SOLUTION BRIEF
Enterprise WAN Agility, Simplicity and Performance with Software-Defined WAN

Today's branch office users are consuming more wide area network (WAN) bandwidth as they collaborate online (e.g., Skype for Business, WebEx, Office 365), increase the use of Software-as-a-Service (SaaS) and cloud services, access large rich-media files, and leverage other bandwidth-intensive applications. Corporate IT is facing significant challenges addressing these demands due to the complexity, cost and static architecture inherent in their existing WAN.

The vast majority of branch office WAN traffic is carried over expensive leased lines (private MPLS circuits) or unpredictable Internet connections (DSL, Cable, LTE) — neither of which is ideal on its own. Deploying leased lines for all bandwidth needs is cost prohibitive and time-consuming, while adopting the public Internet — with its lack of uptime, reliability and performance guarantees — may result in a poor user experience.

VMware NSX® SD-WAN by VeloCloud™ enables enterprises to support application growth, network agility and simplified branch implementations while delivering optimized access to cloud services, private data centers and enterprise applications simultaneously over both ordinary broadband Internet and private links.

Challenges with Branch Office Wide Area Networks

According to Ashton, Metzler, and Associates, WAN technologies used in most branch offices today have changed little, if at all, since the 1990s.1 Traditional wide area networks utilize rigid architectures which are optimized around private data center applications. These architectures are unable to seamlessly integrate cloud computing, SaaS, virtualization, and other industry advances. Branch offices with only private-circuit connections rely on backhauling of all cloud applications, SaaS and Internet traffic through the enterprise data center (Figure 1, following page), adding latency, degrading application performance and driving up private network bandwidth costs.

MPLS typically provides high quality of service, but with the tradeoff of limited capacity, higher cost and long deployment lead times. Broadband provides fast deployments and greater capacity, but with the tradeoff of reliability. These factors can have the following negative impacts:

- **New applications** inhibited by bandwidth or the lack of assured performance
- **Branch network deployments** delayed due to IT complexity
- **Cloud migration** not supported by traditional hub and spoke branch network architecture

Hybrid WAN enables enterprises to incorporate both private MPLS and broadband Internet which can reduce costs. Hybrid WAN, on its own, does not increase agility, performance nor simplicity.
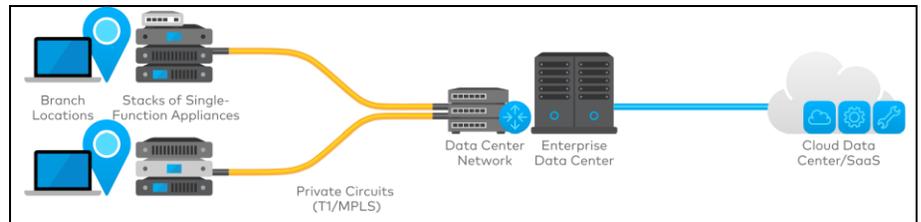
NSX SD-WAN increases agility and cost effectiveness, while assuring application performance across the WAN.

Figure 1: Traditional Branch Office WAN

Solution Overview

NSX SD-WAN combines the economics and flexibility of a hybrid WAN with the deployment speed and low maintenance of a cloud-based service. It includes policy-based network-wide application performance, visibility and control while dramatically simplifying the WAN by delivering virtualized services from the cloud to branch offices.

The VMware NSX® SD-WAN Edge by VeloCloud™ appliance is a compact, thin edge device that is zero-touch provisioned from the cloud for secure, optimized connectivity to applications and data. The NSX SD-WAN Edge is also available as a VNF (virtual network function) for instantiation on a virtual CPE platform. The NSX SD-WAN Edge with Dynamic Multi-Path Optimization (DMPO) and deep application recognition aggregates multiple links (e.g. Private, Cable, DSL, 4G-LTE) and steers traffic over the optimal links to other on-premises NSX SD-WAN Edges in branch offices, private data centers, campuses, and headquarters. The NSX SD-WAN Edge can also optionally connect to the system of global VMware NSX® SD-WAN Gateway by VeloCloud™ as shown in Figure 2 to provide performance, security, and visibility for cloud services (SaaS, IaaS, B2B Internet).

This system of NSX SD-WAN Gateways is deployed globally at top-tier cloud data centers to provide scalable and on-demand cloud network services. NSX SD-WAN Gateways implement NSX SD-WAN DMPO, cloud VPN and NSX SD-WAN Multisource Inbound Quality of Service between global cloud services (SaaS, IaaS, network services) and each NSX SD-WAN Edge, enabling multiple broadband and private leased lines to appear as a single, high-performance WAN. The cloud-based VMware NSX® SD-WAN Orchestrator by VeloCloud™ is used to provision network-wide business policy, enable services insertion, perform real-time monitoring, and analyze application performance.

Deploy in Minutes

Using NSX SD-WAN's zero-touch deployment capability, NSX SD-WAN can be quickly installed. The NSX SD-WAN Edge is shipped to the branch office where a non-technical person simply plugs in power and a few cables. Activation, configuration, and ongoing management are all handled in the cloud.
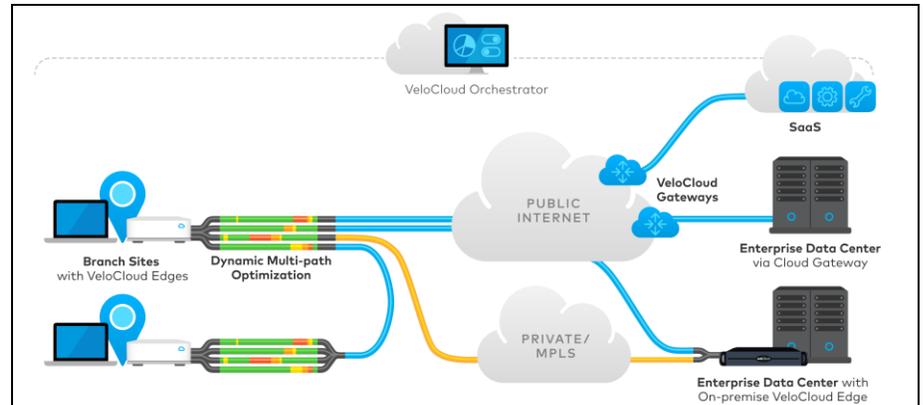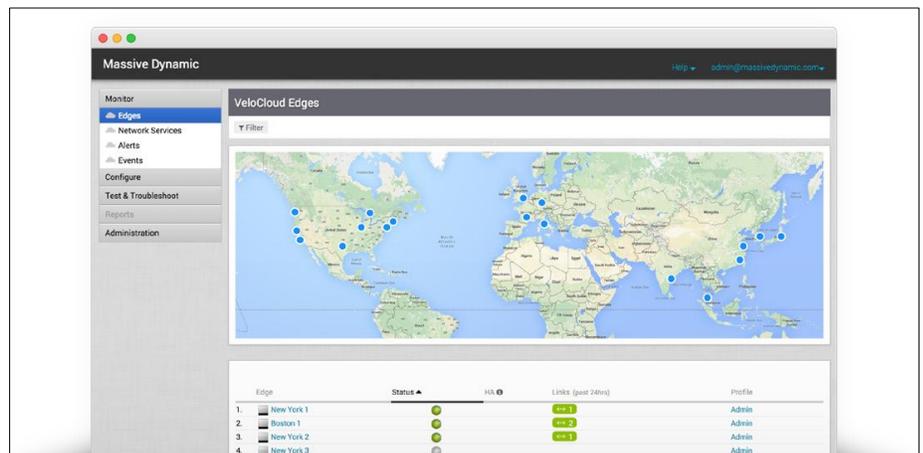

Figure 2: NSX SD-WAN Service

Enterprise-wide Business Policies

NSX SD-WAN makes setting policy as simple as a single click. Enterprises or their managed service providers can define business level policies that apply enterprise wide across many Edges, all through a centralized, cloud based NSX SD-WAN Orchestrator. Link steering, link remediation and QoS are all applied automatically based on the business policies; however specific configuration overrides may also be applied. The centralized NSX SD-WAN Orchestrator also provides an enterprise wide view and configurability of routing in an overlay flow control table, eliminating complex node by node route configurations.
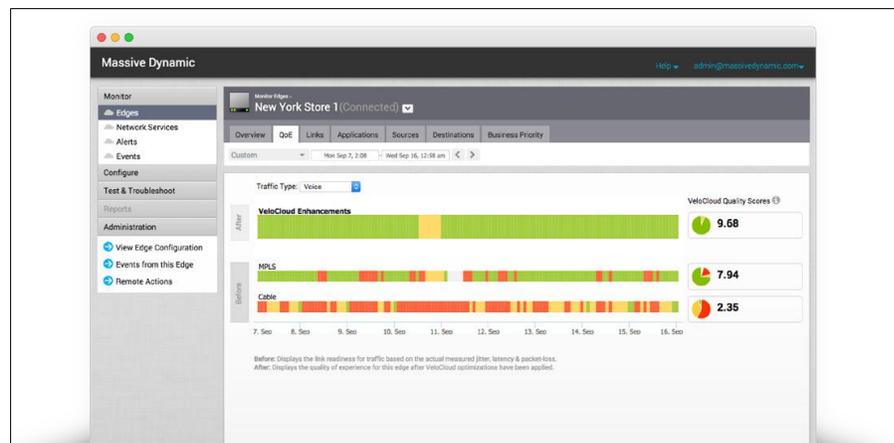
Assured Application Performance

NSX SD-WAN boosts the service level and capacity of hybrid networks or of standard broadband Internet links by implementing its unique DMPO. This includes a number of patent-pending technologies:

Continuous Monitoring

WAN circuits are automatically profiled, enabling zero touch deployments without manual site by site adjustments of configuration parameters. Continuous monitoring of link and path quality and available capacity provide the real-time feedback for dynamic optimization.

Dynamic Application Steering

Applications are automatically recognized and steered to the optimal link(s) based on business priority, built-in knowledge of application network requirements, and real-time link performance and capacity metrics. Dynamic per packet steering can move a session, for example a voice call, mid-stream to avoid link degradation without any call drop or even voice quality glitch. Single high bandwidth flows can utilize aggregated bandwidth for faster response times.

On-Demand Remediation

Remediation including error correction, jitter buffering and local re-transmits are applied on-demand when only a single link is available or concurrent link degradations

cannot be steered around. Remediation is only applied for priority applications that are network sensitive and only when brownout link degradations occur.

NSX SD-WAN Quality of Experience (QoE)

The screenshot at left shows the application specific quality of experience delivered by the SD-WAN overlay with DMPO (uppermost horizontal bar). The multiple underlying individual WAN circuits and link quality are shown below. This illustrates how application performance is assured, delivering a high quality and capacity WAN via a virtual overlay across multiple links, including private and Internet broadband.

Unified and Robust Security

NSX SD-WAN provides unified secure communications no matter what underlying transport traffic may be steered across. Standard IPsec encryption is provided end to end from branches to data centers and for dynamic branch to branch communications. The unique cloud delivered architecture also provides automatic VPN from branches to cloud Gateway aggregation points for interoperable access to Infrastructure-as-a-Service (IaaS), eliminating manual two sided tunnel setup from N branches to N cloud data centers.

The solution provides the scalability and robust security of a PKI infrastructure with the consolidated management of an integrated certificate server, secure on-boarding of devices and revocation management. Risk is minimized by pinning certificates to specific devices and using unique pair-wise encryption keys.

One-Click Service Delivery

The NSX SD-WAN solution simplifies the deployment of services at the branch, at more consolidated enterprise service hubs, and to the cloud, eliminating the need for many single function devices in the branch. One-click service provisioning activates multiple NSX SD-WAN native services and third party virtual network functions from technology partners on the branch Edge. One-click business policies can service chain traffic from branches to both enterprise service hubs and cloud services easily and with application level granularity.

Platform Details

NSX SD-WAN Edges provide zero touch NSX SD-WAN deployments in branches, and scalable on-premises hub deployments for headquarter and data center locations. Additionally, all the benefits of SD-WAN, namely assured performance, security and policy control are available directly to the doorstep of cloud SaaS and IaaS locations via NSX SD-WAN Gateways. The cloud-based NSX SD-WAN Orchestrator provides enterprise wide business policy, configuration, troubleshooting and at a glance monitoring.
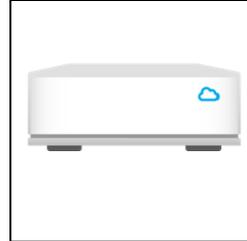
Figure 3: NSX SD-WAN Edges
NSX SD-WAN Edges are available as easy to install appliances for remote branches with a range of throughput, ports for WAN and LAN connectivity and integrated wireless LAN. Dynamic routing enables policy based overlay insertion for both in line and out of path deployments. High availability deployments are also supported. In addition to appliance options, the NSX SD-WAN Edge is available as a virtualized network function (VNF) software for deployment on standard x86 servers including virtual CPE devices.
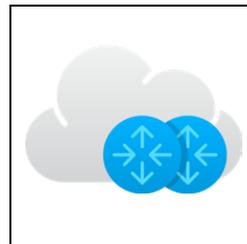
Figure 4: NSX SD-WAN Gateways
Multi-tenant NSX SD-WAN Gateways are deployed by NSX SD-WAN and its partners at top-tier network points of presence and cloud data centers around the world for the full range of NSX SD-WAN benefits. NSX SD-WAN Gateways provide a scalable and distributed infrastructure with the advantages of hosted, network as a service flexibility. NSX SD-WAN Gateways provide the ideal architecture for optimized access to cloud applications and data centers, as well as to access private network backbones and legacy enterprise sites..
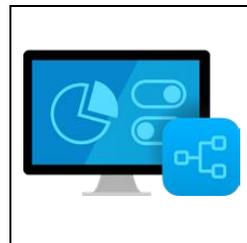
Figure 5: NSX SD-WAN Orchestrator and Controllers
The NSX SD-WAN Orchestrator and Controllers provides centralized enterprise wide installation, configuration and real time monitoring in addition to orchestrating the data flow through the cloud network. The NSX SD-WAN Orchestrator enables one-click provisioning of virtual services in the branch, the cloud, or the data center. Controllers collect and distribute enterprise wide routing information, and are distributed alongside Gateways as a service or can be deployed on-premises.

SDN for the WAN

NSX SD-WAN brings SDN concepts to the enterprise branch WAN. Business policies implemented across the logical overlay deliver abstraction of application flows from the underlying physical transport. Agility is achieved based on adjusting forwarding to meet policy as well as real-time link conditions. NSX SD-WAN has a distributed control plane for forwarding decisions to be made locally with context, so there are no latency issues nor points of failure across the WAN. Yet each NSX SD-WAN node receives centralized control policies for easy programmability and enterprise wide visibility.

A software based approach enables the flexibility and portability of deploying virtual NSX SD-WAN Edges on off-the-shelf x86 based hardware or as virtual network functions (VNFs) on virtual CPEs. Management is configurable via both a GUI and a Rest API.

Solution Benefits

The WAN is in transition as enterprises seek to improve agility and economics, and adapt to the shift of applications to the cloud. NSX SD-WAN offers enterprise-grade performance, security, visibility, and control over both public Internet and private networks. NSX SD-WAN dramatically simplifies the WAN with zero touch deployment, one-click business policy and services insertion, and cloud-based network as a service.

For more information about NSX SD-WAN, visit www.velocloud.com.

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[1] Footnote First Line U.S. and Worldwide Server Installed Base 2007–2011 Forecast, Doc #207044, May 2007;

[2] Footnote Secondary Line Multicore Innovations Disrupt The Worldwide Server Market, Doc #206035, March 2007;

[3] Source: VMware