brings true hardware abstraction for the network; it enables applications like load balancing, security, and filtering to happen in a coordinated manner. But more importantly, by being virtualized, network resources can be provisioned, launched, and changed very quickly. Virtualization dramatically reduces the time and cost of deploying and managing networks. As well, the network can be more responsive to application needs and better maintain QoS through an SDN environment.

### *IMPLICATIONS*

Together, the three trends of open protocols, open operating systems, and network abstraction are driving the shift towards open networking. Vendors who embrace these trends will find themselves in a much better competitive position, as open networking becomes more pervasive in the market.

### **DELL: A LEADER OPEN NETWORKING**

When it comes to driving standardization into the market, Dell has been a leader over the years. Dell was the first to leverage component standardization and supply chain to drive the PC market. Later, Dell leveraged that model to move quickly into network servers and rose from near obscurity to become a leader in the market in only a few short years. Dell's focus on standardization and reliability has allowed them to remain at the top and hold firmly as [the second largest shipper of servers worldwide](#).

Through their highly efficient supply chain, Dell is in a position to do with networking what they did with PCs and servers. The market dynamics are similar, and Dell can use the same playbook that they have mastered in those adjacent markets to push further into the networking market.

While component standardization helps supply chain and pricing, the key for customers will be technology standardization as well as adherence to industry standards. Dell not only adheres to the standards, they are also working actively to help advance the standards. Dell has representation in many global standards organizations.

TABLE 1: DELL REPRESENTATION IN STANDARDS ORGANIZATIONS

Standards Organization	Dell Representation
<a href="#">OpenDaylight</a>	Platinum member
<a href="#">Object Management Group</a>	Contributing member
<a href="#">Open Networking Foundation</a>	Member
<a href="#">Open Networking User Group</a>	Sponsor
<a href="#">The Open Group</a>	Member
<a href="#">Cloud NFV</a>	Founding member
<a href="#">IEEE</a>	Chairperson, High-speed working group
<a href="#">Ethernet Alliance</a>	Chairman
<a href="#">25G Consortium</a>	Steering Committee member
<a href="#">ETSI</a>	NFV working group
<a href="#">OpenCompute Project</a>	Member

By contributing resources to these various organizations, Dell gains valuable insight into the needs and technologies that are driving open networking and future standards. Access to the companies and customers who are on the leading edge of open networking helps Dell design better products that are targeted at this market.

*“Dell is a strong participant on so many standards committees because we believe that open standards help Dell, and the industry, deliver the best products. The standards process brings together a wide range of people who share different knowledge and ideas, resulting in a broader and multidimensional perspective. The collaboration brings a level of discussion and vetting that is not seen in proprietary products, ultimately fostering more innovation and competition in the market. In the end, the customer is the clear winner.”*

–John D’Ambrosia, Dell Chief Ethernet Evangelist & Distinguished Engineer (Chairman of the Ethernet Alliance)

As network platforms leverage more commodity components, and as applications are ported to run on Linux-based network operating systems, network platforms will start to look more like servers from a management perspective. For years, customers had to grapple with complex, manual, and arcane network management. But with open networking, the new management tools start to look and act more like server management tools. With proprietary management tools, administrators could manage

only a small number of proprietary networking devices. Now, administrators have access to more standardized tools and platforms that are based on open source and Linux technology. Administrators now can deal with a much larger set of networking devices (and servers) through improved manageability and better automation. All of this points to better productivity and lower operating expenses. For example, Dell customer IIHT Cloud Solutions in India reduced their total cost of ownership overall by 40% through simplified management, lower energy consumption, and reduced port count—all by using more standardized platforms and tools.

*“The Dell infrastructure is simple to manage. Once everything is up and running it’s hands-off, which lets me move on to the next thing...With Dell, it’s not just about the technology today; it’s about positioning you well for the future.”*

—Jonathan Bisdorf, CTO, Ohio Valley Surgical Hospital

Businesses will see acquisition cost savings from standardized systems like the Dell networking platforms, but the real savings will come in the form of operational savings. This savings opens the door on a lot of potential opportunity. For customers who already are standardized on Dell for servers, the chance to add networking to that same purchasing and support model presents an opportunity to streamline and reduce costs on procurement and support contracts.

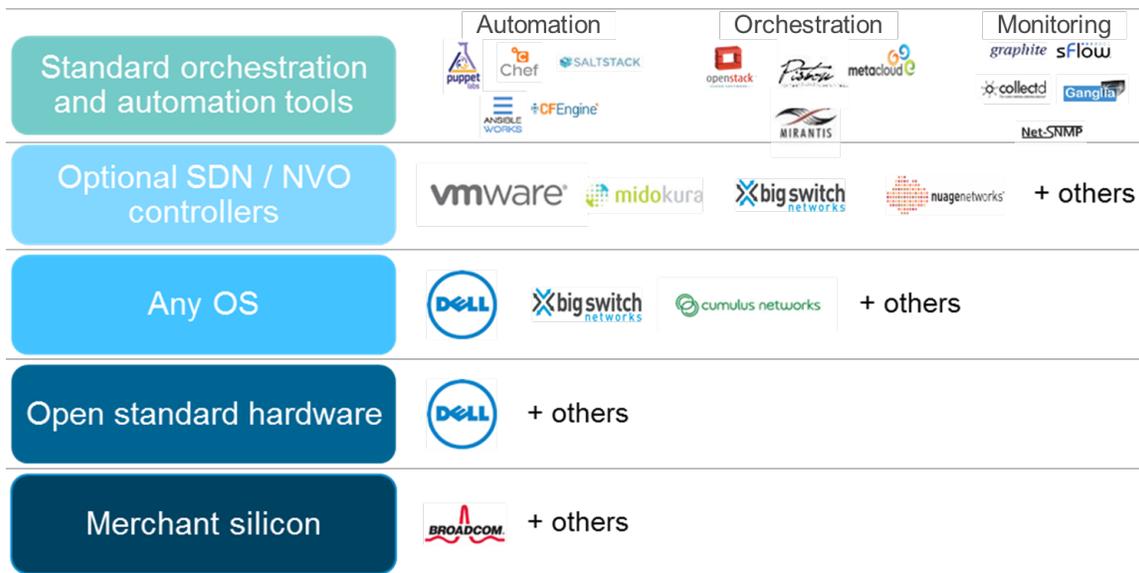
Because Dell is using industry-standard components, we have no belief that some “secret sauce” in the hardware will make the networking and servers work better together. However, where that combination shows its benefit is in the streamlined procurement, simplified global support, and combined management tools.

*“Dell is a very good partner with the University of North Carolina. Close to 90 percent of the servers and networking switches we have are Dell. And when you look at the total cost of ownership, the manageability and reliability of the systems, and the support, it’s obvious why we stay with Dell.”*

—John McGee, the director of Cyberinfrastructure at RENC1

Dell’s strategy focuses on providing support for leading choices in all layers of the stack.

## FIGURE 2: DELL STRATEGY: ENGAGE AT ALL LAYERS FOR WIDE, OPEN SUPPORT



At the base layer, standardized silicon and hardware provide the best platform for enabling the widest selection of choices for the OS, controller, and tools layer. Dell datacenter switching platforms also come out-of-the-box with SDN options for customers. Options include controller-based solutions like OpenFlow, overlay-based solutions from VMware and Microsoft, and programmable-based solutions like the REST API and XML.

Looking up to the application layers, instead of trying to reinvent the wheel and lock customers into proprietary applications, Dell prefers to work with the industry leaders in each of the main categories. Across the key networking application space, Dell has close relationships with the vendors who most businesses are probably already using.

FIGURE 3: DELL NETWORKING APPLICATION PARTNERS



All combined, the strategy of standardized platforms, open layers, and strategic partners puts Dell into a position where integration into existing customer environments is streamlined and simplified. This strategy is especially important as customers determine

how their networks will evolve over time.

It is unrealistic to expect that a business will make a wholesale switch to a new open architecture and throw out their existing networking products. Because this shift will evolve over time, interoperability with existing standards, platforms, and tools is important. There will be some degree of transition for customers. Having this wide breadth of options helps ensure better compatibility, as customers begin the journey of moving from proprietary to open.

## WHERE THE NETWORKING MARKET IS HEADING

The networking market is going through some turbulent times. We see several clear trends driving the market. Most tie back to open networking in one way or another.

- **Open networking is gaining momentum.** Customers are no longer standing still. They're fed up with being locked into proprietary traps, and they are looking for alternatives. Just as open standards and systems have brought value to the storage and server portions of their enterprises, customers recognize that networking is hitting an inflection point. Open networking solutions are moving from a science experiment to something that actually could be deployed in production. While it's not going to be a light switch transition (flipping completely from traditional core-centric to completely open networks), once the transition begins, it will be hard to go back.
- **Traditional networking-only vendors are under pressure.** As customers start embracing open networking, traditional networking vendors like Cisco, Juniper, Alcatel-Lucent, and others have the most at risk in the transition. Most of these vendors are viewed as focusing their recent efforts on maintaining high margins and not necessarily much on innovating open solutions to meet customers' needs. Traditional vendors' lack of feature velocity and continued focus on not disrupting the status quo (keeping customers tied to their proprietary platforms) will invite greater competition from non-traditional vendors, as customers seek new alternatives.
- **Server OEMs are poised to gain networking share.** As the market gravitates to more open strategies, networking will become more about supply chain efficiency and global service and support. Customers who are standardized on a particular vendor's servers probably will be more apt to consider that vendor for networking in the future. This is especially true as open networking becomes more prevalent and networking devices begin to more closely resemble servers

from a platform and management perspective. The feature velocity these vendors can bring to the market allows them to surpass traditional networking vendors in being more customer-focused with more relevant technology. Thus, incumbent server vendors have an opportunity to leverage their server footprint to increase their networking sales within those customers' datacenters. Dell server customers will have a natural affinity for Dell networking hardware. Similarly, HP server customers will probably see a benefit from deploying HP networking. IBM server customers already face a potential move to Lenovo, so it is less clear today where these former IBM customers will ultimately turn.

- **The rise of whitebox networking.** Whitebox server platforms now occupy a portion of the compute landscape as companies like Google, Facebook, and Amazon build their own commodity servers. Similarly, there is an opportunity for whitebox solutions in the networking world. While not for everyone—as they do not come with the same levels of support as products from traditional hardware vendors—some customers will be attracted to these very low cost solutions. And like servers, most (with the exception of a handful of hyperscale datacenters) will find that the acquisition cost savings are offset by higher management and support costs that they were not expecting. But for a handful of large companies who have the resources to customize their own switch OS to their specific needs, whitebox solutions will be an interesting option. They definitely will not become mainstream, but they will occupy a slice of the networking products continuum.
- **Software strategies will become more critical.** As choices for open network operating systems unfold in the market, the underlying hardware will become more commoditized—leading, again, to supply chain optimization. With fewer proprietary hooks in the hardware, customers will look toward the software when making buying decisions. SDN will take some of the functionality focus away from hardware, such that procurement decisions are more software-driven.

Ultimately, as the market sees this strategy shift play out, the pain of transition may not be as drastic as anticipated. Elmcroft Senior Living, for instance, moved away from Cisco and began deploying Dell Networking switches. Along with 50% switch cost savings, Ray Sands, Senior Technical Analyst notes, because Dell Networking switches use a similar command line interface to Cisco,

*“I can still use all my Cisco knowledge and training when I buy Dell’s switches.”*

## CONCLUSION

As open networking becomes more prevalent, we believe the networking market will mimic what we have already seen in servers and storage with more standards, more virtualization, and more heated competition. This trend towards standardization will enable better agility for businesses. They will be able to move faster and react more quickly to changes in the market, because their networking will be more responsive to their needs.

With Dell being a leader in both servers and storage, we believe there is every opportunity for them to expand their current network footprint (which is disproportionately low relative to their share in other enterprise products). Currently, the move to open networking is a server vendor's best opportunity, as customers break from the traditional status quo and investigate new architectures and potentially new vendors. Dell's focus on driving openness into their products makes them a compelling alternative as IT customers look for change.

Based on changing network patterns (more east-west traffic), new deployment models (cloud, IoT, Big Data), and new open networking choices (Linux-based OS, SDN), customers are well served by looking at their options and considering the networking offerings of their server vendors. Now is potentially one of the best times for end customers to consider alternatives to their traditional networking vendors. We see Dell as a compelling option, especially for those businesses who are already standardized on Dell servers.

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