



Nemertes

Achieving Agility with Cloud UC

SD-WAN reduces costs, boosts agility while better supporting cloud-based applications including UC as a Service

Q2 2018

John Burke

Principal Research Analyst
and CIO

Nemertes Research



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Executive Summary

Businesses are rapidly moving to the cloud for their communications and collaboration needs, especially when they want to deliver a consistent set of services to staff anywhere in the world without the hassles of maintaining a PBX of their own. Unified Communications as a Service (UCaaS) strives to meet business needs for features and performance, but achieving a successful rollout means providing a network that delivers high availability, high performance, and the ability to proactively address conditions that can hurt cloud communications and collaboration.

Three options are key to re-architecting the WAN in the age of cloud: Software-Defined WAN (SD-WAN), Direct Cloud Connect (DCC), and WAN-Cloud Exchanges (WAN-CX). SD-WAN pools branch connectivity and intelligently manages traffic across all available links, increasing resiliency and improving performance while reducing management costs. DCC bypasses the Internet for communications with a specific cloud service provider by linking the enterprise WAN edge to the cloud provider's edge directly. WAN-CX uses an exchange approach to direct connection: enterprises connect to an exchange, then spin up virtual links through that connection to any cloud service provider on the exchange.

Connecting enterprise networks to cloud service providers through direct connect, SD-WAN, or WAN exchange services offers the opportunity to guarantee high quality application service delivery as well as to reduce costs by leveraging lower-cost connectivity options globally.

IT leaders should:

- Re-evaluate their wide area network strategies in conjunction with their plans to adopt cloud application and platform services, especially UCaaS
- Examine the ability of SD-WAN to reduce operating costs, enable greater flexibility, and optimize cloud-based traffic flows
- Consider DCC and WAN-CX offerings to provide more predictable performance, increase resiliency, and enable end-to-end performance management for cloud-based applications, especially UCaaS
- Explore various SD-WAN approaches to find the one that will work best for their organization.

The Issue: Business Needs UCaaS, UCaaS Needs More

Businesses are rapidly moving to the cloud for their Unified Communications (UC) and collaboration needs, especially when they want to deliver a consistent set of services to staff anywhere in the world without the hassles of maintaining a UC platform of their own. Leveraging Unified Communications-as-a-Service (UCaaS) enables organizations to rapidly deploy new features and capabilities, but at the same time offload responsibility for management, maintenance, resource provisioning/scaling, and security to a software service provider.

UCaaS providers strive to meet businesses' needs for features, reliability, and performance, but achieving a successful rollout means providing a network that is optimized for SaaS, that delivers high availability, high performance, and the ability to proactively address conditions that hurt cloud-based UC and collaboration.

The Shift to the UCaaS

The march to the cloud is moving ahead—and accelerating. Nemertes' 2017-18 Cloud and Network research study found that:

- 60% of companies use public Infrastructure as a Service (IaaS)
- 52% use Platform-as-a-Service (PaaS)
- SaaS solutions comprise about 18% of the typical enterprise's total IT workload.

At the same time, nearly 67% of organizations are using or planning to use Unified Communications as a Service to shift some (38%) or all (29%) of their telephony, messaging, and conferencing applications to the cloud. IT leaders justify this shift to the cloud mainly by pointing improved agility—44% call out the ability for IT to support rapidly changing business conditions. They also highlight the ability to shift capex to opex, and to take advantage of new capabilities quickly and easily. Nearly 18% note that they see cloud services as more secure than on-premises platforms. (Please see Figure 1.)

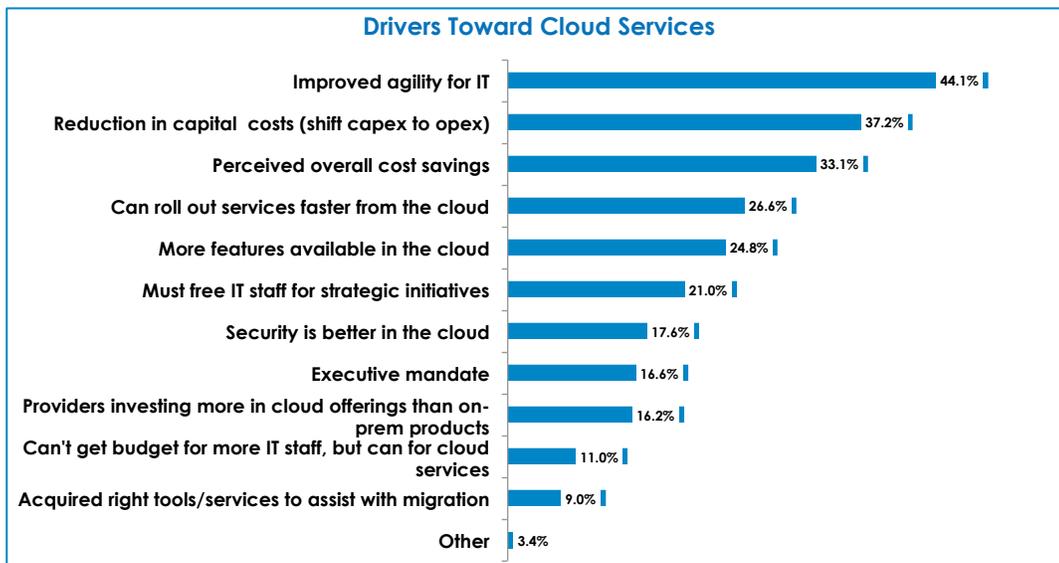


Figure 1: Drivers for UCaaS Adoption

Greater reliance on the cloud for critical communications services means the enterprise needs rock-solid reliability and high throughput—and also for application intelligence in the network. An intelligent network preserves, and improves, performance for business-critical applications.

It's Time for a New WAN

For most of the last decade IT has relied on a three-tier WAN architecture; it evolved to deliver applications housed in corporate data centers to branch offices with maximum reliability. (Please see Figure 2.)

This architecture is ill suited to the transition to cloud.

Thanks to growing adoption of cloud-based applications, an increasing number of traffic flows connect end-user devices to solutions delivered via IaaS, PaaS, and SaaS. UCaaS perfectly exemplifies the challenges, as it weaves cloud services into every aspect of daily communications and therefore spotlights the tortured path of old-WAN traffic in the cloud era: branch to DC to cloud to DC to branch.

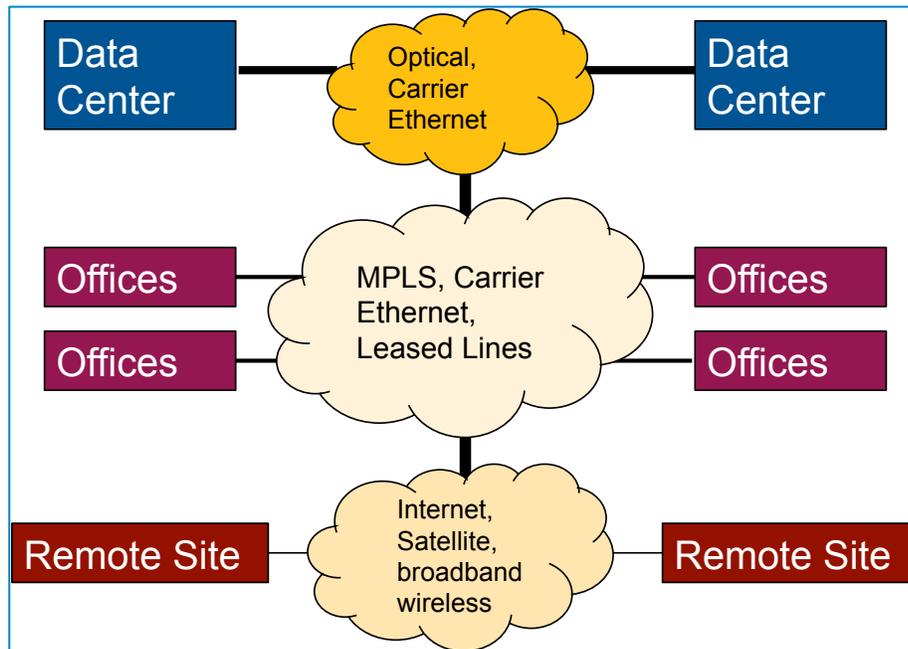


Figure 2: The Current Dominant 3-Tier WAN Model

The Cloud Requires a Simpler, Smarter, Software-Defined WAN

Organizations continue to increase their number of physical locations, often by breaking up large ones into multiple smaller ones, or by extending applications into the home via telework. Emerging, cloud-optimized WAN approaches include Direct Internet Access, and SD-WAN.

Direct Internet Access

Replacing MPLS partially or fully with directly Internet-connected offices has emerged as a way for IT to decrease network spend while increasing bandwidth and avoiding backhaul of

traffic destined for the Internet. With UCaaS, Internet-connected branches can improve performance by eliminating the latency associated with backhauling Internet-bound traffic across the WAN, and can further reduce costs by eliminating local loops or SIP trunks for PSTN access. Offloading some or all such traffic to lower-cost branch Internet access reduces or avoids loads on high-cost WAN links, and thereby reduces WAN performance challenges, as well. It also reduces loads on firewalls and other security systems in the data center, frees up data center Internet bandwidth, and can even reduce overall vulnerability to denial-of-service attacks against the data centers (and other incidents) by making it possible for more people to get more done without using data center services.

Internet-enabled branches come in two flavors—branches with direct Internet access *supplementing* dedicated WAN links, and branches with Internet links *only*—with variations on each. (Please see Figure 3.)

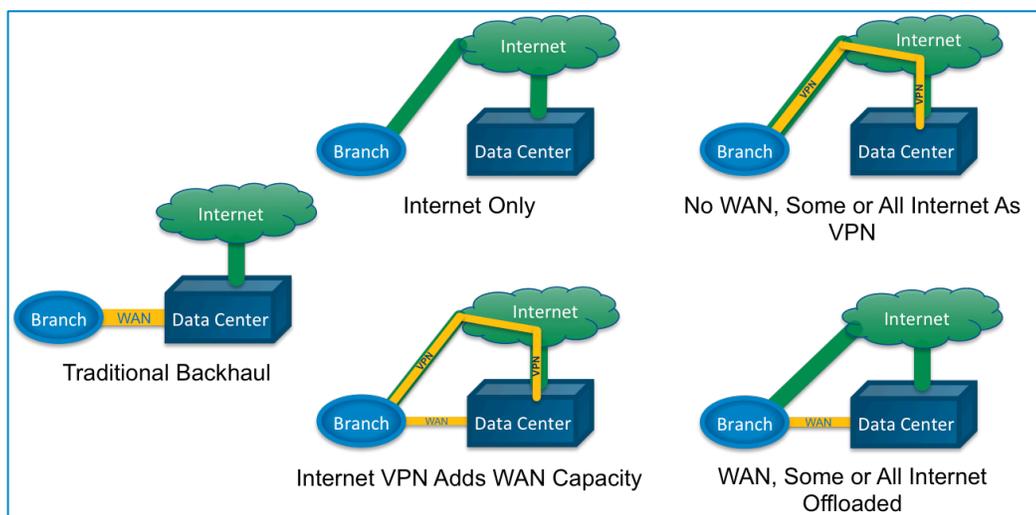


Figure 3: From Traditional WAN and Backhaul to Internet-Enabled Branches

Internet-only branches substitute cheaper bandwidth for MPLS for all branch communications, and come in three flavors: VPN-only, split pipe, and Internet only.

- **VPN-only connections** use the whole Internet link as an encrypted pipe back to a company data center
- **Internet-only connections** use the whole link to send traffic out to the Internet. To them, the company data center looks like any other Internet site; staff in such sites approach internal systems just as they would if they were not on a company network: through public interfaces or via a device-specific VPN rather than a full-site VPN
- **Split-pipe installations** devote some bandwidth to a site-to-site VPN and the rest to direct Internet access.

These all offer the potential to reduce costs. Internet-only and split-pipe designs align network design more closely with cloud-centric traffic patterns. Internet-only branches are increasingly common, and slowly moving “up market” to larger, more important, or higher-risk branches. On its own, though, Internet connectivity offer little opportunity for network architects to optimize connections for specific applications (such as UCaaS), enable insight into performance between branch offices and SaaS providers, or enable optimized utilization of multiple Internet connections or mixed Internet and MPLS scenarios.

Enter SD-WAN

Software-Defined WAN (SD-WAN) optimizes branch connectivity using:

- **Abstraction of edge connectivity:** Virtually combining all the connections into a location (Internet and MPLS) to serve as a single pool of capacity for all services
- **Virtualization of the WAN:** Overlaying one or more logical WANs on the pool of connectivity, with behavior and topology for each virtual WAN defined to suit the needs of specific types of network services, locations, or users
- **Policy-driven, centralized management and deep visibility:** Key to an SD-WAN is the ability to define behaviors for an overlay WAN and have them implemented across the entire infrastructure without requiring device-by-device configuration; likewise, the ability to see, easily, not just which applications are running across the network but how much capacity is going to each and how well each is performing, something many IT shops have long struggled to achieve by other means
- **Flexible, dynamic traffic management** for performance and security: SD-WANs can optimize traffic in many ways, including using forward error correction and other techniques to mitigate latency, jitter, and packet loss; and they can load-balance and selectively route traffic across different links based on criteria such as link performance and end-to-end application performance, and can selectively sending traffic direct to cloud destinations across branch Internet links.

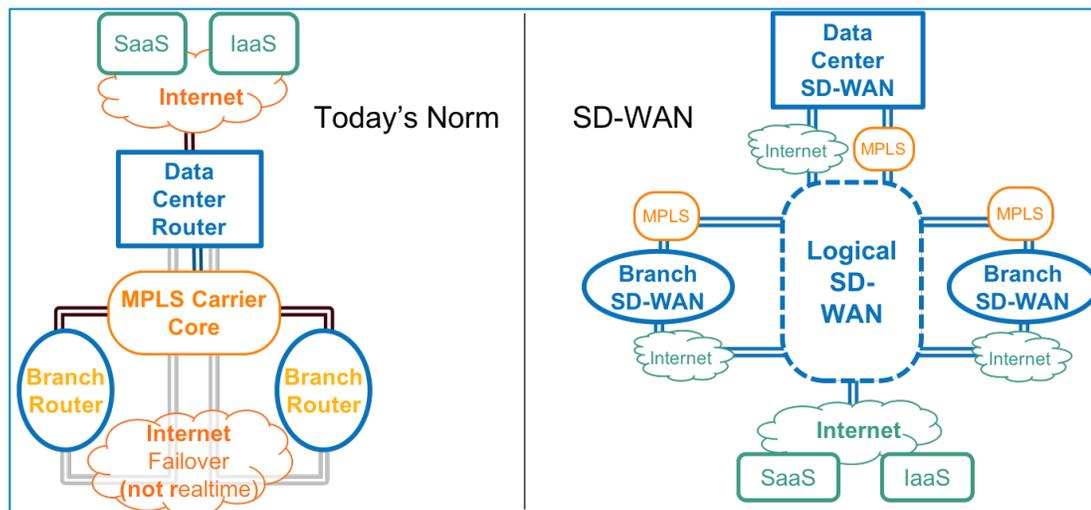


Figure 4: SD-WAN Overlays Logical WANs on Pooled Connectivity

Interest in SD-WAN is exploding, with 29% of companies using it by end of 2017, and another 13% planning to deploy in 2018. Early adopters report a 92% reduction in troubleshooting time and a 95% reduction in branch connectivity outages.

Types of SD-WAN

There are two key ways to provide SD-WAN services: overlay and in-net SD-WAN.

Overlay SD-WAN

In an overlay SD-WAN, SD-WAN endpoints either replace branch routers or sit just behind them. (Please see Figure 5.) SD-WAN appliances can collapse the typical branch stack by replacing not just a router but also optimizers and firewalls. Connectivity is independent of the SD-WAN solution, an interchangeable part whose details the SD-WAN abstracts away.

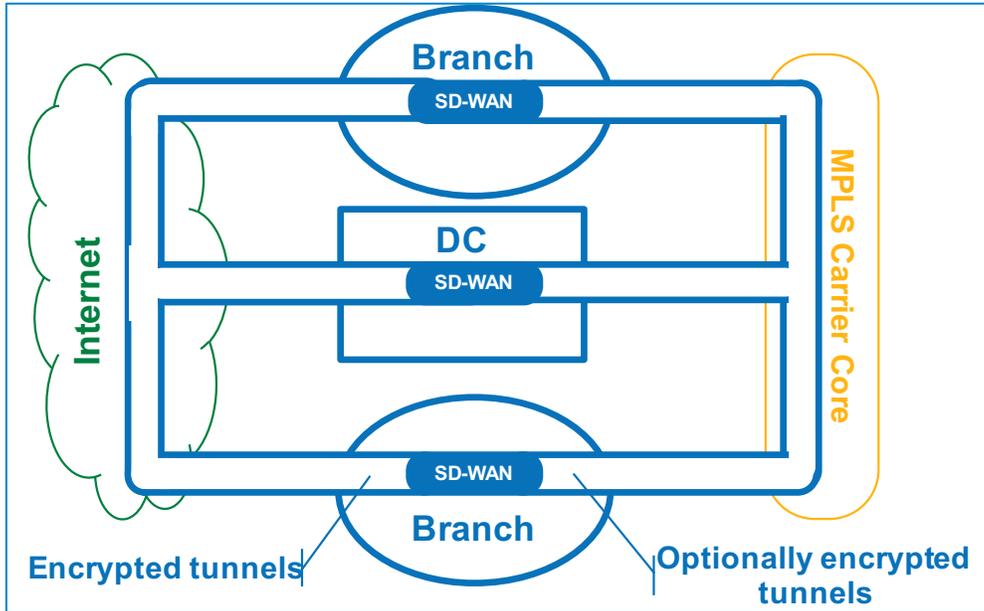


Figure 5: Overlay SD-WAN Architecture

In-Net SD-WAN

In contrast, in-net solutions tie the SD-WAN functionality to the connectivity. These functions may all be provided in the service provider's edge and core infrastructure, with the branch using a traditional router to connect to the provider's nearest point of presence. (Please see Figure 6.) Or, some or all functions may be provided on-premises via appliances under service provider management, which pushes work out of the service provider's infrastructure and also allows optimization of last-mile connectivity via compression.

In-net SD-WAN providers usually use Network Functions Virtualization (NFV), which delivers various WAN features using separate, cooperating Virtual Network Functions (VNFs) software modules running on a shared customer premises edge (CPE) device, or running in the provider's infrastructure and chained into the traffic path there. NFV makes it easy to use a whitebox x86 server as the CPE device instead of some bespoke, provider-branded box, decreasing vendor lock-in.

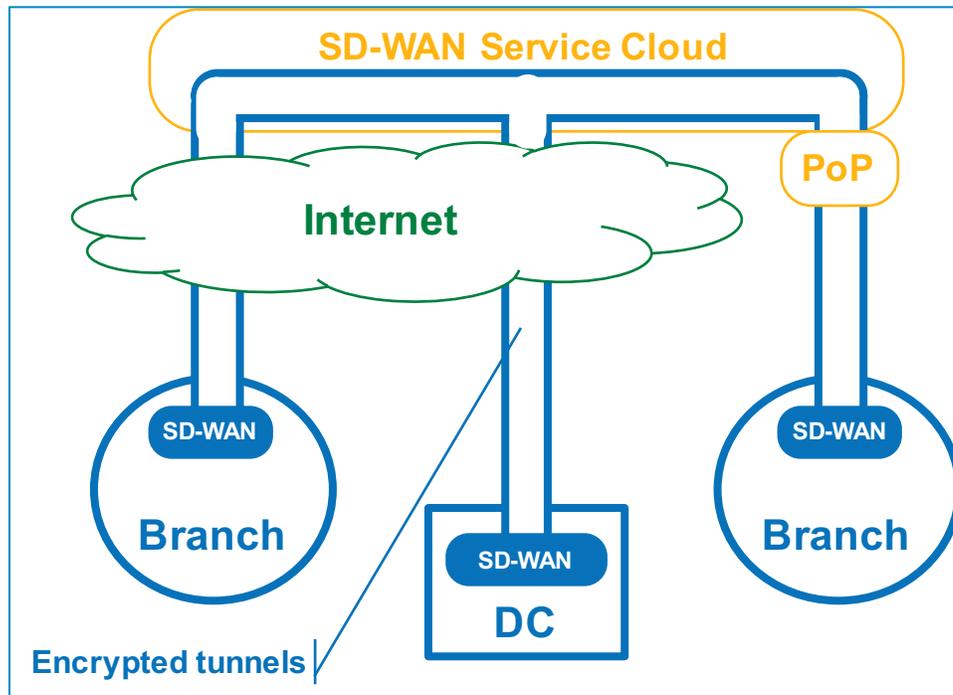


Figure 6: In-Net SD-WAN Architecture

Direct Cloud Connect (DCC)

Of course sometimes, routing traffic over the Internet isn't the ideal option. Examples include when an organization wants to adopt UCaaS before it has the opportunity to transition to SD-WAN, or where an SD-WAN transition isn't cost-effective, or where geographies make the Internet path to a service insufficiently reliable or performant.

When the variability in latency, loss, or speed of an Internet-only path leads to unacceptable performance variation cloud services, the enterprise can connect directly to providers' network edges with services such as Amazon's Direct Connect and Microsoft's ExpressRoute. UCaaS providers are getting into the game as well, as with RingCentral's CloudConnect.

For a DCC, the enterprise extends a link from one of its own edge routers to an edge router in the provider's network. They might pay to have cable pulled, in cases where the business has some infrastructure in a data center where the cloud provider also has presence (a "meet me" space). Or the enterprise might lease a router port in a meet-me facility from its connectivity provider, extend its WAN to that router, and have the connection pulled to there. Forty-eight percent of companies will have at least one DCC by the end of 2018.

WAN-Cloud Exchanges (WAN-CX)

WAN-CX solutions provide an alternative to DCC by adding a layer of mediation and abstraction: businesses connect to the "outside" of the exchange, and multiple cloud service providers connect to the "inside" of it. Through the physical connection to the exchange, customers can spin up multiple virtual DCCs to any provider on it.

WAN-CX providers can be traditional carriers or network-as-a-service providers; or connectivity exchanges operating inside carrier hotels and big colocation/hosting facilities that serve as meet-me points. Examples include AT&T NetBond, Equinix Cloud Exchange, Level 3 Cloud Connect, and Verizon Secure Cloud Interconnect.

Forty-one percent of organizations use or will use a WAN-CX by the end of 2018.

Making the Business Case for SD-WAN with UCaaS

Bottom-Line Benefits: Cost Savings

First and foremost the business case for most SD-WAN adopters is cost savings, and the main source of hard-dollar cost savings in SD-WAN is the substitution of lower-cost Internet connectivity in place of more expensive services like MPLS. Savings are entirely dependent on the cost and availability of Internet access, current MPLS rates, and the scope of the transition. One Nemertes client operating a 200 site MPLS network reduced expected WAN spend by \$4.9 million over three years by using SD-WAN to add Internet services to its MPLS backbone. (Please see Figure 7.)

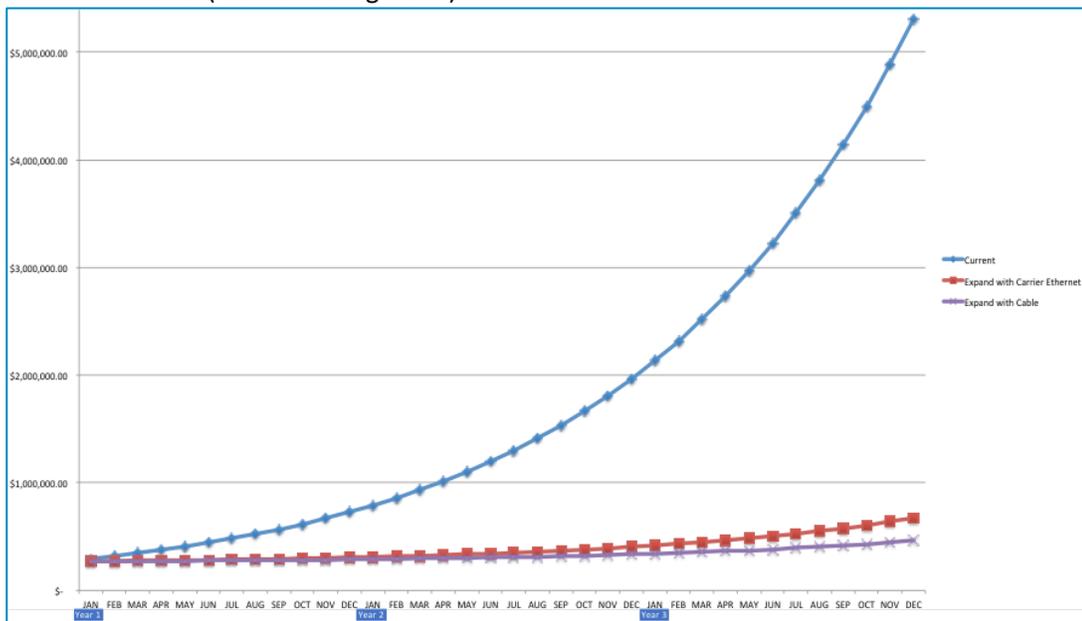


Figure 7: SD-WAN Cost Savings Example

Top-Line Benefits: Business Agility

Speed has value in business. For the growing number of businesses adopting a “get closer to the customer” approach to their physical storefronts, that speed can be measured in part by how many days it takes to turn up a new branch. UCaaS supports this model perfectly: as soon as the branch is on the network, it has UC services.

SD-WAN can radically reduce the number of days to productivity, by providing high-quality network services using almost any kind of connectivity. Most solutions allow free mixture of different varieties of link. So, new locations can be brought up with whatever form of connectivity is most readily available, be it cable or DSL or even 4G/LTE (a favorite redundant link type when it is not primary; and typically available from multiple carriers when it is primary). A new branch can therefore come on line in under a week, sometimes

even within a day of receiving its endpoint equipment. Contrast that with the more usual case for legacy MPLS networks: 30 to more than 90 days to connect up a new branch.

Bottom-line Benefit: Management Overhead Reduced

SD-WAN offers not just the 92% reduction in WAN troubleshooting time, but overall a 50% reduction in the number of staff hours required to manage the WAN. That can translate into staff expansions avoided, staff repositioned to work on strategic projects rather than mundane management tasks, or headcount reduced.

Operational and Performance Risk Reduced

SD-WAN solutions contribute to the overall resilience of the organization in several ways.

They make the organization less dependent on its own data centers by allowing traffic to flow branch to branch and branch to Internet without passing through a data center.

By making it cheap and simple to leverage multiple network links in a location simultaneously, while providing transparent and real-time failover of services from failing links to working ones, SD-WAN keeps locations connected.

By leveraging those multiple connections simultaneously, and routing traffic dynamically based on application needs and current link behavior, SD-WAN improves the performance of network applications, especially real-time media tools such as UCaaS.

SD-WAN also improves UCaaS performance through traffic optimizations. Solutions mitigate against packet loss, for example, using FEC (useful even in branches lacking redundant connections) and by employing strategies like traffic multipathing (sending duplicate packets along different paths to ensure best-available delivery for every packet). They can actively manipulate packet sizes to optimize them for delivery; for example, combining packets when long packets are doing better than short ones at getting from end to end and breaking packets into multiple smaller ones when the reverse is true.

In a UCaaS world, adding SD-WAN means customer calls don't get hung up, video streams won't break up, conference calls will continue uninterrupted, even when a link's performance wavers or (if multiple links are available) even when a link completely fails.

Some UCaaS services employ optimizations like FEC directly, and can provide good performance over a normally functioning Internet link. Even for such solutions, though, having a link fail is deadly to active sessions unless there is a redundant link to fall back on, and an intelligent, application-aware SD-WAN to hide the transition from end users. And for solutions that don't do their own robust optimizations, SD-WAN can fill the gap.

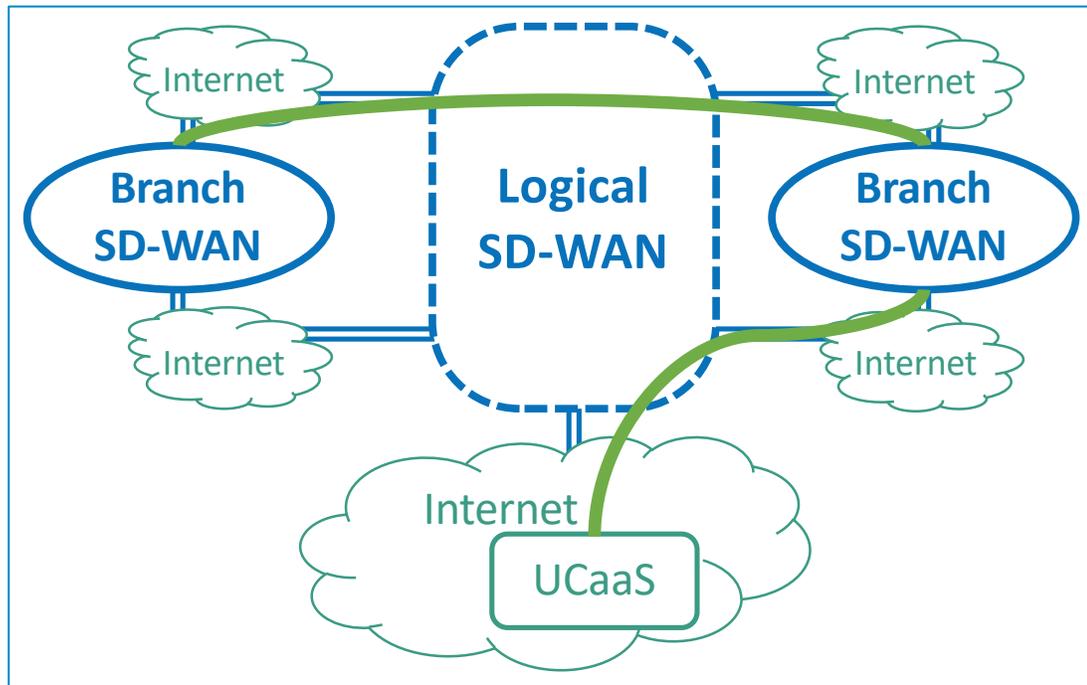


Figure 7: UCaaS plus SD-WAN for Internet Branches

Global WAN, Regional Services, Unified Solution

Lastly, and again like UCaaS, SD-WAN can make it easier for the organization to spin up new branches anywhere they need to, globally, by delivering a consistent set of services while taking advantage of whatever local connectivity options are available. In-net SD-WAN can enjoy a particular advantage in this scenario by using an optimized backbone to deliver “middle-mile” optimizations independent of locale, avoiding the multi-continental Internet performance that can be highly variable. Bringing greater consistency as well as better performance to both in-house and SaaS applications can boost productivity globally.

Conclusions and Recommendations

Enterprise adoption of cloud-based applications is on the rise. As a result, traditional network architectures must evolve to support changing traffic flows and performance requirements associated with cloud-based applications, especially Unified Communications as a Service.

IT leaders should:

- Reevaluate their wide area network strategies in conjunction with their plans to adopt cloud application and platform services.
- Consider the ability of SD-WAN to reduce operating costs, enable greater flexibility, and optimize cloud-based traffic flows.
- Evaluate DCC and WAN-CX offerings to join enterprise data networks with cloud-based services and provide predictable performance, resiliency, and end-to-end performance management for cloud-based applications, especially UCaaS.
- Explore various SD-WAN approaches to find the right fit for them.

About Nemertes: Nemertes is a global research-based advisory and consulting firm that analyzes the business value of emerging technologies. Since 2002, we have provided strategic recommendations based on data-backed operational and business metrics to help enterprise organizations deliver successful technology transformation to employees and customers. Simply put: Nemertes' better data helps clients make better decisions.