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Scaling Large and Multinational Enterprise SD-WAN Deployments

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Executive Summary

Mission critical enterprise applications and services are moving to the cloud, driving the need for wide area network (WAN) agility, flexibility, and scalability. The increased deployment of cloud applications for storage, voice/video, and other SaaS applications has challenged IT to continue to provide high quality WAN services to the branch. Deploying and managing the WAN has become more challenging, complex and costly as traffic flows decentralize via the Internet.

SD-WAN offers compelling advantages for distributed organizations with critical branch operations, including the benefits of business agility, simplification, improved application performance, and lower costs of bandwidth. SD-WAN deployments are becoming main stream as dozens of Fortune 1000 sized organizations have moved through proof of concepts, initial pilots, and on to rollouts of SD-WAN to their branch locations.

As SD-WAN moves enterprise-wide, IT organizations require SD-WAN solutions that enable them to deploy flexible, secure WAN connectivity that scales to their large numbers of distributed branch locations. Specifically, enterprise scale SD-WAN should provide the following:

- Simplified management and orchestration with one dashboard to control application policies, QoS, security, network segmentation, services insertion and monitoring
- Application assurance for the availability, reliability and quality of experience for business critical on-premises and cloud applications, such as voice, video, and VDI
- Architectural flexibility – the ability to deploy SD-WAN on premises, in the cloud, or as a combination of both
- Transport independence – choose any link technology (MPLS, Internet, 4G) and any combination of suppliers (CSPs)
- Platform agnostic – choose the best cost-effective software or hardware platform with the ability to leverage the economies of scale in the cloud and on-premises

SD-WAN solutions must be compatible with the existing WAN equipment (i.e. routers) and should be future-proofed to allow large organizations the ability to rapidly re-design their WAN as their needs change and in response to changing organization structures (e.g. mergers, acquisitions and divestitures).

Trends in Cloud Adoption

The adoption of cloud computing, cloud-based storage, infrastructure as a service (IaaS) and software as a service (SaaS) has rapidly changed the way end-users and businesses access applications and their data. As the functionality, security, and performance of cloud-based applications has improved, the usage of SaaS applications has skyrocketed, including Salesforce, Google Docs, and Microsoft Office 365. Every day millions of employees access the Internet to use cloud computing services such as Amazon Web Services, cloud-based storage, unified communications services, collaboration, and conferencing applications.

Industry analysts expect the use of cloud-based computing and applications to grow strongly over the next five years. Research conclusions include:

- IDC predicts that more than 80 percent of new applications will be deployed via the cloud and that cloud platforms will gradually displace the client/server approach as the dominant model for application delivery.
- Internet traffic models project that business WAN bandwidth will increase (on average) 20% per year. All of the trends point to the requirements for more bandwidth at the branch, with a focus on branch to Internet bandwidth.
- Gartner has determined that at least 50% of big business' traffic within the Enterprise is destined for the Internet and 30% to 50% of Fortune 1000 Enterprise workloads are shifting to the cloud.

IT organizations need to provide all of their users with fast, reliable, quality, and secure access as they increase their use of Internet-based and cloud-based services and resources. For more information, see the White Paper: [Why the Cloud is the Network](#).

SD-WAN Moves to Enterprise Scale

With increased usage of cloud-based applications, overall demands for more bandwidth, and the requirement for branch WAN simplification at scale, many large organizations have deployed SD-WAN technologies to prioritize and steer application traffic while tapping the benefits of inexpensive, pervasive, fast Internet bandwidth. The economics of Internet WAN circuits can help organizations increase WAN bandwidth without significant increases in WAN spending. Internet circuits (Ethernet, DSL, cable, etc.) are typically one third to one half the cost of comparable speed MPLS links. Internet services also have the advantage of pervasive availability and rapid provisioning times as compared to MPLS.

Many organizations are implementing WAN architectures which incorporate existing MPLS along with broadband Internet by leveraging SD-WAN technologies which dynamically and proactively steer application traffic based on business policies across the most ideal link at any given instant in time. These technologies enable the shift of all traffic (over time) to Internet circuits which will enable IT organizations to meet increased bandwidth demands and deliver high quality of experience all without significant budget impacts.

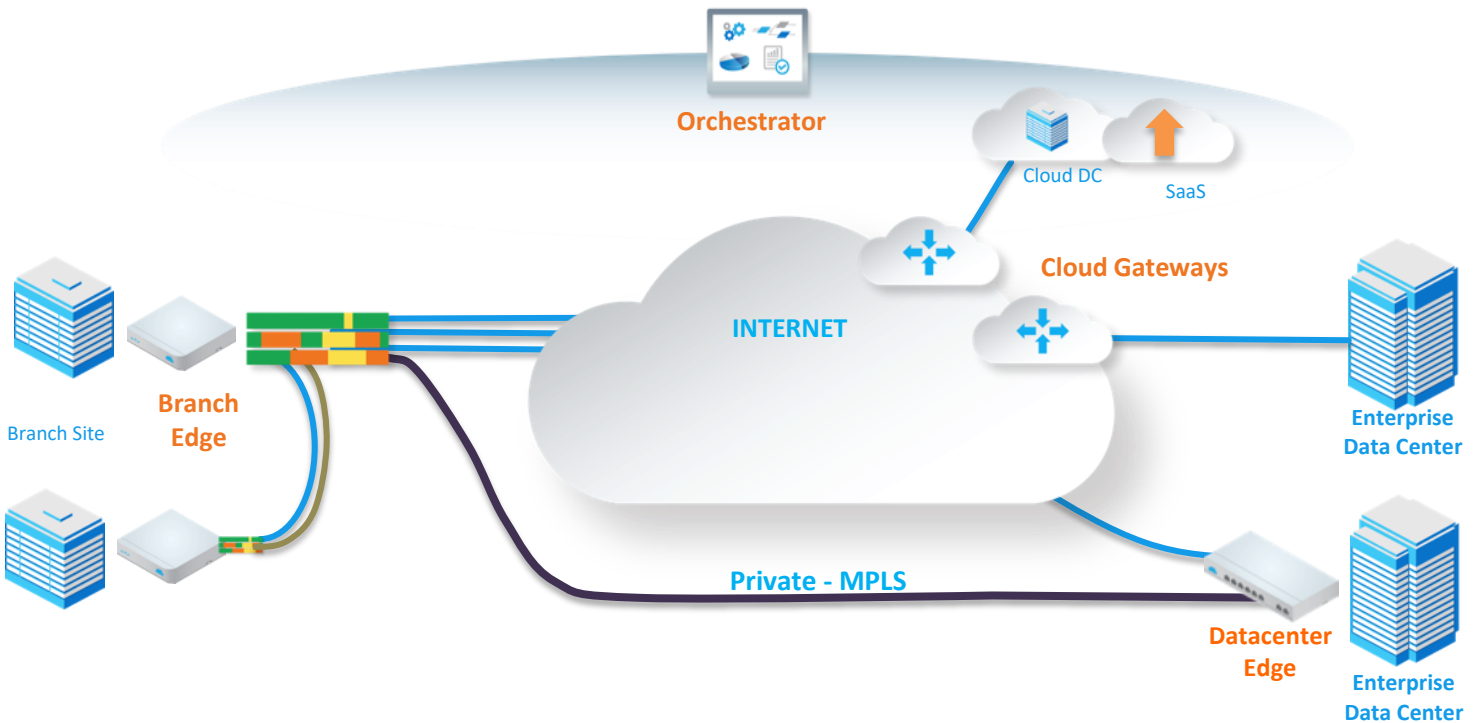
As the traditional network security perimeter disappears with the adoption of cloud, mobility, and IoT, security and policy need to be intrinsic to the network. The intelligence in WAN needs to enhance security by monitoring and applying security policies across network traffic. MPLS (as a private network), though not encrypted, provides excellent security from attackers hoping to intercept data on the WAN due to the private nature of the network. The Internet has an inherent lack of security, but with SD-WAN technologies such as scalable encryption, quality of service, and network impairment mitigation, the Internet can transform into a secure, reliable, Enterprise-class transport option. IT organizations must plan for additional security as they migrate an increasing portion of their traffic to the Internet, whether over hybrid WAN or as an entirely Internet-based WAN.

SD-WAN enables a level of scalability necessary for large and multinational Enterprises through the following capabilities:

- Centralize and orchestrate the branch office WAN network with fewer number of people from a cloud console and eliminate the need for truck rolls with network engineers to implement branch network changes
- Deploy secure connectivity to all branch offices, eliminate the need for site-to-site VPN and connect to IaaS and legacy data centers via a single VPN connection to cloud SD-WAN
- Deliver link network impairment remediation over private and public transport
- Enable bi-directional quality of service across public transport (such as Internet) to and from on-premises applications, cloud applications, compute, storage and Internet-based resources

SD-WAN technology delivers the network intelligence required to connect an increasingly remote work force with cloud-based applications and data. See Figure 1.

Figure 1



Requirements for Enterprise SD-WAN

Distributed large and multinational enterprises that depend on their branch networks to deliver high quality WAN services have specific requirements as they deploy SD-WAN solutions. The network must be reliable, deliver high quality of service, limit network impairments for mission critical applications, and be cost-effective. Many large organizations, including banks, restaurant chains, and retailers, have thousands of distributed branch locations. Thus, SD-WAN solutions must easily scale up to beyond 10,000 branches. These organizations require the choice to work with managed service providers, telcos, carriers or to develop/deploy their own solutions.

The ability to scale includes the following capabilities:

- Zero Touch branch office deployment
- Centralized operations, management and monitoring
- Visibility, analytics, and troubleshooting
- Security for all WAN traffic
- Seamless, secure and quality access to cloud applications and resource

Large enterprises need the flexibility to roll-out SD-WAN at their own pace and to expand/contract their network with changing business requirements (e.g. add or close stores or adapt to a merger). SD-WAN solutions should be selected based on their compatibility with existing network equipment (i.e. routers and WAN optimization). Enterprises should also be able to deploy the chosen SD-WAN solution on premise, in the cloud, or as a combination of both depending on their requirements.

Ease of Deployment

Large, distributed enterprises typically roll-out SD-WAN in a phased manner. They require a solution that can be easily activated remotely as most branches (e.g. restaurants or retail stores) do not have trained IT staff on location. These organizations can benefit greatly from SD-WAN solutions with “zero touch” deployment – thus eliminating the costly time and travel costs for central IT personnel to visit branch locations.

Centralized Management

IT organizations in large enterprises spend a significant amount of their time (up to 80 percent) maintaining existing solutions. The ability to identify, root cause and mitigate WAN challenges at remote locations (e.g. downtime, slowdowns, or specific application latency) from a centralized management console is a critical requirement. Again, the lack of IT staff at most branches means that the inability to solve the WAN challenge centrally will be very expensive in terms of lost productivity (elapsed time to resolve the problem) and travel costs if the IT team needs to visit the location. The SD-WAN solution should be able to identify network issues, dynamically steer around those issues and proactively repair links on an application-by-application basis. At the same time an SD-WAN solution should empower the Enterprise to point to specific WAN link quality challenges so the IT team can work with their service providers to resolve link difficulties over the long term.

Visibility and Analytics

Related to management, IT organizations need the tools to “see” the current status of application connectivity on their WAN; such as, the ability to monitor mission-critical applications (e.g. Point of Sale), the latency, jitter and packet loss experienced by their voice and video traffic, and the performance of cloud-based applications. IT staff must be able to quickly identify traffic challenges (visibility) and be given tools to understand how to fix them (analytics). IT requires the insight to point their services teams (and those of their technology partners) to the root of the WAN problem – for example, hardware, software, or network link failures.

Security

Security is generally cited as the number one IT concern due to the sheer number of security breaches and the resulting damage that these breaches cause to brand reputation, productivity, and user satisfaction. The distributed nature of cloud applications and remote users (with BYOD) makes it difficult to pinpoint security vulnerabilities and to identify security breaches. SD-WAN solutions should help protect sensitive data, be able to detect security anomalies, and work well in conjunction with network security elements such as firewalls, anti-virus, IPS/IDS, and other security systems. In addition, many organizations (e.g. retail and financial services) require the ability to implement public key infrastructure (PKI) – with its security certificates – at scale during a SD-WAN rollout. SD-WAN should provide auto provisioning of PKI within the management/orchestration framework.

VeloCloud Cloud-Delivered SD-WAN

Founded in 2012, VeloCloud, the Cloud-Delivered SD-WAN™ company, is based in Mountain View, CA. VeloCloud has helped a wide range of customers across multiple vertical industries with their WAN challenges and delivers SD-WAN as a subscription-based service. The solution comprises the following key components:

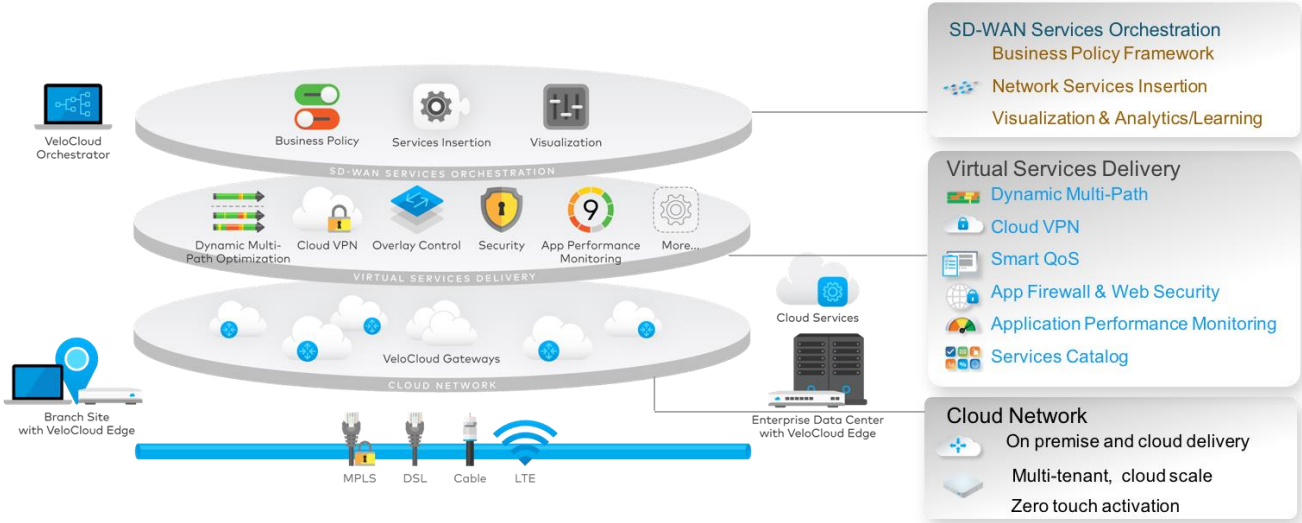
- VeloCloud Edge – SD-WAN appliance or virtual network function enables SD-WAN in the branch; data center appliance is optional
- VeloCloud Orchestrator - multi-tenant, cloud-based, centralized configuration, management and real-time monitoring of the SD-WAN solution
- VeloCloud Gateways - multi-tenant and deployed at top tier network and cloud data centers around the world providing the option for Enterprises to extend VeloCloud SD-WAN technologies to the front doorstep of cloud services and resources around the globe
- VeloCloud Controllers – multi-tenant, cloud-based control of on-premises VeloCloud Edges and VeloCloud Gateways

VeloCloud provides a broad SD-WAN feature set including deep application recognition, categorization and policy treatments for traffic prioritization, dynamic path selection, and impairment remediation. It also enables scalable ease of deployment, management, and change. See Figure 2 for an overview of VeloCloud Cloud-Delivered SD-WAN architecture.

VeloCloud partners include:

- Security partnerships with Palo Alto Networks, IBM, Fortinet, VMware NSX, Scalar and Forcepoint
- IT partnership with HP’s Open NFV alliance, Dell, IBM, Cisco and Intel Network Builders
- VeloCloud instances are co-located in multiple cloud points of presence with partners such as Equinix

Figure 2



VeloCloud SD-WAN Customer Examples

Large Retail Organization

A larger retailer with nearly 5,000 locations deployed hosted VoIP over private MPLS links to stores nationwide. The organization was challenged by poor voice call completion and voice quality even after deploying a hybrid WAN using an additional broadband Internet connection to stores. After implementing the VeloCloud Cloud-Delivered SD-WAN overlay across both the private and public links, call success rates and call quality improved significantly. The Enterprise-class solution is being rolled out nationwide to carry real-time business critical applications to and from stores, private data centers and the cloud.

Large Manufacturer

A major manufacturer selected VeloCloud Cloud-Delivered SD-WAN for a deployment to several hundred branches around the world. The networking team chose VeloCloud due to the ease of management, speed of bringing on newly acquired sites or decommissioning divested sites, and especially the simplicity of introducing new services and policies across the entire WAN at the same time. This manufacturer wanted to take advantage of the cost, bandwidth and pervasiveness of direct branch Internet links and leverage the system of VeloCloud Gateways to meet growing demand for unified communications and SaaS services.

Large Financial Service Company

A large financial services company needed to replace its aging branch office wide area network solution spanning nearly 20,000 locations. The organization needed increased bandwidth at a lower cost with the same or better quality of experience for their end-users. Their goal with SD-WAN is to improve WAN security, reliability and quality using broadband Internet while leveraging a smaller footprint in each location at a competitive price. The organization has recognized IT operational expense savings due to the zero-touch deployment model, central management and a low cost subscription model.

Recommendations for IT Leaders

The increased popularity of cloud-based services and resources, including compute, storage, applications, UC, conferencing, and security is changing WAN requirements. The new WAN must be able to connect any user to any application reliably, securely, and with exceptional quality of experience. SD-WAN provides the ability to leverage the advantages of Internet connectivity (high speed, low cost, wide availability) while minimizing the disadvantages (unpredictable reliability, poor performance, and limited security).

SD-WAN has become a trusted technology in many large organizations with the number of installed locations connected via SD-WAN in the tens of thousands. With SD-WAN, remote users have seen significant improvements in their quality of experience when using the Cloud/SaaS-based applications in addition to private data center applications. Organizations with a distributed workforce which access cloud-based applications, resources and services should strongly consider the adoption of SD-WAN solutions. Enterprises who need increased bandwidth to branch offices at a lower operational cost for business critical, real-time applications should also choose an SD-WAN solution.

For enterprise large scale implementation of SD-WAN, IT leaders must choose a supplier which meets their requirements for ease of implementation, centralized management, extension to the cloud, multi-tenancy, security, cost effectiveness and flexibility. Specific requirements include:

- Compatibility with current WAN network components, including routers, firewalls, and WAN optimization
- Zero-touch branch installation
- Assurance of high quality connections to critical applications located on-premises or in the cloud
- Centralized management and orchestration to set network-wide business policies, control QoS per application, perform network segmentation, and security.

The SD-WAN solution should also provide architectural flexibility with the ability to place network services inside the branch as a VNF or in the cloud. It should enable large to multinational enterprises to migrate to SD-WAN at their own pace and provide the agility to adapt to changing application and business requirements. SD-WAN will be part of most large or multinational Enterprise networking strategy over the next few years and performing the necessary due diligence, proof of concept evaluations and pilot deployments are the next necessary steps to being prepared for this inevitable transition.

Meet the Author

Lee Doyle is Principal Analyst at Doyle Research, providing client focused targeted analysis on the Evolution of Intelligent Networks. He has over 25 years' experience analyzing the IT, network, and telecom markets. Lee has written extensively on such topics as SDN, NFV, enterprise adoption of networking technologies, and IT-Telecom convergence. Before founding Doyle Research, Lee was Group VP for Network, Telecom, and Security research at IDC. Lee contributes to such industry periodicals as Network World, Light Reading, and Tech Target. Lee holds a B.A. in Economics from Williams College.