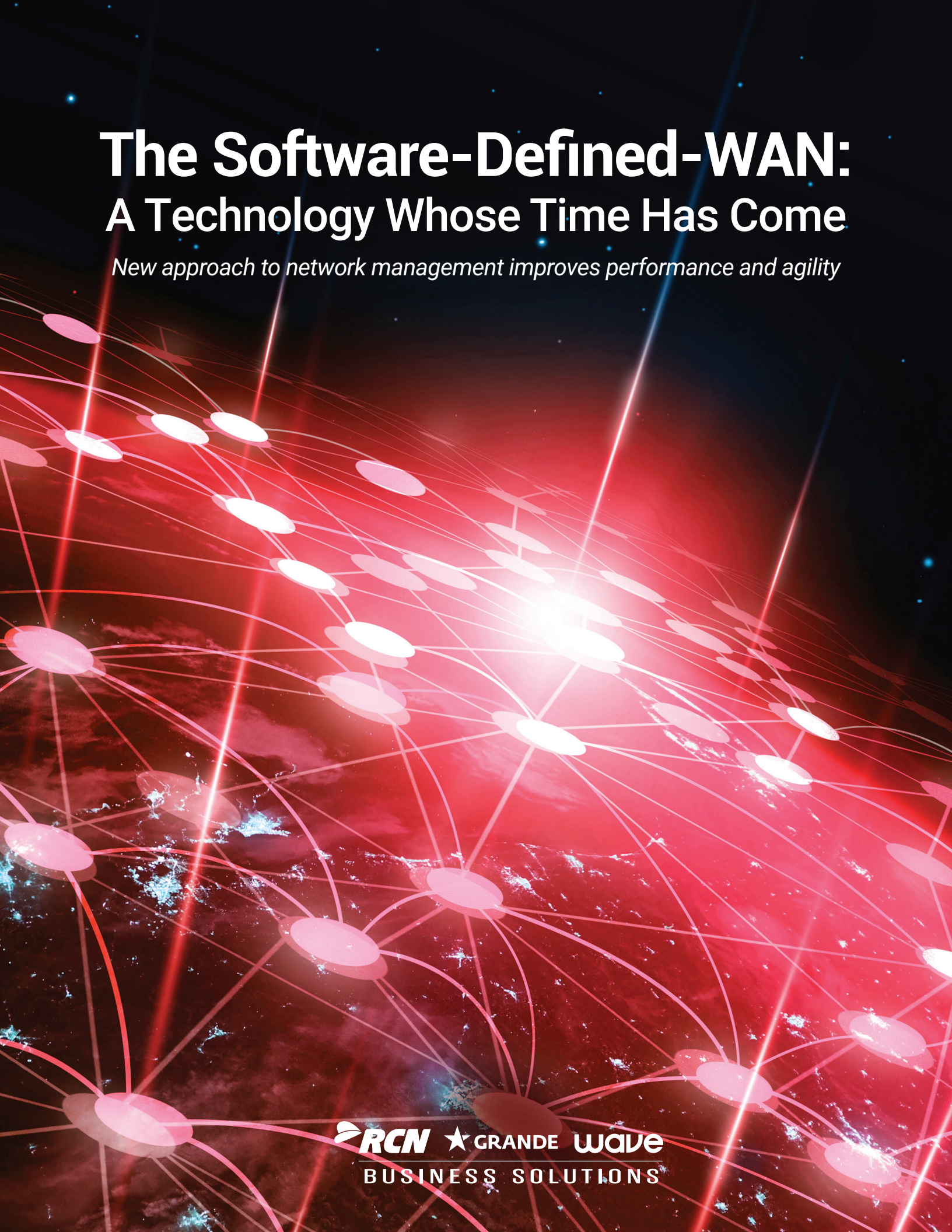
The Software-Defined-WAN:
A Technology Whose Time Has Come

New approach to network management improves performance and agility



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Executive Summary

As businesses migrate to the cloud, administrators are finding that many of the tools they use for on-premises wide area network monitoring and management do not transfer; they no longer have complete visibility into key performance metrics and analytics. Further, as WANs expand to support more locations, users and devices, they become more complex. Manual server and router configuration are required at each site every time there is a change in policy or provisioning. Quite simply, WANs designed during the pre-cloud era are not able to handle the explosion in traffic that cloud adoption brings.

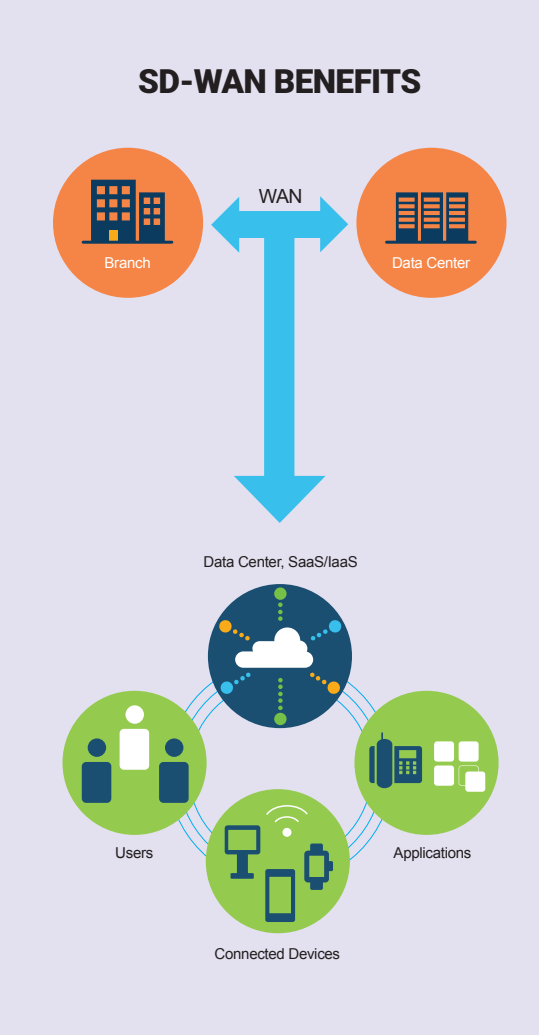
SD-WAN technology simplifies the management and operation of a WAN by decoupling the physical network hardware from its control mechanisms. SD-WAN does not *replace* the WAN, but adds a layer of intelligence through software to automate and prioritize traffic routing between WAN sites and maintain operational rules for the entire network. It is the cloud-based toolkit administrators need for total visibility through a single portal, and can alleviate never-ending configuration headaches for customers, with capabilities like zero-touch provisioning, application-based security and more.

For most companies, SD-WAN adoption is no longer a question of *if*, but *when.* This white paper examines the driving factors behind the move to SD-WAN and offers advice on how to best implement and manage the complexities that SD-WAN adoption brings to different size businesses.

CREATING A SMARTER NETWORK

What is SD-WAN?

SD-WAN stands for *software-defined wide area network*. It represents a fundamental shift in the way wide area networks (WAN) are implemented and managed. A WAN is a connection between multiple local area networks (LAN) separated by large geographic distances. WANs are generally virtual private networks (VPN) used to connect remote branch offices, users and devices in an enterprise to a centralized data center, allowing them to access applications, share information and execute business functions. SD-WANs use software to automate and prioritize traffic routing between WAN sites and maintain operational rules for the entire network from a single portal. SD-WAN technology does not replace the WAN; it is a transport-agnostic overlay that sits on top of the user's network infrastructure, or runs "as-a-service" option provided by an ISP. SD-WAN technology adds a layer of intelligence to basic internet connections to improve the user experience and alleviate constant configuration complexities for customers. It simplifies the management and operation of a WAN by separating the physical network hardware from its control mechanisms, allowing companies to free themselves from proprietary hardware and leasing legacy point-to-point data lines. Instead, data is routed securely between all remote sites using low cost, globally available broadband Internet and cloud services, optimizing traffic flows while reducing expenses.



Why Are Businesses Switching to SD-WAN?

The short answer is, the cloud.

SD-WAN technology has been around for several years, but for much of that time, it was a solution in search of a problem. It wasn't until a majority of data traffic migrated to the cloud that the benefits of SD-WAN crystalized.

Traditional WANs are a complex mix of public and private data lines that use fixed circuits and technologies like MPLS in conjunction with proprietary hardware to build a VPN. Often times they were simple point-to-point connections between branch and data center. Network administrators, tasked with ensuring reliability and

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security, amassed a number of software tools for on-premises network traffic management and application monitoring. They implemented firewalls, security engines and wrote proprietary rules for resource allocation, employee access and compliance.

But times have changed. Today's network environment is a more complex mix of users, applications, devices and the cloud, all interacting with each other on a continuous basis. WANs designed during the pre-cloud era lack the tools to handle the explosion in traffic that cloud adoption brings, and the management complexity, application performance unpredictability and data vulnerability that comes along with it.[1] The on-premises toolkits used by network administrators do not transfer to the cloud; they have limited visibility into key performance indicators needed to effectively manage a network that is no longer solely in their domain. So how can administrators continue to monitor network performance, apply advanced security features, customize apps, run analytics or generate reports after some or all of their network infrastructure has migrated to the cloud? Those needs simply don't vanish because the network moved off-premises. Rather, another solution is required.

SD-WAN technology is that next-generation toolkit. It provides a centralized portal to control and manage all areas of network performance through the cloud. Administrators have access to analytics and the ability to see trends and the types of services that are consuming bandwidth. For example, administrators can prioritize mission-critical apps by rewriting policies to more efficiently utilize the current allocation. SD-WAN gives administrators the tools to pinpoint exactly where bottlenecks occur and the ability to make necessary adjustments to reroute traffic or improve network performance without additional expense. Since SD-WAN is software based, if the capacity is available the service provider can solve the problem quickly. Ultimately, SD-WAN provides a level of automation that creates a smarter, more agile network.

The value proposition for SD-WAN is more about making the network smarter, optimizing assets already in place, and the practicality of not having to purchase equipment, hire staff and manage the logistics of a complex network environment.

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Will SD-WAN Adoption Lead to Cost Savings?

Much has been written about the savings that can be achieved through SD-WAN by reducing the need for dedicated lines and fixed circuits between remote sites. But cost savings is **not** the primary reason to invest in SD-WAN technology. The reduced operating expenses it offers are mostly offset by the need to purchase SD-WAN equipment and licenses, which aren't cheap. Rather, the value proposition for SD-WAN is more about making the network smarter, optimizing assets already in place, and the practicality of not having to purchase equipment, hire staff and manage the logistics of a complex network environment. For example, traditional WAN configuration is distributed; each individual router and server must be updated locally every time there is a change in policy or provisioning — a labor and time-consuming process. SD-WAN eliminates the need for individual router and gateway provisioning. Rather, policy changes are deployed to all network assets automatically while intelligently monitoring performance and traffic loads for maximum agility. The economics for SD-WAN are there, and enterprises need the visibility and tools to understand network performance in the cloud just as much as they did when the network was managed on-premises. And eventually, everyone is going to the cloud.

Why Businesses Need SD-WAN?

Network configuration is a never-ending task for IT administrators in a traditional WAN environment. Configuring the servers and routers installed in each branch office requires manual setup and most likely, an on-site technician to do it. And there are so many levers to coordinate and settings to match at every site, it's hard to keep track of it all. The same applies to any changes. If a company decides to install teleconferencing at all its branch offices, a technician (or third-party VAR hired to help with the project) would have to re-architect and deploy the functionality for each office. Adding more branch locations or moving into new markets? That's more repetitive manual configuration and change management. When companies expand their networks to new areas and/or over longer distances, data may traverse multiple carriers. That means connecting multiple types of users and devices across multiple networks. This can result in network congestion, data packet loss, application performance issues and possibly even service outages. Network administrators need to be able to fully support applications hosted both on-premises and in the cloud to ensure an acceptable level of service. This is not possible with legacy WAN monitoring tools alone.

So for enterprises with multiple distributed locations such as retail chains, branch offices, franchises or dealer networks — whether regional, national or global — the question is not *should we move to SD-WAN,* but rather, *what is the best way to implement SD-WAN?* Let's take a look at the process from two different perspectives:

SELF-IMPLEMENTATION

Company A is a mid-sized auto dealership, or perhaps a regional savings and loan with branches throughout the city. It doesn't matter what the business does, only that it has a robust internal IT department that believes it is capable of rolling out SD-WAN technology on its own.

First, IT has to build competency in SD-WAN. After spending weeks getting educated on the technology and determining the right equipment and necessary options, they purchase SD-WAN appliances and licenses for each branch location. Not cheap. Spares are needed in each location in case an appliance fails, which requires more resources to inventory expensive hardware. Those spares can sit in a closet for months or years before being called into service, and when finally plugged in...well, gigabytes of updates need to be downloaded and configured before it's up and running — IF it's still even compatible. Maybe Company A foregoes the inventory route and buys replacement SD-WAN appliances as they fail from Amazon, but that location will be off-line while waiting for it to arrive. Either way, time and money are wasted while unnecessarily stretching the competencies and responsibilities of the IT staff. Self-implementation also means Company A must plan for and manage their own back-up and disaster recovery operations, and constantly refresh their network for the latest security patches and compliance upgrades. The company may hire a VAR to assist in the initial design and implementation of the system, but they will surely need to hire additional staff that can understand and manage an SD-WAN after the VAR leaves. If bandwidth requirements change, it is on the company to discover it and make the necessary adjustments with their service provider.

ISP-ASSISTED IMPLEMENTATION

Company B is the mirror image of Company A. Having also migrated a portion of their network infrastructure to the cloud, they too recognize the advantages SD-WAN provides, but decided to deploy the technology in partnership with their internet service provider.

After an initial consultation with Company B to determine implementation objectives, the ISP selects and recommends the proper hardware and software. The ISP architects the deployment, installs the equipment and activates the necessary licenses. Bandwidth can be scaled up or down as needed. And the best part: all the equipment is leased; the appliances are owned by the ISP. Company B pays only for the SD-WAN service. There is no need to tie up financial resources maintaining an inventory of expensive back-up SD-WAN appliances; if one fails, it is the ISP's responsibility to replace it within SLA constraints. The headaches of hardware refreshes, software and security updates are also the obligation of the service provider, as is disaster recovery operations after a cyberattack or natural event. IT simply alerts their ISP to the problem (if the ISP didn't detect it already) and the network can be restored in minutes instead of internal staff trying to figure out which of thousands of levers to push to get everything back up and running. Company B found they are best served by leasing SD-WAN as-a-service from an ISP that already has the necessary infrastructure and expertise in place to implement it. Not only does Company B eliminate the expense of owning and maintaining the equipment, they do not need to pay the premium salaries of highly skilled network engineers to manage it. A win-win.

The bottom line is that SD-WAN is a service that is perfectly suited for an ISP to implement and manage on behalf of its customers. Some large enterprises may have the resources to handle the job internally. But most companies moving to the cloud should allow an experienced service provider to design a right-sized SD-WAN solution and deliver the tools to the customer so they can do what they do best — run their business — while still having visibility and control over all vital network systems through a single portal…just one that is managed and administered by an expert.

Advantages of ISP-implemented SD-WAN

When implemented with the help of an ISP, SD-WAN technology can improve the overall performance of enterprise WANs through:[1,2,3]

- **Streamlined network management.** SD-WAN consolidates network management into a policy-driven, centralized dashboard for the configuration and management of the entire WAN, cloud, and security environment from a single portal. It replaces the need to deploy specific software and/or hardware components at every remote site with template-based, zero-touch provisioning across all locations.
- **Improved network visibility.** Administrators can easily see the status of all appliances connected to the network and design, deploy and manage new equipment from a central location for improved quality of service. SD-WAN basically decouples the data traffic management and monitoring plane from the hardware.
- **Tailored to your IT infrastructure.** Bandwidth can be increased or decreased on-demand, ensuring mission-critical applications always have access to network resources despite fluctuating loads. In hybrid environments, you can direct lower priority traffic to broadband in order to optimize leased line use for more important applications. This translates into higher availability with more predictable service for a better user experience.
- **Increased performance.** SD-WAN increases network performance and agility because it automatically funnels traffic through the fastest and most reliable connection. Dynamically routing traffic based on real-time analytics reduces common network issues like jitter and latency.
- **Tighter security.** SD-WAN encrypts all endpoints edge-to-edge and implements uniform compliance rules across the network, making it easy to control the access privileges of guests, employees, partners and customers. Threat protection is integrated and cloud-based, with automatic updates to detect the latest viruses and malware to head off cyberattacks before the network is affected.
- **Technology refreshes.** Beyond periodic security updates, if something breaks, the ISP is responsible for fixing or replacing it. Obsolescence is eliminated as the ISP provides the latest software updates, tools and appliances as part of its service.
- **Enhanced network resiliency.** A capable SD-WAN solution is able to detect isolated outages and trigger a failover that switches sessions to another connection or carrier in milliseconds for uninterrupted service. This ensures core business functions are never disrupted in the event of brownouts or even blackouts in the local area.

In sum, SD-WAN technology has the built-in intelligence to simplify network operations, but is best implemented by an ISP with the competencies to manage the complexity that SD-WAN brings. Not many companies have the resources in-house to handle it.

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How to Tell if Your Business is Ready for SD-WAN

The main goal of SD-WAN technology is to deliver a business-class, secure and simple cloud-enabled WAN connection with as much open and software-based technology as possible.[2] Again, SD-WAN is not intended to replace traditional WAN (although it can in cloud-first enterprises), but rather to enhance WAN connectivity, capabilities and security. In fact, according to a Nemertes study, 78 percent of organizations deploying SD-WAN have no plans to completely drop MPLS from their WAN infrastructure.[2] Here are a few indicators to determine when the time may be right for SD-WAN at your company:

1. **Your business is becoming more reliant on cloud-based applications.** If you've already moved some functionality to the cloud then you may have already lost some visibility into network performance that came with on-premises monitoring tools. SD-WAN provides a looking glass into the cloud side of network performance with advanced analytics and reporting to regain that control.

2. **Your workforce is becoming more mobile.** Your employees are accessing files and applications on the move, working remotely or are using their own smart devices to launch company apps and read data. Traditional networks are optimized for static site location, not mobility. If your users are relatively stationary, WAN works well. SD-WAN allows for the prioritization and dynamic traffic routing from any source and any device, wherever it may be. In short, SD-WAN is designed for today's mobile workforce.

3. **You need a better security option.** SD-WAN's traffic encryption features protect data in transit across the entire network, including commercial broadband lines running over the internet and to the cloud. It gives network administrators complete visibility and the real-time information needed with firewall management, application-based security and threat detection so it can identify and block suspicious activity before it can do any harm.

4. **You want to simplify network management.** With the growth of the Internet of Things (IoT), Bring Your Own Device (BYOD) workplaces and the overall move to the cloud, traffic profiles are becoming more diverse and data loads are increasing. Translation: more users are running more applications and creating more data on more devices in more locations. Networks are getting more complex and threatening to swamp your IT team with daily on-site monitoring, configuration and housekeeping chores. SD-WAN features a single, centralized management portal with zero-touch provisioning (ZTP) to remotely manage all sites and locations. With ZTP, configurations and policies are programmed once and pushed to all branch locations without having to manually program (touch) each device individually. This eliminates the need to send specialized IT resources out to every location whenever a new application is added or a policy is changed, and reduces the potential for human error.[3]

Strategies for Successful SD-WAN Deployment

You recognize the benefits of SD-WAN technology. You know your business needs it and is ready for it. But what is the best way to go about a successful SD-WAN deployment?

While many large enterprises do indeed have the capability and competency to transition to SD-WAN without outside assistance, why turn down support from an ISP with the resources, expertise and history of successful SD-WAN implementation on behalf of its customers? Especially when it means the difference between owning or leasing the equipment, and handling the associated responsibilities and costs to manage and maintain it?

Perhaps the best strategy is to determine what degree of assistance your business needs from its ISP based on your current IT competencies. Free your staff to focus on other priorities and allow the ISP to handle the mundane tasks of network management.

Large enterprises *have lots of experience managing their network environment. They have built VPNs, set up firewalls and have been running virtual machines in the cloud for years. They have fully staffed, dedicated IT departments ready, willing and able to take on SD-WAN. How can the ISP help? Let's talk about streamlining and optimizing the resources you already have. An objective third party assessment can sometimes expose issues or present solutions internal staff might not have considered before. If they want to own the equipment, consult the ISP on hardware recommendations. Enterprises don't have to give up total control; offload pieces of network management to the ISP such as security threat detection or provisioning smaller remote locations through SD-WAN and cloud management. Most ISPs are also ready, willing and able to partner with large enterprises at any level, from helping to monitor a few fringe locations to taking on the entire SD-WAN deployment and management responsibility. It all depends on what the customer wants.*

Mid-size businesses *with several regional locations may have some internal IT capabilities to monitor and manage their network once it's up and running, but not the competencies or manpower to deploy the SD-WAN. They'll need a little more help in defining goals, designing the SD-WAN and then selecting and installing the hardware. Further, mid-tier companies are evolving, and are usually more concerned with day-to-day business activities and growth, as they should be. As such, they are best served by leasing rather than owning the equipment, freeing financial resources to address other areas of expansion. The WAN is therefore a continual work in progress. Building a more flexible SD-WAN architecture in partnership with an ISP is a strategy that will allow mid-size businesses to expand the WAN cost effectively while maintaining their focus on growing the business.*

Small businesses *moving to the cloud may just want a turn-key solution. They may have just one or two locations and a few mobile employees. They don't want to know how or why SD-WAN works, just that it does. And when it doesn't, they want to know someone is behind them to fix it fast. For these customers ISPs can perform an assessment and design an end-to-end SD-WAN solution, provide all leased equipment and licenses and relieve the business of the entire network deployment burden (and owning the equipment). The company is provided with a simple user-friendly interface for on-site monitoring, and can contract with the ISP for help desk resources as needed, all in an affordable monthly retainer for the SD-WAN service.*

No matter the size of your business or the number of locations, whether you need just a little help or a lot, we can help tailor a next-generation SD-WAN solution that will give you the performance, visibility and security you need to confidently manage all aspects of your network environment.

SOURCES & ACKNOWLEGEMENTS

This white paper draws from multiple published articles on SD-WAN technology as well as interviews with RCN technology experts. The information referenced herein has been synthesized from those conversations and the following sources:

[1] *What is SD-WAN?* Cisco.com

[2] *What is Software-Defined WAN (or SD-WAN or SDWAN)?,* SDxCentral.com, June 2015; Updated April 2019 by Connor Craven

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