

OPEN NETWORKING LEADS DIGITAL TRANSFORMATION

TO REINVENT A BUSINESS, THE FIRST STEP IS REINVENTING THE NETWORK

EXECUTIVE SUMMARY

Companies see digital transformation as a way to help them accelerate their business by leveraging mobility, the Internet of Things (IoT), big data analytics, and social media to drive better insight and speed decision making. But before they can transform their businesses, they need to transform their network first, because traditional network architectures hamper digital transformation instead of propelling it forward. Dell Networking has a product strategy that focuses on making networking **open**, **programmable**, and **scalable**—all attributes that will be required for a business that is heading down the path of digital transformation.

WHAT IS DIGITAL TRANSFORMATION?

Before delving into the role that networking will play, it is important to first define what we mean by “digital transformation”. Digital transformation is the wholesale change in how companies operate, aligning their business around information and data sources to help drive better agility and deeper insights. This change requires a company to not only retool its IT environment but also refocus the skills that IT staff will require. To address the changes that will need to happen to IT, companies should focus on modernization, automation, and transformation, because the traditional IT systems that will be the key underpinning need to become agile and flexible before the business can begin the journey. Networks will need to change from being hardware-centric to software-centric in order to enable this evolution. Through digital transformation, companies can move quickly and decisively in today’s challenging business environments, but the underlying technology foundation must be in place first.

Digital transformation will see companies taking a cloud-first strategy, as many on Wall Street and the technology sector have already done, focusing their efforts on leading with the cloud to drive faster innovation. Traditional application development is seen as a last refuge, only considered when there is a compelling reason to not build in the cloud—a complete reversal of where we were just a few years ago.

With the wealth of information now being generated, big data analytics becomes critical to digital transformation. As latency in the business becomes more of a hindrance, care

must be taken to handle the analytic workload where it makes sense, often at the edge, where it is closest to the data. This shift puts networking at the heart of how applications are designed (and located) as the volume of data being analyzed is skyrocketing.

Iteration is important in setting the direction and narrowing the focus towards the actionable insight that digital transformation demands. Being able to move quickly is essential, so decisions cannot wait for every last bit of information. To be agile, the bias towards action must be paired with a willingness to course correct as new iterations bring new insight. The first mover benefits drive agile development methodologies like DevOps, which can help bring more velocity and focus in the business.

We see that these drivers for digital transformation will impact businesses from their processes all the way through to their IT systems and strategies. With everything that must happen inside of the IT department, companies will also need to address their workforce and security, as these areas will go hand-in-hand with IT in the transformation from a traditional state to a fully connected digital state.

TODAY'S BUSINESS NEEDS AROUND DIGITAL TRANSFORMATION

The focus on digital transformation is possible because everything has become instrumented, integrated, and controllable as the world moves towards a truly connected economy. Information is becoming a rich resource for businesses that are creating data at a rapidly accelerated rate, as the tools to collect, analyze, and drive action in real-time are finally available. But to truly take advantage of this digital transformation, businesses need to move from the traditional networking of the past into the more flexible and agile infrastructures of the future that are scalable, programmable, and open. As these networks become more open, scalable, and programmable, IT skills will need to change in order to harvest the potential opportunity that exists.

Alvin Toffler's book *The Third Wave* describes the three great waves of societal transformation: from agrarian to industrial to the post-industrial era which is where we have been since the late 1950s. The third wave was driven heavily by knowledge, data, and eventually computing. As computing changed how businesses operated, we saw that there are also three waves of computing platforms.

The first true computing platforms were mainframes, which allowed companies to centralize data and decision-making. However, mainframes' expense and limited flexibility left them accessible to only a few, and the response time for decisions lagged the business greatly.

The second platform was driven by departmental needs for greater and faster information, with client-server computing reducing decision time and increasing agility. But these systems were rooted in corporate data structures and inwardly focused. While they helped change the trajectory of business, they were still too limited.

Today we find ourselves staring into the face of the “third platform”: truly connected, flexible, and on-demand platforms that leverage technologies like cloud computing. This wave brings large numbers of disparate information sources together, enabling a business to move in a more truly agile manner. By leveraging mobility, cloud computing, the Internet of Things (IoT), and social media, businesses are able to draw a far more complete picture, in real-time, to help them understand where opportunities exist.

To bring all of these disparate data sources together and digitally transform the company, a business must re-architect its current data structures, applications, and processes, as they must now step outside of their datacenter at times, integrating external feeds. New technologies are also driving changes. For instance, as flash memory prices have dropped dramatically in recent years, IT is modernizing systems with the latest flash technologies to reduce system latency. While the dream of an all-flash datacenter is still beyond the budgets of most businesses, flash is rapidly becoming a foundation for most enterprise applications in one way or another. But capitalizing on the reduced latency that flash can deliver requires IT to optimize the paths between systems, meaning that the network must be re-architected to take advantage of these cutting-edge high speed technologies.

With datacenter space at a premium and the majority of workloads now being deployed on virtualized infrastructures, converged and hyperconverged platforms are becoming more important. In these architectures, networking resources—both within the system and outside of the system—play a more critical role in data access and resource provisioning, a role that can only be handled through network virtualization.

To take advantage of digital transformation, networking needs to change. But that may be easier said than done. Businesses must address significant obstacles when trying to embrace a digital transformation strategy.

OBSTACLES THAT BLOCK DIGITAL TRANSFORMATION

The network is one of the largest obstacles on the path to digital transformation. We have seen modernization of servers, storage, applications, and even datacenters, but today's networking has not evolved. Today's networking still resembles traditional

networking of the past 20 years. With proprietary network structures that are hard to deploy and manage, slow to change, and difficult to work with, traditional networking is the largest impediment to change in the enterprise.

It is not just the equipment that holds companies back. Organizational challenges and the skillset gaps that exists among today's IT staff create an equally thorny impediment to change. More focus on agile disciplines like DevOps and greater emphasis on Linux experience (and other open source software) need to be brought into IT organizations to enable them shift to the future.

Throughout this digital transformation, the increased use of virtualization will lead IT staffs into a new realm where visibility will become more critical. Being able to correlate issues between the virtual overlay and the physical underlay will become an invaluable skill. This skill is vital, because the on-demand networking and IT infrastructure required for a full digital transformation will be far more complex than today's traditional models.

But all of the changes that businesses are seeking as they move towards digital transformation will be meaningless without the tools to manage and orchestrate the systems automatically. Vendor-neutral tools like Chef, Puppet, and others will become essential, as the fluid nature of tomorrow's systems will demand automation. With all of the big data analytics that companies are putting in place to manage their information, the very systems that they rely on can also be feeding an endless stream of telemetry and system information. The same automated tools used for managing digital assets can also be used to automatically tune and optimize the underlying systems—especially in networking.

THE ROLE OF NETWORKS IN DIGITAL TRANSFORMATION

Changing network infrastructure is key to any digital transformation strategy. While servers and storage have been virtualized for many years, networking has lagged. To effectively serve an enterprise engaging in a digital transformation, the network will need to flatten out. It will need to move away from its traditional hierarchical structure into a leaf-spine architecture that enables better scaling and optimized traffic patterns to accommodate the new generation of applications that rely on increased east-west traffic. With the integration of so many different data sources, including external sources like social media and IoT, traffic patterns in this new world will shift away from traditional multi-tiered models into a flatter and more interconnected world. Software definition of the network will help to boost agility by enabling the network routing and applications to

operate in a more coordinated manner, shifting quickly through automation and orchestration as business needs change.

IT will play an important role, as employee skill sets will shift. Even Cisco recognizes that the old days of CCNE/CCNA certifications and command line scripting will be replaced by agile tools and a DevOps environment that encourages rapid releases and more generalized skills. However, while Cisco's perspective is broadening to comprehend a wider and more differentiated set of networking skills, it still misses the mark. Cisco's new CCIE program, which is supposed to help networking professionals tackle the world of digital transformation, falls just as short as the previous programs, because it still focuses IT skills on a single set of vendor products where almost all enterprises live in a multivendor world. Instead of today's army of hardware-specific resources, the digitally transformed IT of the future will be staffed by people with a broader horizontal knowledge who can view systems from an application perspective across multiple domains instead of only their individual silos.

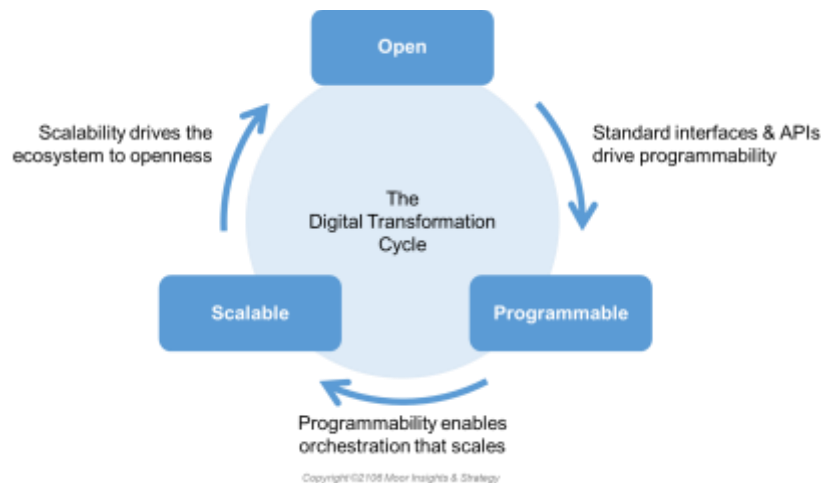
Having a knowledge and understanding of software and DevOps processes will be infinitely more valuable for IT staff as the move from hardware-centric (and especially vendor-centric) knowledge is replaced by an application-centric viewpoint. However, to be truly valuable both as a resource to the business and also in a future career, software and DevOps processes need to be combined with a vendor-agnostic approach that focuses on Linux and open hardware instead of a single vendor vertical view. A smaller number of vertical hardware-specific resources will still exist to deal with specific platform issues, but the resources will primarily align around applications and business processes, not equipment. Linux and cloud technologies help greatly in this transition as they enable more cross-functional knowledge that breaks through the traditional silos that most organizations operate in today.

From a budgeting perspective, traditional environments see almost 80% of their budgets being allocated towards operations (keeping the lights on) with only about 20% being actually focused on innovation or helping to drive a competitive advantage. But before a company can truly move to a digital transformation, they need to make a commitment to automation in order to drive the teams into a DevOps mode. This will require significant training and culture shifts, as new skills will be required. This change in skill sets is part of the workforce change that is needed to support a digital transformation.

KEY ATTRIBUTES OF AN IDEAL NETWORK INFRASTRUCTURE

An ideal network infrastructure to support a digital transformation has three key attributes: it needs to be open, programmable, and scalable. Without these capabilities, the network will not be able to move at the speed the business requires.

FIGURE 1: IDEAL NETWORK ATTRIBUTES



OPEN ARCHITECTURES

After years of proprietary vertical solutions, networking for the third platform will represent an inflection point where businesses adopt new strategies, mindful of not simply moving to the next proprietary lock-in. At a recent Open Networking User Group meetings (May 2016) one of the most thought provoking questions was, "Is cloud technology just the next lock-in in disguise?" While many argued for or against that position, it was clear that IT is very cognizant of keeping their third platform strategies open to drive better flexibility and value from their investments. The commonality and commoditization of the underlying platforms, which have gravitated around both x86 and ARM ecosystems, are providing a break that enables non-proprietary (read: open) platforms for compute, storage, and now even networking. Linux has become the *de facto* option for operating system and management tools, enabling a true DevOps environment as a single IT employee can now understand, develop, and support an application across all three domains. With open APIs, protocols and applications, IT can lead their digital transformation with the best components, building a modular stack that is tuned to their exact needs instead of force fitting a proprietary vertical stack from a single vendor.

PROGRAMMABILITY

Programmability—by the end user and not the vendor—is essential to digital transformation. Businesses can no longer rely on a vendor to create the products they need. From 3D printing to software-defined networking (SDN), end users need to be in control of the products and the process. Fixed-function platforms have no place in the digital transformation world, as their lack of flexibility hampers ITs need to provision, change, or update on the fly. Virtualization breaks the linkage between platform and application. In networking it goes further, virtualizing the control plane and the data plane, enabling the functions to be localized for faster response, closer to the users, data, and applications. Digital transformation demands as few physical limitations on systems as possible, enabling the work to follow the worker and not vice versa. Mobility is key as the workforce changes to accept the new style of execution in the workplace. Manageability will be crucial to support programmability—with orchestration and automation being key elements—as proprietary consoles and command line instructions cannot scale to meet the demands of a digital transformation.

SCALABILITY

Older, predictable growth expectations give way to the bursty growth that a digital transformation can bring. As a business has the ability to move faster and capture more opportunity, this very dynamic will push the need for systems that can keep pace with the rapidly increasing demands of a fully digital world. Simply looking at the amount of data growth tied to the key underlying technologies for digital transformation tells a story about the scalability businesses will need.

- By 2021 smartphones will consume [22GB of data per month](#)
- By 2020 IoT data is expected to [grow 10x](#)
- By 2020 the amount of data worth analyzing [will double](#)
- More than 2/3 of the 3B people using the internet are [using social media](#)

Clearly, with this type of growth and the amount of data that will need to be handled, businesses will need both systems and networks that can scale to address the explosion of information. As the number of systems scales up and management moves to the application level (across multiple systems / domains), common management, orchestration, and automation tools will need to be deployed to drive better administrator efficiency.

DELL NETWORKING IS A BRIDGE TO DIGITAL TRANSFORMATION

Dell Networking is aligned with the principles of digital transformation and has set its strategy based on the needs for the third platform—that new wave of IT changes that businesses will require to successfully move into a fully digital world.

MODERNIZE

The first step of modernization is to move away from traditional infrastructures and applications and to lean into cloud technologies. Dell's networking commitment to the cloud space is reflected in not only the products it delivers for flexible, agile clouds, but also in the open strategy that is a hallmark of cloud deployments. Cloud-native applications demand flexible software-defined networking underneath to extract the proper levels of agility that an elastic cloud will require. With a fully SDN-enabled portfolio, Dell is able to address public, private, and hybrid cloud environments. Dell's open networking switches support the Open Network Install Environment (ONIE) boot loader, which allows these switches to support not only Dell's operating systems but also third-party operating systems from partners like Cumulus Networks, Big Switch Networks, IP Infusion, and Pluribus Networks. Dell built its network operating system, OS10, with open software modularity designed to bring DevOps and traditional CLI management with Linux platform portability. To drive those benefits into the wider market, Dell has made portions of OS10 available as part of the [Software for Open Networking in the Cloud](#) (SONiC) project, a subset of the OpenCompute project. SONiC adds a complete set of functions that can be used on top of a Linux-based network switch that bring advanced capabilities like routing down to the switch level for agile cloud deployments.

AUTOMATE

When more flexible networking is in place, IT has the ability to change on the fly, driving agility and helping the business to react instantly when conditions shift. But what good is this capability to change on the fly when changing systems is still a manual process? Being able to automate changes will be critical for a digital transformation. The [Dell Open Network Automation](#) strategy is based on adherence to standards, integration, and open APIs. This strategy enables Dell Networking products to be automated via a variety of tools, from bare metal provisioning and smart scripting all the way through the advanced capabilities of the Dell Active Fabric Manager, which can automate the design, deployment, and monitoring processes of a modern datacenter. The adherence to industry standards also means that third-party automation tools like Chef and Puppet, favored by DevOps organizations, can also be used across Dell Networking products.

TRANSFORM

Because businesses need to continue operating during transformation, one cannot expect a light switch change overnight. Instead, transformation will be driven by constant, rapid iteration as each round brings the organization closer to the ideal state. To iterate quickly, businesses need to adopt agile, flexible development environments like DevOps, but they also need flexible infrastructure underneath that enables the rapid succession of innovative changes that DevOps will bring. Part of that iteration is handled through SDN, which enables the networking topologies and architectures to change easily with each iteration and every new application that needs to be deployed. Underneath this rapidly changing software layer, Dell Networking products can adapt to match capability. The Dell Networking Z-Series is one example of how Dell can enable rapid iteration. With dense multi-rate fabric switching, the Z-Series can deliver up to 128 ports of 10/25GbE, 64 ports of 50GbE, or 32 ports of 40/100GbE in a compact 1RU design. This flexibility enables IT to deploy a large number of dense ports that can be easily provisioned and re-provisioned at different line rates, depending on how the applications tied to those ports are changing. Without having to change out the underlying hardware physically, Dell provides a business the flexibility to move through the iteration that a digital transformation demands.

CALL TO ACTION

As companies work through digitally transforming their businesses, it is clear that they first will need to transform IT significantly with networking that is open, programmable and scalable. This reinvention of the architecture and systems will be an important inflection point. IT will need to reflect on whether its traditional vendor is delivering the innovation needed to execute successfully towards the desired future state.

As companies move through this process, we recommend that they consider SDN and open networking and also investigate the Dell Networking portfolio. To change business trajectory, IT will need to use the types of forward-thinking architectures - like networking hardware and software disaggregation and leaf-spine topology - that Dell is already delivering today. Beginning to deploy with a different methodology now is a way to begin taking positive steps that will set a business up for success in the fully digital future.

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