Virtual Network Architecture

A Dell Point of View

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Table of Acronyms

Acronym	Meaning
API	Application Programming Interface
IDS	Intrusion Detection System
IPS	Intrusion Prevention System
LAN	Local Area Network
TOR	Top Of Rack
VNA	Virtual Network Architecture
WAN	Wide Area Network

Executive Summary

Looking back at how the IT landscape has evolved over the past 20 years, it is amazing to see the striking parallel between the evolution of technology and the evolution of business. In the Client /Server era, it was normal for IT initiatives to take months or even years on end. This was reflective of the pace of business at that time; it seems the whole world ran at a slower pace as purchasing behavior was still dictated by the physical world and global competitors were separated by vast distances. As industry transitioned into the Internet era, the world became increasingly flat, new business models emerged and new competitors from around the globe became as close as a mouse click.

The amazing technological progress that has led industry through the Internet and into the Cloud era was made possible in large part by the advancement of open innovation in the server and software industries. The open x86 architecture, powered by Moore's law, has unleashed unparalleled innovation and value over multiple generations of microprocessor technology. Similarly, the open x86 software industry has grown to provide revolutionary advancement in 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. Unlike the open x86 market, there is no modern software development ecosystem for the leading network operating system; there are no modern standards for intelligent programmable interfaces to enable automation; virtualization is primitive, static, and fractured.

Dell's Virtual Network Architecture (VNA) framework is a direct response to this growing need for networking solutions to be brought into the modern age. VNA is designed to be both innovative and practical, based around a set of open, flexible architectures that provides the benefit of the latest innovations in networking. VNA is also designed with embedded virtualization and automation 'smarts' enabling plug-and-play simplicity and providing a software technology framework that simply works.

This whitepaper outlines the principal elements of VNA and maps out its principal applications for traditional, virtual and cloud IT environments.

The Changing Business Paradigm

Globalization, consumerization, economic turbulence, social media, hyper-competition ... these are just some of the factors creating the most challenging business environment ever faced. The growth of technology has flattened the world, opening markets to competition from around the globe. Increased use of technology among consumers, accelerated by mobility and social media, has resulted in rapidly changing consumer behavior. This combination of increasing global competition with ever-changing consumer behavior has placed unprecedented pressure on businesses, and when combined with the pressures of a

turbulent global economy, businesses face an evolutionary mandate to adapt or become extinct. While management is facing a dizzying array of change, technology has risen to a new level of prominence in solving business challenges. The lines between business strategy and technology strategy have all but disappeared; it has become increasingly clear that a company's effective use of technology will be the cornerstone of success in the cloud economy.

A daunting challenge and an unprecedented opportunity

According to bestselling author and former Harvard Business Review executive editor Nicholas Carr, the transition to the cloud era is analogous to the transition from private electrical plants to a centralized power grid in the early 20th century. If right, the cloud era could come to define the early 21st century as the proliferation of electricity defined the early 20th century. The transition to the cloud era could be among the most significant in the history of computing, and represent an architectural paradigm that will extend well beyond the length of the previous eras in computing technology. This makes an organizations' adoption and transition to cloud technologies perhaps the most critical element of business strategy. As the enterprise business landscape has become characterized by viral growth, disruptive technologies and disruptive emerging business models, it has become clear that the tremendous challenges of the cloud era also provide an unprecedented opportunity: disruptions are not isolated events; each disruption has the potential to unleash a chain reaction of complimentary disruptions as the technology at the source ripples out across industries.

The Network is the Foundation

There is no doubt that cloud technologies are disrupting legacy technology architectures, but for enterprises to ride this wave, they must build upon a foundation purpose-built for the cloud. However today, there are no standards in the networking industry for virtualization, and the early attempts at network virtualization are primitive, fractured and proprietary. There are also no standards that enable a network to dynamically communicate and respond to the needs of applications and users. The legacy, proprietary network technologies crowding the market today simply cannot provide the foundation needed to enable
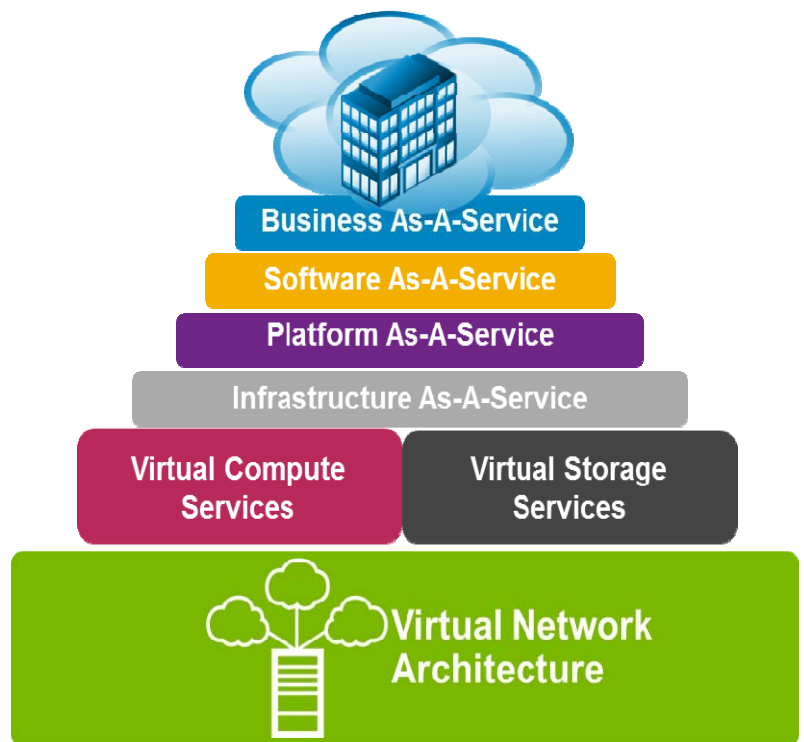

Figure 1. VNA is the foundation for the cloud

business to lead in the cloud era. Networks must change to provide an open, intelligent and virtualized foundation to unleash the promise of the cloud.

The time to disrupt is now – the place to start is the network

Today the business benefits of simply virtualizing a server are waning, and businesses are seeking to take their IT service delivery to the next level, providing the elasticity and efficiency of the cloud. To make this happen, IT infrastructure can no longer be divided into silos and characterized by the fractured management and primitive automation tools of the client-server era. To deliver on the promise of the cloud, legacy infrastructure management tools cannot be further contorted to squeeze out the last remaining drops of business value. Infrastructure must operate as single cohesive system to deliver the agility that businesses demand.

Introducing the Dell Virtual Network Architecture

Figure 2. Dell Virtual Network Architecture Design Tenets

Today as enterprises seek to bring their virtualization initiatives to the next level, enabling dense and efficient elastic computing, Dell's Virtual Network Architecture (VNA) provides open, standards based interfaces to allow seamless continuity and harmonious alignment of infrastructure with the needs of the business. With VNA, you can virtualize, automate and orchestrate networking functions and services and align resources to real-time business events.
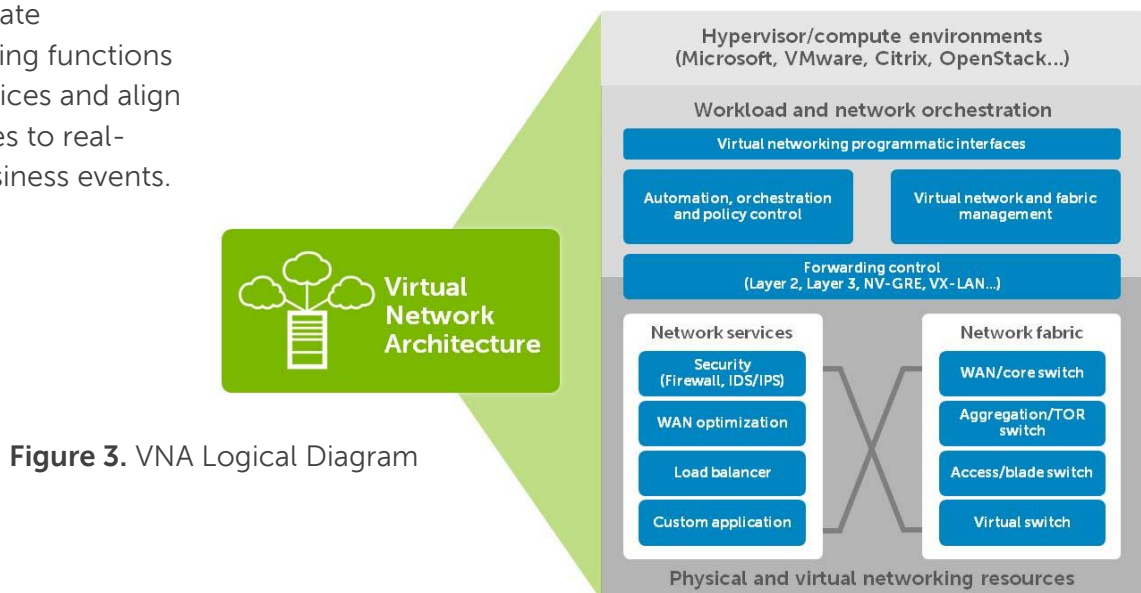

Figure 3. VNA Logical Diagram

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VNA can take businesses off of the brick-wall path of client server era-technologies, past the proprietary pitfalls crowding the technology landscape, to a platform that can drive enterprise virtualization efforts to the next level while providing a network platform purpose built for the demands of the Cloud Era.

A Virtualization layer for networks

VNA provides the infrastructure stack with a network virtualization layer - a clean layer of abstraction and programmatic interfaces between applications and the network. As server virtualization liberated workloads from being constrained by physical resources, VNA presents applications with virtualized views of the network topology so the applications are not constrained by details of the physical topology.
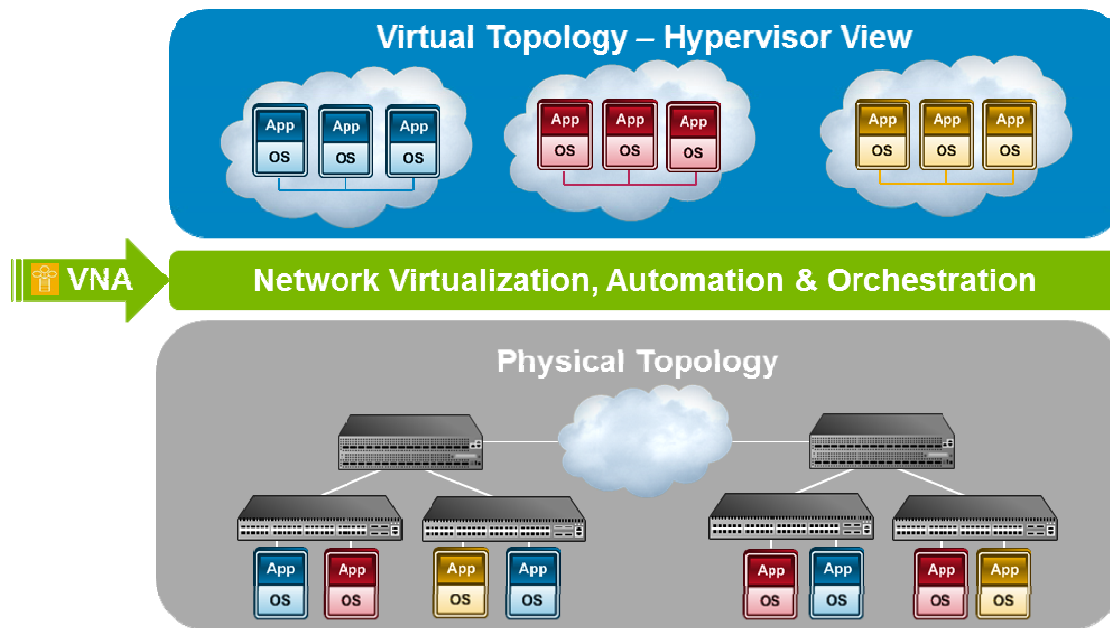

Figure 4. VNA Network Insertion

With VNA, the network becomes a true platform for the cloud era, providing applications with everything they need from the network, on-demand, when the application needs it, enabling a user experience that delights even the most demanding business consumer.

The end of the network bottleneck

Server virtualization efforts can result in drastic increases in the amount of network trouble tickets causing crippling delays while adding tremendous expense. A virtualized network means the end to gathering info you don't have - only to open a trouble ticket you don't want to open - only to have a delay your business can't afford to wait for – all the while costing the business more money. Virtualization of the network means that when an application needs a connection to another host, the application immediately sees the connection to the host with no operator intervention, and no delay: VNA hides the

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complexity of the physical environment and automates any required changes. VNA also provides a cloud delivery platform for network services, so when an application needs customized security, performance or application delivery services, they simply become available, no trouble ticket, no waiting, and no additional steps required.

The end of IT silos

The end of the network bottleneck means substantial reductions in network trouble tickets, freeing the network team from menial tasks and allowing them to focus on driving innovation. A virtual network means that network policies are no longer associated with legacy identifiers such as physical ports in the network; instead network policies are built around the workload and the user, allowing processes to be unshackled from the limiting silos of the past and re-optimized to support the needs of your business. A virtual network allows your network teams to focus on the needs of the application, working closer with the application and storage teams and breaking down the siloed boundaries of the past.

A platform built for the demands of the cloud

As business speeds into the cloud era, the pace of technological change required is presenting never-before-seen challenges that will place unprecedented stress on IT infrastructure. An increasingly mobile workforce, new demands on virtualization infrastructure, expansion to hybrid cloud environments and the need to support emerging cloud applications such as big data analysis will create new network challenges that cannot be met with legacy network architectures. And in addition to the more traditional infrastructure role of supporting applications, IT executives are now being faced with a new business imperative: innovate. Process improvement is now just the tip of the iceberg; IT executives are increasingly being called on to drive meaningful innovation and business differentiation.

Drive new levels of data center efficiency with network virtualization

Multicore × Blade Servers × Virtualization = Increases I/O Demands by 25x - Gartner

The power of Dell 12th Generation servers now makes it possible for organizations of all sizes to drive Virtual Machine deployments to new levels of density, but is your network ready? Gartner predicts that over next few years' bandwidth requirements per rack will grow as much as 25x . While the leading network vendor's "data center" grade networking solutions are hard-wired for low levels of network utilization that characterized the client-server era, new server densities make it possible to drive much higher utilization within the same footprint driving never-before seen levels of efficiency. Dell's VNA solutions provide the market-leading density and performance that powers the world's largest cloud and high performance data centers, and can accelerate todays IT initiatives while ensuring your organization is prepared to handle the great demands of the cloud with ease.

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Prepare you network for the coming "explosion" of big data

More than 85% of Fortune 500 organizations will fail to effectively exploit big data for competitive advantage through 2015 ... Traditional IT infrastructures are simply not able to meet the demands of this new situation - Gartner

The rapidly changing business and consumer landscape requires strong analytical capabilities to allow business management to successfully navigate the seas of change. But an increasingly Internet-driven economy has generated mounds of data that are presenting new challenges for business and market intelligence and analytics. The ability to rapidly and effectively analyze this data is a critical element of business strategy, and new cloud technologies to support big data such as the Hadoop MapReduce framework require new and demanding infrastructure requirements and traditional network architectures just won't hold up. Big Data can drive a new level of efficiency, maximizing return on assets; however the network must be able to support the demanding requirements. VNA can simultaneously adapt to the needs of big data and traditional enterprise requirements, providing a common set of network tools that can adapt to the needs of today and seamlessly scale to the needs of tomorrow.

Open and Flexible Architecture to power the Hybrid Cloud

More than 50% of Global 1000 companies will have stored customer-sensitive data in the public cloud by year-end 2016. - Gartner

Enterprise private clouds are morphing at a rapid pace into hybrid clouds requiring elastic network extensions and an orchestration platform that can incorporate business policy and compliance requirements into automated workload migration. Leading analysts have noted that this trend will be a critical requirement for businesses in the coming years; however the old guard of enterprise solutions vendors' have been focusing on developing end-to-end proprietary architectures that can leave businesses stranded. Leading proprietary solutions require all parties to utilize the same proprietary hardware and software to enable workload mobility. These highly-limiting architectures simply cannot achieve the promise of the open and interoperable cloud experience that will drive the next generation of business. The future of business will be defined by open innovation, and as businesses require closer collaboration and integration of their supply chain partners, proprietary will not deliver.

The Virtual Network Architecture is built on Dell's history of strong commitment to open standards. VNA delivers open application programming interfaces providing clean points of abstraction with robust capabilities between each layer, preventing proprietary lock in. Dell's strong commitment to standards and active participation in leading organizations such as the Open Networking Foundation will ensure future elements of VNA will continue to deliver open and interoperable technologies.

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Delight IT consumers with Technology that Simply Works

> *Mobile application development projects targeting smartphones and tablets will outnumber native PC projects by a ratio of 4-to-1 by 2015. - Gartner*

An increasingly mobile workforce that is productive on-the-go helps to create greater employee responsiveness which drives superior business execution. However increasing workforce mobility provides a tremendous challenge for IT as user experience needs to be consistent across device types and locations. And mobile users are only part of the challenge; virtualization and stateless computing are driving dynamically changing mobile workloads. Legacy network architectures that distribute static user and workload policies across a wide array of isolated devices simply cannot keep pace with demands of the cloud user experience.

> *The customized services and products model requires a company to be as dynamic, flexible, mobile, and connected as its customers so that it can respond to customers' needs. The "have-it-my-way" and always-connected" generation demands this level of immediacy. Infrastructure and operations personnel can't afford to keep a "build-it-and-they-will-come" attitude. –Forrester*

The rise in cloud services combined with the trend of consumerization has created a new set of expectations that corporate users expect from IT. Users have now come to expect that they can access content not only across device types, but also across traditional corporate security boundaries as the "bring your own device" trend continues to proliferate.

Customized User Experience - On-Demand
Dell's Virtual Network Architecture allows the network to handle all of the complexities of application transport and delivery, providing a consistent application experience for a mobilized workforce, wherever they may be, across any type of device. A key tenet enabled by the Virtual Network Architecture is a robust policy that follows the needs of the user, and not bound by arbitrary physical locations and static policy enforcement points.
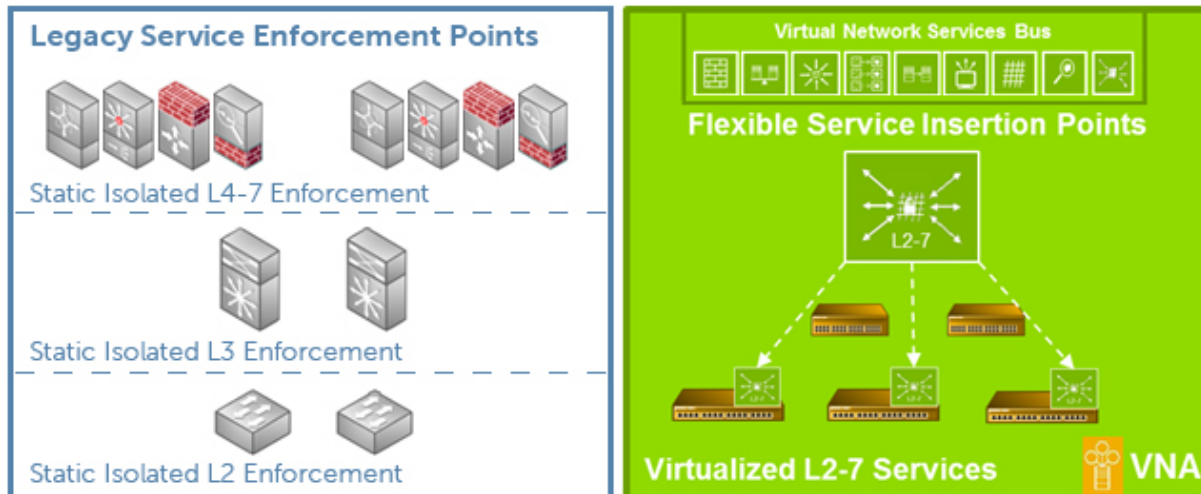
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Figure 5. Dell Flexible Service Insertion points

Dell Flexible Service Insertion Points will provide a separation of control and forwarding planes for a multitude of network services, allowing for centralization of service policies while providing a level of service granularity that has never before been possible. VNA delivers new possibilities, allowing the needs of today's business user to be met seamlessly while providing the consistent user experience, business continuity and security that the cloud-enabled business demands.

Summary

The cloud era is driving a new business landscape, creating new demands that are changing more rapidly than ever. The increasingly global stage of business has resulted in a breakneck pace where the old models of finding the next trend in consumer demand and identifying disruptive business strategies from a 3rd party will simply no longer work. The rapidly changing nature of the cloud demands that businesses analyze changing consumer trends with cloud enabled business intelligence driven by big data. Just as businesses of the internet era differentiated through supply-chain innovation, the increasing prevalence of technology in business supply and value chains necessitates new architectures to power the next era of business.

While the old guard of enterprise solutions vendors' have been focusing on developing proprietary end-to-end solutions, Dell offers a different refreshing approach to delivering enterprise cloud technologies; rather than trying to contort legacy systems management to imitate clouds, Dell has been working to optimize purpose-built cloud technologies for enterprise workloads. Dell's complete enterprise solution stack presents our customers with a proven path for data center transformation that avoids the complex, discontinuous, and expensive paths crowding the technology landscape today. Dell's "*better together*" solution enables our customers to successfully navigate this unprecedented transformational opportunity.

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The disruptive shifts in technology that VNA is built upon provide the benefits of both low-cost and new-technology disruptions by providing entirely new levels of customized performance while fundamentally lowering the cost-basis of infrastructure solutions. Properly leveraged, these disruptions can provide drastic improvements in operational models and entirely new service capabilities, enabled by new platform technologies that make highly customized automation simple.

That's the power of VNA—that's the power to do more.

To explore the broad portfolio of Dell networking solutions, visit: www.dellnetwork.com.