OPEN NETWORKING CONTINUES MOMENTUM

DRIVING FLEXIBILITY & EFFICIENCY FOR BUSINESS THAT JUST CANNOT STAND STILL

EXECUTIVE SUMMARY

Technology has fueled much of the business acceleration in recent years, but in many cases it is also holding businesses back. In today's data-driven world, companies are finding that to be competitive they must move quickly, maneuver ahead of the competition, and use information to help them stay ahead. Unfortunately, as many find, being that adept and agile might not be that easy, because technology can be an impediment as well as an enabler. Today's networks are aging; their proprietary components and arcane interfaces can stymie a business's plans to move forward.

There needs to be an alternative to traditional networking that is more agile, more cost effective, and most importantly can change with the business's needs. Open networking proposes to change these staid networking products and processes to bring a more flexible and cost-effective approach. Many companies today have already begun to deploy open networking solutions to improve their operations and better tailor their services to match their end customer needs. Open networking is bringing new levels of flexibility, agility, and cost effectiveness that are creating a better competitive advantage for forward-thinking businesses.

Dell has been executing an open networking strategy, as they enable open networking on virtually all of their enterprise switching products, as well as building an ecosystem of software partners to help deliver on customers' needs. This strategy is gaining traction as Dell and its partners are helping customers see clear results today with open networking in their environments. Looking at customers that Dell has already helped in deploying open networking is one of the best ways to illustrate its practical applications.

TRADITIONAL NETWORKING IS THE BOTTLENECK

Today's networks are bottlenecks for customers. When opportunity arises, the network is typically the long pole in the tent—the hardest component to change. This results in longer than necessary delays when deploying new hardware, services, or applications to take advantage of these opportunities. At times companies may even see opportunities pass them by, because they just cannot move fast enough.

Over the years, networks have become more complex and harder to deal with. As a mesh that connects all of the endpoints, any network change can have a large impact across many areas. The complexity of security and access alone (determining which applications can access which data or other applications) creates a hurdle in trying to move quickly, due to the risk of mistakes. Open networking proposes to solve much of the complexity in today's networks, but some still view open networking as adding an extra layer of complexity.

The best analog to today's open networking movement is the virtualization of the server. Back in the early 2000s, many viewed virtualization as another layer of complexity for servers, but disaggregating the software stack from the hardware allowed companies to boost administrator productivity. Today there is no question that servers are significantly more manageable than ten years ago, and more importantly servers can be deployed very quickly, in hours or minutes. Only the network lags behind, holding back the deployment of new applications and services for days, weeks, or even months.

New applications like big data analytics, the Internet of Things (IoT), and even mobility are putting pressures on businesses to move quickly, and networking just cannot keep pace. A key commonality in all of these new computing trends is that they are very focused on (and rely heavily on) data in movement, unlike older trends that were more focused on the compute or transformational elements. Normally, networking teams do not like to "rock the boat" by changing direction because of the complexity of change, but traffic demands are requiring more bandwidth and efficient data movement. Companies are finding that as these new applications are demanding new infrastructure, the inflection point is a good opportunity for them to address their wider network strategies. Businesses need more flexibility, and moving away from traditional networking is the only way to bring that agility to the network.

The traditional networking stack's monolithic black box is the biggest problem that open networking solves. These old, tightly integrated offerings lack flexibility and prevent innovation by exerting a model of control that typically results in vendor lock-in, ultimately hurting the end customer. The burden on IT is growing faster than budgets and resources; continuing to rely on traditional networking to solve this problem only intensifies the issues. The old way of networking cannot scale at the same pace that business is growing.

Open networking presents the best alternative: standardized hardware with innovative software and services targeted at this fast pace of change.

THE PRACTICAL ASPECTS OF OPEN NETWORKING

Open networking does to the network stack what Linux and open source have done to the server. By splitting the linkage between hardware and software, customers have more choice and flexibility. This split results in solutions that can be better tailored to customers' needs. Openness drives competition, and competition drives value—a clear win for open systems and a clear challenge to the proprietary alternatives.

Platform standardization has led to almost identical Broadcom silicon in practically every switch on the market, just like Intel processors in servers. Networking hardware has become far more standardized with most of the differentiation moving to the software and services. "White box" network switches, available from companies like Accton or Quanta, can provide a very inexpensive base set of networking features. However, most customers are still more comfortable with solutions from more prominent vendors who are able to combine the full stack of standardized hardware with the right software and services for the life of the installation.

These so-called "brite box" (branded white box) switches come from many of the same companies providing server infrastructure and deliver networking features at a low price, but they have a better selection of software, services, management tools, and warranty behind them. Instead of coming from an ODM with an unfamiliar name, they are procured from a company that the customer has heard of, is probably doing business with already and can trust. With an already established supply chain, it is easier for a customer to make a change away from proprietary networking vendors. **Customers can reduce risk by choosing network switches from the same vendor they rely on for servers or other infrastructure**.

Hardware standardization is the key factor enabling the open networking ecosystem to grow. New network operating systems, management tools, and automation software offerings expand every day. This ecosystem growth is bringing more hardware vendors into the fold, delivering more choice and flexibility for customers, and ultimately resulting in a better set of features with more value. Platform standardization is driving better interoperability and more efficiency from the same resources, just as we saw in the server world. Linux, which benefitted from server standardization, is a key component of open networking. Many of the management and automation tools from the server world are starting to make their move into networking, joining the Linux-based open networking operating systems already on the market.

THE OPEN NETWORKING ECOSYSTEM

Open networking has been steadily gaining momentum, not due to technological advances, but due to business needs. Workloads are changing, forcing the discussions about alternatives to older, traditional methods that just cannot scale with today's business needs. Fueling the momentum are companies that are approaching networking from a different perspective. Disaggregation is enabling choice, something that has been missing in the past. As the ecosystem for open networking grows, the expansion of choice is increasing customer control. Some key software vendors of this open networking ecosystem are listed below.

- **Cumulus** is a Linux-based network OS that merges networking into the architectural and supply chain model of compute.
- **Big Switch** brings hyperscale networking to enterprises, cloud providers, and service providers.
- **Pluribus Networks** delivers an open networking virtualization-centric fabric.
- **IP Infusion** brings the power of the Open Compute Project to networking.
- **Community Projects and Representation**: three and four letter acronyms abound in organizations and projects focused on open networking including OCP, ONF, ONIE, ONL, ONOS, ONUG, and OVS.

Each of these companies or organizations has a different perspective and some product differentiation that sets them apart from the others, allowing them to focus on individual customers' use cases and networking needs in this broad landscape.

CUSTOMER EXAMPLES

The following four examples describe how companies are embracing the open networking ecosystem, using these new capabilities to help meet the needs left unmet by traditional networking.

OPEN NETWORKING DELIVERS SCALE

Medallia is a company that helps businesses boost their customer experience, an important metric that helps drive deeper customer relationships. By using real-time analytics, Medallia can provide businesses the input that helps them monitor and improve how they work with customers. However, throughput is critical to do this; tremendous amounts of data need to be analyzed quickly through an in-memory data analytics engine to provide the real-time feedback regarding customer interactions.

Medallia chose Cumulus software on Dell Networking switches to tackle the challenge of both delivering that level of real-time performance and also scaling out their business as they add more customers and grow their analysis offerings.

Scaling the infrastructure and environment to match a growing business was critical, and Medallia needed not only throughput and performance but also the ability to deploy quickly as business needs increased. When Medallia evaluated Dell's Open Networking solutions relative to both traditional networking options and white box choices that supported open networking, Medallia found that Dell had the best technical, most capable, and highest performing products. Dell Networking switches delivered a high performance, yet affordable 40GbE infrastructure for their growing server-to-server traffic needs.

Cumulus software enabled Medallia to look at every piece of data running through the network to better understand and control that traffic as their business was growing… without any vendor limitations. Medallia's server direction was clearly established on open source software and tools for building out their analytics platform, as well as their overall business. Cumulus and Dell—with their support of open networking and Linux— fit well into that strategy. Previously, the integrated networking stack from traditional switch vendors had taken Medallia weeks to set up and configure. But with a Dell and Cumulus open networking solution, Medallia was up and running in an afternoon. The pilot showed enough benefit that the company quickly continued with rollouts across the globe in a variety of colocation datacenters.

Because they must respond quickly to the needs of their end customers, Medallia cannot afford the delays in provisioning and deploying services typically found with traditional networking. Through open networking (and using ONIE for discovery and installation), Medallia can provision hardware and software quickly and efficiently, removing steps and streamlining the process. Cumulus' zero touch provisioning enables the Dell switch to auto-provision once installed into the rack and powered up. The provisioning process enables the switch to be automatically added to a configuration management platform such as Puppet, Chef, CFEngine, or even a homegrown tool. The automation helps Medallia scale up to match business needs, and more importantly it gives them the flexibility to add and roll out new features as Medallia continues to better understand its end customers' needs.

OPEN NETWORKING ACCELERATES TIME-TO-REVENUE

For hosting businesses, time is literally money. From the time a customer agreement is signed to expand their services until those services actually come online, any moment that those services are not online is lost revenue that can never be recaptured. Because of this dynamic, hosters like U2 Cloud are looking to software-defined infrastructures with server virtualization, software-defined networking (SDN), and software-defined storage (SDS) to minimize deployment times and boost time-to-revenue.

This flexible infrastructure increases agility as services can be provisioned in minutes instead of a week, which is a huge benefit for U2 Cloud's end customers. Not only does this accelerate U2 Cloud's business, it also enables U2 Cloud's end customers to accelerate their businesses as well. With faster provisioning, new services can be deployed rapidly, allowing U2 Cloud to realize new revenue streams by expanding their offering to meet emerging opportunities.

To drive the best flexibility, U2 Cloud stuck with only platform-agnostic technologies, leading them to choose Big Switch Network's Big Cloud Fabric to create a leaf-spine topology. This architecture breaks from the traditional vertically-designed and core-centric architectures that are so difficult to change as business needs move quickly. The flatter 40GbE solution running on Dell Networking switches and Big Switch software easily integrated into their VMware vSphere environment, simplifying management tasks. The simplicity of the cable map afforded by the leaf-spine configuration reduced much of the potential for human error when managing, allowing U2 Cloud to quickly ramp up capabilities as customer needs grow.

Through much of the automation of both the SDN and SDS environments, U2 Cloud has been able to reduce the number of engineers needed to execute change, as the Dell servers, Big Switch networking, and Nexenta storage are all running Linux-based operating environments.

In the end, U2 Cloud was able to enhance their customer experience by increasing performance threefold while giving themselves more insight and control over their IT environment. The move to an open environment—and ultimately open networking—has resulted in an improved ROI for the company. The costs of open networking are lower than the costs of traditional networking, and the benefits in both new business and productivity are higher as well.

OPEN NETWORKING HANDLES FLUID ENVIRONMENTS

Academia is often cited within open networking and SDN, because much of the early research was done there. Some believe that universities have the luxury to play with new emerging technologies as "science experiments", however dismissing academic usage as "not relevant" to the broader commercial market really misses some key elements. Universities like Cornell are deploying SDN, because they have a wide range of needs that their IT organization must respond to: faculty / academic tasks for running the university, researchers who need state of the art technology to drive their research projects, and of course the greater student body at large.

Cornell had built a research cloud based on Eucalyptus, an open source software that enables private clouds. But the challenge they were facing was how to manage network traffic in a way that enabled researchers to accelerate their work without impeding the rest of the production users on the network.

Cornell needed to balance these different traffic demands and chose an SDN fabric based on OpenDaylight with NEC controllers and open networking running on Dell Networking switches for a more fluid environment. While the solution reduced Cornell's prior networking footprint by more than 50%, Cornell was still able to accelerate research and to support more users than before. With production and research traffic all consolidated onto one network, but still effectively isolated, SDN controllers enabled Cornell to partition each individual switch into four virtual control planes with two planes for production and two planes for research. Previously only a few researchers could work simultaneously, because their massive datasets would bog down the network; now 12 or more researchers can do their work concurrently without grinding the network to a halt. The 10GbE network that completely wires the research center provides high throughput from any desktop to any server with the SDN engine able to optimize data movements throughout that network.

Through SDN's data plane management, the researchers now have control over their network segments. The automation that SDN brings means that many previously-manual tasks now happen without any administrator intervention. Thus IT resources are free to focus on other projects that can add value to the university's research center.

OPEN NETWORKING ENABLES FLEXIBLE PRIVATE CLOUDS

Midokura should be a natural for supporting open networking. As a Japanese supplier of an SDN fabric, the company is clearly aligned behind the concepts of open networking. But they do not just preach that vision for the future, they live it.

The company is geographically dispersed with an IT environment that runs around the globe. Initially, hosting all of their VMs in the cloud through a major cloud provider seemed like a great strategy. But their developers needed to continually build out additional VMs for testing new features, functionality, and different software configurations. To drive innovation, developers need to be able to "play in multiple sandboxes", but in a public cloud world, every new sandbox adds operational expense to the budget. Worse yet, with no good mechanism for determining which VMs were still required and which no longer served a practical purpose, the "VM sprawl" was costing the company more money each month in operational expenses.

Midokura determined that the best alternative for tackling this sprawl was to bring those development environments in-house, hosting them on a private cloud. The private cloud gave Midokura the flexibility their developers needed. Developers now had the opportunity for more experimentation without having to worry about the cost every time they spun up a new VM. The company wanted standards at every layer, so using Cumulus Linux running on all of the Dell switches provided a base for building out the services they needed to run on top. The Linux-enabled switches provide an interface that is more like a Linux server with network functionality added on top. Common tasks like network provisioning can be performed using standard Linux commands instead of arcane command line interface instructions. For Midokura management, this familiar environment means that **any administrator with the knowledge to manage a Linux server now also has the expertise to manage a Linux switch as well**, boosting productivity and the number of devices that a single administrator can handle.

OPEN NETWORKING COMMON THREADS

All of the customers highlighted here have made the transition to open networking, because they found traditional networking lacked the functionality they wanted and, more importantly, the flexibility they needed. As the business environment becomes more competitive, it is important for companies to move quickly to stay ahead. This is hard to do when your network is holding you back and preventing transformation due to network changes being simply too difficult or time consuming.

Open networking brings new capabilities to businesses including:

- **A Linux-based environment**: This is a key feature of open networking that has the biggest fundamental impact on businesses. After years of working with Linux-based servers, much management expertise and efficiency has been gained. A Linux-based network OS enables administrators to apply all of that server management knowledge to their networking. This accelerates and simplifies management tasks and, more importantly, drives the span of managed devices. The efficiency afforded by open networking enables much higher administrator-to-device ratios, freeing up resources to tackle other networking problems instead of focusing time on typing characters in a command line. Additionally, when deploying new services on Linux-based servers or VMs, the fact that both are based on the same underlying architecture speeds the process.

- **Broader range of skills**: Traditional networking typically required certified networking specialists (*e.g.*, Cisco CCNA through CCIE) with a very narrow set of skills, but this approach was more limiting and less flexible. With open networking, IT resources can deal with both servers and networking, increasing job flexibility and removing the need for very (expensive) vertically-focused training and certification. This can also speed the resolution of issues because IT resources can span multiple domains, allowing them to more easily track down and resolve issues.

- **Better flexibility**: Every business today needs to move quickly. As the pace of competitive pressure ratchets up in almost every industry, the need for flexibility is heightened. Availability of data and the growth of information in general are helping businesses stay on top of their customer needs. This data comes with new technologies (IoT, big data, analytics, *etc.*) that can provide real-time collection and evaluation to discern the best path forward, but these demand more flexibility. Having the ability to change underlying infrastructures to keep pace with business is critical. Innovation does not come from rigid inflexible environments, so if businesses demand innovation they need to be able to move flexibly to support it.

- **Better speed**: Flexibility must live hand-in-hand with speed. Simply having an environment that can change to meet demands does not help if the time to make those changes is still too long. Open networking speeds alterations to the network, helping to operationalize flexibility and deliver the desired results faster.

- **Performance**: Many performance gains that customers will see in open networking stem from the fact that these deployments are using the latest generation of networking equipment. Because these products do not need to

support a vendor's proprietary business model, customers find that they are able to get more for their money, meaning they can buy into higher levels of performance than they were able to afford in a more proprietary product.

- **Customization**: The Linux base for most open networking environments enables companies to build their own custom applications to meet their precise needs. With more configurability, customers are able to tweak / tune their application, giving developers a fine-grained approach to optimizing their environment. Administrators with Linux server experience will find many of those same optimizations and tricks "bleed over" into the networking space, enabling better control and customization.
- **Better value**: Open networking is not about paying less; it is about getting more for your money. While people often view Linux and open source as free, the reality is that these are platforms for innovation. Instead of paying more to get less from proprietary platforms, customers who investigate open networking find they actually can get more for their money in performance, features, flexibility, and capability.

Overall we find that open networking can do to the traditional networking space what Linux and open source did to the server space: **create more flexibility and capability for business while shifting the control point from the vendor to the customer**. This means that a business can be more responsive to their end customers and the market, as they are the ones to chart their destiny based on their actual needs instead of focusing on what a proprietary vendor tells them is possible.

CALL TO ACTION

The capabilities of open networking are now becoming more mainstream, aligning with the open technologies that customers are already working with in servers and storage. We believe that customers who are struggling with the limitations of their current networking environments should evaluate the open networking alternatives that can help them break from the limitations of current proprietary networks.

Open networking is the key to moving forward, scaling, and keeping up with IT service demands. The field of open networking options—both hardware and software—is growing every day, so the momentum in this space will help to fuel future innovations.

IMPORTANT INFORMATION ABOUT THIS PAPER