Network Functions Virtualization with the Brocade Virtual ADX and the Brocade Vyatta vRouter

INTRODUCTION
The war is over; virtualization has won. Today, data centers around the globe rely on server virtualization to provide services faster and more efficiently than ever before. Now virtualization is conquering new territory. This time, the aim is not to virtualize applications, but to virtualize network services. The idea, called Network Functions Virtualization (NFV), is being advanced by a consortium of some of the world’s largest carriers and Telco’s. However, the concept of Network Functions Virtualization resonates far beyond carrier data centers. Enterprises and service providers of all sizes are looking at deploying networking functions in software to increase agility and to reduce networking costs.

Many core networking services including switching, routing, firewall, load balancing and VPN can now be performed by software either running directly on x86-64 servers or running as virtual machines. The movement towards software-based networking is being driven by the same economic imperative that continues to drive server virtualization. This brief will look at Network Functions Virtualization, the factors driving the NFV movement and some of the ways that the Brocade solution can be used to virtualize network functions.

CHALLENGES AND OPPORTUNITIES
IT organizations are being asked to deliver new services and functions at ever-increasing speeds – and at ever-decreasing costs. Software Defined Networking (SDN) is predicated on building networks that can adjust dynamically to changing application and business needs. However, while the reality of SDN is still in the early stage, the pressure to deliver more efficient and more agile networks continues to build. Software-based networking can realize many of the core benefits of SDN today while laying the groundwork toward future networks built around Software Defined Networking. The goal is to help organizations build networks that are both more agile and more cost-effective.

Agility
Competition between service providers has never been fiercer. One dimension of that competition is the speed at which carriers are expected to deliver new services. Carriers and service providers are struggling to support new services in rapidly evolving markets. Network Functions Virtualization offers a solution.

Software-based networking technology can be deployed, configured, even removed with the click of a mouse. In fact, deployment...
fully configured load balancers, routers, firewalls and the like can automated and integrated into a service delivery process—without requiring on-site service.

Cost
Today’s networks are dominated by an ever growing variety of proprietary hardware appliances—each providing specialized function or service. These specialized networking devices serve as dedicated resources for processor intensive tasks and business critical services, and in most cases, as underlying foundation for a reliable and scalable network. However, the plethora of hardware uses valuable space and energy, requires on-site deployment and removals, and leaves the network owners dependent on various vendors for hardware, spares and accessories.

Figure 1.
Comparison of the network economics of mobile networks.

More worrying still, the operational costs of managing data centers and networks has skyrocketed—even as margins have been cut ever finer. The result is a financial squeeze that has service providers scrambling for solutions. John Mazur of ESG Research wrote, “Telecoms’ modest revenue growth just can’t keep up with the projected infrastructure investment needed for rapidly accelerating data traffic growth with their current scaling model (see Figure 1).” Indeed, Nav Chander of IDC Research agrees, “IDC believes that the rapid global growth of data and video traffic across all networks, the increasing use of public and private cloud services, and the desire from consumers and enterprises for faster, more agile service and application delivery are driving the telecom markets toward an inevitable era of network virtualization.”

The goal of those promoting Network Functions Virtualization is nothing less than to change the economics of networking by offering to replace proprietary hardware with Common-Off-The-Shelf (COTS) servers, by consolidating functions, and by allowing automated deployment, configuration and orchestration.

BROCADE FOR NETWORK FUNCTIONS VIRTUALIZATION
Brocade offers two powerful solutions for software-based networking; the Brocade® Vyatta vRouter and the Brocade Virtual ADX. The Brocade Vyatta vRouter includes advanced routing, stateful/zone-based firewall and VPN for site-to-site and remote communications. The Brocade Virtual ADX provides Layer 4 to 7 server load balancing services and extends the reach of the advanced Application Delivery Controller (ADC) services closer to the application infrastructure. The Brocade Vyatta vRouter and the Brocade Virtual ADX together form a comprehensive suite of software-based network services that will allow you to build fast, effective and secure networks in highly virtualized environments.

THE BROCADE VIRTUAL ADX
Brocade Virtual ADX leverages the same system architecture and operating system as its award winning Brocade ADX Application Delivery Switch. The Brocade Virtual ADX has a dedicated, logical management processor and multiple logical application cores to intelligently load balance traffic. The solutions’ management processor performs management tasks and monitors the health of servers, while the application core takes user traffic and performs server load balancing. This distributed architecture enables increased performance as more virtual CPU cores are added to the virtual machine.

The Brocade Virtual ADX offers robust Layer 4 to 7 services with high availability and comprehensive management. It provides advanced load-balancing methods to choose the best server in both virtual and physical infrastructure. It can monitor server connection load, server resources such as CPU, memory, and application response time in order to deliver the best application performance and reliability. It also utilizes a flexible application scripting engine for real-time application services. Through the comprehensive portfolio of Brocade ADX application delivery switches, customers can now choose between the virtual and the physical Brocade ADX platforms to meet the different deployment needs.

To assist cloud administrators in the control of their virtual applications, the Brocade ADX switch enables the automation, migration, and scalability of cloud-based applications while increasing visibility across the application delivery tier. For environments that already facilitate virtual network service orchestration, individual Brocade ADX switch components (e.g. VIPs, contexts, full devices) can be managed via XML/SOAP API or plug in to third-party vendor offerings and standard frameworks (e.g. OpenStack for large-scale enterprises and VMware vCloud Director for SMB). These tools can be combined with Application Resource Broker for continued advancement in resource provisioning, monitoring, and intelligent management of network resources and capacity.

THE BROCADE VYATTA VRMUTOR
The Brocade Vyatta vRouter delivers advanced routing for physical, virtual and cloud networking environments. The Brocade Vyatta vRouter includes dynamic routing, Policy-Based Routing (PBR), stateful firewall, VPN support, traffic management and more in a package that is optimized to perform in virtualized environments. All features are configured through the vRouter’s familiar, networking-centric CLI, Web-based GUI or third party management systems using the Vyatta’s RESTful API.

The Brocade Vyatta vRouter supports all major hypervisors or it can be installed on any standard x86 based system or in public clouds. The newly announced Brocade Vyatta 5600 line of vRouters will employ Brocade-patented vPlane™ technology, allowing the software router to meet or exceed the performance of many proprietary hardware based solutions. By separating the control plane from the data plane and taking advantage of the latest in processor advances, the 5600 vRouter will offer exceptional performance—making it ideal for the 10Gb/s servers increasing deployed in modern data centers.

BROCADE ENABLES NFV USE CASES
Service providers, especially carriers are facing some of the highest volume of customers and the most diverse network infrastructure on the planet. NFV’s hallmark for service providers is to bring
increased provisioning agility in revenue generating services and reduce the time, CapEx, and OpEx in bringing those services to market. While this promise is ambitious, the applicability of virtualizing the network functions in the data center is already occurring in many facets of telecommunication industry landscape. The Brocade Virtual ADX and the Brocade Vyatta vRouter have leveraged this modern technology to enable these deployment models below that offer wide range of operational and cost benefits for network operators, their partners and customers.

APPLICATION SECURITY AND OPTIMIZATION

Virtualizing your network infrastructure does not mean dropping your guard against the rising tide of application threats, data leakages, and security breaches. Brocade Vyatta vRouter offers distinct security attributes to safeguard your application delivery and service creation. These include:

• Secure cloud bridging with combination of Layer-2 bridging allowing secure communications between physically separate networks.
• Enterprise-class SPI (Stateful Packet Inspection) firewall enables providers to define and enforce access control policies and segment networks while isolating multitenant virtual infrastructures. Zone-based deployment is critical to PCI and HIPAA compliance, enabling network isolation without the need to restructure IT policy or firewall architecture. Because the Vyatta firewall can be installed anywhere in your network as well as in public and private clouds, it allows consistency in firewall configuration and policy.
• Powerful dynamic and policy-based VPN functionality with options for both IPsec and SSL-based OpenVPN.
• Network Address Translation and DHCP Together with the advanced Layer 4-7 services from Brocade Virtual ADX, organizations of all sizes can safely optimize the delivery of their business critical services from one locality to another, or between multitiered application/service environments (see Figure 2).

The software-based Brocade network appliances offer other security advantages, for example, the Brocade approach allows the use of a firewall or a secure tunnel between virtual machines, without hairpinning traffic out of the hypervisor to an external, hardware device. Brocade also allows the installation of routing and firewall within and between public clouds such as Amazon AWS and Rackspace, allowing you to build secure hybrid cloud architectures.

SECURE MULTITENANCY OF NETWORK FUNCTIONS

Secure multiteny is a critical concern for service providers and service oriented organizations alike. One significant challenge involves maintaining compliance to corporate and regulatory standards, while leveraging the shared infrastructure model’s cost benefits and improved operational efficiency. In order to meet this challenge, the network infrastructure must enable security policies to be enforced exactly as they are within the enterprise network—that is, each tenant must have their own private, isolated, and secure virtual network service infrastructure. Brocade Vyatta vRouter and Brocade Virtual ADX enable a multitenant network services with dedicated router, virtual firewall and VPN (Virtual Private Network) as well as advanced server load balancing services, enabling tighter control over VM sprawl and making efficient use of physical and virtual infrastructure (see Figure 3).

FLEXIBLE HYBRID CLOUD DEPLOYMENT

The Brocade software-based networking solutions offer key capabilities for enabling hybrid cloud deployments, including the cloud bursting capabilities of the Brocade Application Resource Broker (ARB) in conjunction with the Brocade Virtual ADX and secure cloud bridging through the Brocade Vyatta vRouter (see Figure 4).
Brocade ARB essentially acts as an ADC resource manager – enabling organizations to burst their local resource footprint to a cloud-optimized data center when demand for computing capacity spikes and finally evoking that burst capacity as demand subsides. Through the global scripting capabilities of Brocade ARB, administrators can customize the particular environments and actions during the burst cycle, expanding the flexibility to leverage the set of third party and/or custom resources to improve the overall application performance.

The Brocade Vyatta vRouter provides not only the Dynamic Multipoint VPN functionality to automatically and dynamically build secure tunnels between data centers and/or cloud environments, but also advanced routing and firewalling to ensure secure and optimal traffic flows. The Vyatta vRouter is also available as an on-demand service through Amazon’s AWS and Rackspace’s open cloud or can be installed as an instance in public or private clouds.

**RAPID TESTING AND DEVELOPMENT**

Development (Dev) and quality assurance (QA) teams have always been early adopters of innovation, such as NFV. Whether hosting isolated sandbox environments or rapid application development, virtualization has proven to be effective in increasing the productivity of these functional groups, the quality of their work, and the speed at which they test and develop codes. In the same way, NFV enables efficient reusability of network services between QA and Dev, and also allows a higher density of automated testing, thus accelerating the time to release or to market new services. The Brocade Virtual ADX and Brocade Vyatta vRouter enables Dev and QA to replicate physical networks within virtual environments while allowing network operators to streamline their service development life cycles. Together, the Brocade Virtual ADX and Brocade Vyatta offer an agile framework for on-demand network functions independent of hardware.

**CONCLUSION**

Network Functions Virtualization promises to enable a new cycle of network innovation and to launch a wave of next-generation network-based applications and services. Brocade has a comprehensive portfolio of software-based networking solutions designed for Network Functions Virtualization. The Brocade Virtual ADX and the Brocade Vyatta vRouter along with powerful tools such as the Brocade Application Resource Broker allow service providers to dynamically offer and control network services. Brocade also provides integration into next generation cloud orchestration environments such as OpenStack directly and through rich RESTful and XML APIs. Together with the Brocade purpose-built physical networking portfolio, Brocade enables service providers and service-oriented organizations to support diverse deployment models and network services at scale.

**ABOUT BROCADE**

Brocade networking solutions help organizations transition smoothly to a world where applications and information reside anywhere. Innovative Ethernet and storage networking solutions for data center, campus, and service provider networks help reduce complexity and cost while enabling virtualization and cloud computing to increase business agility. Learn more at [www.brocade.com](http://www.brocade.com).

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