

A SOFTWARE-DEFINED UPGRADE TO WIDE AREA NETWORKS

SD-WAN simplifies the delivery of efficient, agile connections.

EXECUTIVE SUMMARY

Wide area networks were created with 20th-century infrastructures in mind. There were no cloud-based apps or smartphones. There was an internet, but it didn't have watches and doorbells and other "things" connected to it. In recent years, the number of applications used in the workplace has skyrocketed. They consume more bandwidth, require reduced latency, are accessed from an increasing number of locations and face escalating security threats. Adding to the chaos are more than [17 billion connected devices](#). Managing such complex networks has strained WANs.

Software-defined wide area networking solutions are designed to overcome these obstacles. SD-WANs, which consist of physical or virtual appliances and a central controller, use overlay networks to connect branches directly to data centers, cloud services and each other. SD-WANs simplify network operations by enabling administrators to remotely push out policies from a central management tool. These policies allow for the efficient use of different forms of transport by building secure overlays and prioritizing applications, which can improve user experience, network performance and agility while [reducing network costs](#).

While SD-WAN can simplify ongoing operations and make administrators more agile, it can be complex to plan, design and roll out. A partner such as CDW can help you make sense of this changing market, design solutions to meet your needs and maximize the benefits from this powerful technology.

Introducing SD-WAN

It's been a long time since the workplace was contained within four walls. Employees occupy far-flung offices, travel the world and conduct business in the field. They work from computers on their desks, tablets in a warehouse and smartphones in their pockets. They use applications hosted in a corporate data center, on public and private clouds and by Software as a Service (SaaS) providers.

While mobility, cloud computing and the Internet of Things have brought unprecedented levels of efficiency and new opportunities to the workplace, they've created something of a morass when it comes to the networks that support them. As the demands on WANs grow, so do performance issues and costs. Network management has also become increasingly complex as organizations face more steady and sophisticated security threats while producing growing volumes of data that move between branches, data centers and the cloud.

Addressing the Need for a Better WAN

SD-WAN solutions were created with these challenges in mind. They can improve network performance, simplify management, enhance security and, over time, reduce WAN costs while enabling networks to scale with the ever-growing demands they face.

With traditional WANs, the data and control planes are housed within routers in branch offices, which communicate with each other to direct traffic throughout the network, device to device. To make changes to the WAN, administrators have to manually configure each router, which can be time-consuming and error-prone. A [2018 report](#) by Enterprise Management Associates found that 86 percent of businesses that use manual policy inspection have problems in more than 10 percent of the devices.

One of the key tenets of SD-WAN is to separate the control and data planes and centralize control so that administrators can set policies and manage the entire WAN from a single tool. This unified tool effectively makes an SD-WAN operate as a single system, which allows network operators to increase agility and efficiency while reducing manual errors.

In addition to simplifying management, SD-WANs can improve network performance because they more efficiently use multiple transports. Traditional WANs typically route data through primary and backup or failover paths, such as a service provider-based multiprotocol label-switching primary path and an internet VPN backup. In contrast, SD-WANs agnostically and simultaneously use different forms of transport, including MPLS, broadband internet and 4G or 5G networks, to more efficiently move traffic through the network based on application and performance policies.

The move to SD-WAN can also lower costs for some organizations. Ultimately, however, it generally takes a few years for an organization to reduce its costs with an SD-WAN solution. The hardware, software and implementation expenses for a new SD-WAN system are higher than traditional WANs. But [generally](#)

[after 18 to 24 months](#), organizations can begin to avoid cost increases by more efficiently routing traffic over less expensive internet circuits and, in turn, avoiding increasing their overall MPLS contracts with service providers.

Top Target: A Better Network

The primary business driver of an SD-WAN, however, is its ability to improve user experience, regardless of where those users are — in the office, at home or on the road. Central management and multiple transport capabilities enable administrators to define service-level agreements for applications, including voice, video and real-time traffic, and choose the path that best meets each application SLA. So, they can prioritize more mission-critical applications over other traffic.

The other main business driver is that SD-WANs change the operational paradigm for administrators. A key tenet of traditional WANs is that they operate each device independently, hop by hop, as one-off locations. The network has no unified control plane, so it can be challenging to steer traffic or make improvements.

Service providers have created homegrown systems to orchestrate these complexities on the backside, but SD-WAN puts the power in administrators' hands, enabling them to manage a WAN far more simply and orchestrate it centrally. Thus, an administrator in an organization with 500 branches doesn't have to reconfigure 500 routers to make a change to the network. He or she can implement policies at the system level and push them down to those 500 sites. And because SD-WAN uses a central management tool instead of relying on a device-by-device architecture, it can route traffic more efficiently and along better performing paths between the data center, branches and multiple clouds.

Security is another motivator for companies considering SD-WANs. Organizations used to house all their applications centrally in their secure data centers, where they could inspect traffic accessing them. As employees use more cloud-based applications, security has grown increasingly complex.

SD-WANs embed security directly in the routers at branches. Some security features, such as Layer 3 and Layer 4 firewalls, authenticating SD-WAN appliances and encryption over insecure mediums, such as the internet, are table stakes. Most SD-WAN solutions can integrate with external, cloud-based firewall systems to provide advanced branch security use cases such as intrusion prevention systems (IPSs), next-generation firewalling and URL filtering. Some SD-WAN solutions can embed those advanced security use cases directly into the SD-WAN appliance, without the need for external services.

Much of the technology that's built into SD-WANs is not new, but the way it's consumed is new. Service providers or organizations with large, highly skilled IT staffs have been able to offer many of the capabilities of SD-WANs, but now

500%

The percentage by which SD-WAN traffic is expected to increase in 2019, compared with the previous year¹

organizations can more easily manage networks through a software platform.

SD-WAN is on the cusp of becoming mainstream. The industry is still in its infancy, but the promise of the technology has been clear for years. As many as [60 vendors](#) began crowding the market with SD-WAN offerings, but most businesses have been waiting for the market to shake out. That was a wise choice, as some vendors have already gone out of business. There are only about [two dozen serious players](#) in the SD-WAN space now, including Cisco, Citrix, Silver Peak and Riverbed. As the market matures, more businesses are putting their SD-WAN plans into motion.

Key Use Cases for SD-WAN

Many of the use cases for SD-WAN are inherent in the technology, meaning organizations that adopt SD-WANs will automatically realize their benefits. Organizations can solve countless challenges with an effective SD-WAN deployment.

- **Branch connectivity:** Traditional networks employ a hub-and-spoke model, routing traffic, hop by hop, to an enterprise data center to inspect traffic, then moving it along to its ultimate destination. This model can hamper



The average percentage increase in network traffic each year²

network performance, especially considering that [most distributed workforces access WANs from branches](#). SD-WAN, on the other hand, can connect branches directly to the data center, the cloud or to SaaS applications, shortening transit time, reducing overhead, eliminating bottlenecks and enhancing application performance. This can be done with all traffic, or subsets of traffic, depending on organizational business and branch security requirements. Branches also typically have a variety of connectivity types, and the transport independence provided by SD-WAN can help accelerate branch connectivity.

- **Cloud connectivity:** The architecture of traditional WANs was designed long before the invention of cloud computing. It was built on the premise that applications are hosted in a centralized data center, so traffic from branches needs to travel back to that data center to access those applications. Under that model, it's the most direct route to applications. But with an increasing number of cloud-based apps, backhauling traffic to a central data center before routing it to the cloud slows down the network and degrades application performance. SD-WAN can transport data directly from the branch to the cloud.
- **Security:** When asked about their top SD-WAN concerns, 36 percent of worldwide respondents ranked security first, and 72 percent put it in their top three, according to a 2018 [survey by Gartner](#). Security is also a [main driver](#) of SD-WAN adoption. The capability to provide a secure overlay to trusted devices over an insecure medium, such as the internet, is mandatory. However, additional key security capabilities such as application-based firewalls, IPSs, URL filtering and other unified threat management capabilities allow organizations to consider moving to a decentralized security model. Instead of backhauling cloud traffic to the corporate data center for inspection before routing it to the cloud, an SD-WAN solution leveraging these advanced security features can connect branches to cloud-based apps through secure direct internet access. Organizations can utilize multiple ways to get access to these security features, such as being embedded directly in the SD-WAN software stack or in integration with other cloud-based security services.
- **Visibility into network operations and traffic:** [Seventy percent of application outages](#) stem from network issues. In most organizations, users are employing more bandwidth-heavy applications, more of which are cloud-based or SaaS solutions, and they're using more devices, resulting in network congestion, packet loss and outages. SD-WAN provides administrators with a bird's-eye view of the network, so they can easily pinpoint issues in the network and take immediate steps toward resolution. This visibility can also greatly assist administrators in capacity and application prioritization planning to proactively improve user experience.

Transport Independence

Network costs rise. It's inevitable. Five years ago, MPLS that delivered 100 megabits per second (Mbps) of throughput may have been more than was needed. But as the number of users, devices and cloud-based applications has climbed, many organizations' needs have jumped to 1-plus gigabits per second (1+ Gbps).

And organizations need extra capacity to withstand traffic peaks, which means their costly MPLS circuits are underutilized when traffic wanes.

A software-defined WAN creates a unified overlay on top of the existing WAN, which gives organizations the option to use different forms of transport, including MPLS, internet or even 4G or 5G. By shifting some traffic to more affordable internet circuits, organizations won't need to continually increase their MPLS spending as network demand grows.

That doesn't mean that MPLS will go away. It's still a secure, reliable form of transport, so it makes sense for mission-critical data. But by shifting other traffic to internet circuits, organizations can lower their network costs, reduce their reliance on MPLS carriers and balance traffic across different lines of transport, reducing congestion and easing performance.

An SD-WAN can also increase reliability because administrators can set policies to shift traffic from one line to another should an outage occur or if circuit performance metrics aren't met.



▪ **Application control and prioritization for quality of service:**

SD-WANs allow administrators to route some traffic using MPLS and some on more affordable broadband internet circuits to ease congestion, improve application performance and reduce networking costs, ultimately resulting in improved user experience. In addition to giving administrators the ability to route traffic along different forms of transport, they can easily prioritize mission-critical applications over others. That way, users on a videoconference sales call aren't hampered by network traffic from colleagues watching YouTube videos during their lunch break. Using QoS capabilities in SD-WAN solutions, administrators can deprioritize less important apps to ensure that critical applications have the performance they need.

▪ **Centralized management:** On a traditional WAN, the control plane is housed within each router on the network, and traffic is routed along a hop-by-hop architecture. New policies or changes require complex manual configurations, generally to multiple devices. By shifting the control plane

from the branch routers to a central tool, administrators can see across the network and manage it simply by centrally pushing out policies to all the branches. They can even bring new branches online remotely within hours. That simplifies and strengthens network management, giving administrators more control over traffic, security and application prioritization.

Path Selection – A Key Capability



When SD-WAN solutions first came on the market, many networking experts expected cost savings to be a primary driver for adoption, as these experts assumed that organizations would replace MPLS with internet circuits. Eighty percent of business executives [surveyed by IDG](#) said they plan to augment, rather than replace, their network circuits.

To conduct path selection, SD-WAN requires at least two circuits at any given location. When most organizations get started with SD-WAN, they most often use a hybrid approach, augmenting existing MPLS circuits with internet circuits. They can then create application SLAs and policies within the SD-WAN solution that they can use to steer traffic down either of those paths.

Many organizations initially send most of their traffic along tried-and-true MPLS paths, but as they start testing SD-WANs and implementing application routing policies, they begin to steer less critical traffic over the internet. With SLAs in place, if the internet path isn't performing, that traffic will fall back to the MPLS path to maintain the SLA. As administrators become comfortable with this capability, they can continue to shift more traffic to the internet, leaving only mission-critical applications, such as VoIP, on MPLS. As organizations explore additional use cases, direct internet access can also help reduce the need for large MPLS circuits. In the end, these capabilities provide improved user experience while avoiding costly MPLS upgrades.

Some organizations may migrate to dual internet circuits. That's where real cost savings come in, because commodity internet circuits are far less expensive than MPLS. However, that strategy is complex and may seem risky for some organizations that rely on MPLS for mission-critical applications.

The Value of Direct Internet Access



Security, ease of management, cost avoidance – there are plenty of benefits to software-defined WANs, but at their core, SD-WAN solutions are about improving the user experience. When enterprise networks move slowly, users naturally grow frustrated. But managing dozens, hundreds, or even thousands of WAN locations can be a challenge.

As organizations move to cloud-based applications, such as Microsoft Office 365, Dropbox, or Amazon Web Services, backhauling all network traffic to the corporate data center for security inspection, can become less appealing. With SD-WAN, companies can cut out the middleman by incorporating direct internet access.

DIA connects branches directly to the cloud. An SD-WAN solution's central management directs traffic to ensure efficiency, reliability and security. SD-WANs can either integrate with cloud-based firewall services or directly embed security features, including application-based firewalling, IPS and content filtering, into the network at the branch and cloud edges, eliminating the need to backhaul traffic via MPLS to a central data center for security processing the way that traditional WANs do.

The original goal of many SD-WAN deployments was to optimize the connections between corporate locations, but more modern features in SD-WAN solutions enable administrators to optimize and manage path selection directly from branches to SaaS applications.

Moving the internet egress to the branch and using a geolocated Domain Name System can drastically improve the user experience. Often overlooked, using GeoDNS provides an optimal path for web traffic. It ensures that DNS requests go from the local internet egress to local DNS servers that return the local content delivery network nodes for those given platforms. So, for instance, rather than sending a Los Angeles branch office to Chicago to access Office 365, it routes traffic to San Diego instead.

Providing a quick, secure on-ramp to the internet is becoming increasingly crucial for today's businesses. [Gartner predicts](#) that 60 percent of corporate branches will deploy DIA by 2020.

- **Support for a cloud-first strategy:** All of the above use cases — branch and cloud connectivity, security, visibility into network traffic, application prioritization and centralized management — come together to make SD-WAN the right solution to support the cloud-first strategies deployed by many organizations. Traditional WANs were designed for applications hosted in a central data center. SD-WANs were created for the specific demands of cloud computing.

SD-WAN Spotlights

Businesses across a number of industries have turned to software-defined WANs for a variety of reasons.



- For a [plumbing supply company](#) with 500 branches, Cisco's SD-WAN was the key to the company's digital transformation strategy, aimed at providing staff with always-on connections to the applications they need to serve customers. Instead of spending countless hours manually configuring routers in every branch, the company's IT team can now push out policy changes throughout the network in minutes.

- A [fleet management company](#) had a few goals in mind when it deployed Citrix SD-WAN. The company, which had been using Citrix Virtual Apps and Desktops, was managing its 110 global offices from centralized data centers and connecting them through multiprotocol label-switching lines. MPLS was reliable but expensive, especially as a backup circuit that was used only as a failover if the primary line went down.

Another problem was the time it took to get new locations online. SD-WAN helped the company reduce the amount of time from months to days or weeks.

Migrating to Citrix SD-WAN resulted in cost savings after the company moved from exclusively MPLS to a combination of broadband, asymmetric digital subscriber line service, 4G and MPLS. It also improved performance because branches had direct access to cloud applications using local connections instead of backhauling to the data center. And the central console gave IT staff granular control to manage traffic, resulting in high availability and low latency.

- A [provider of audiology services](#), including diagnostic hearing tests and hearing aid fitting and rehabilitation, implemented Riverbed's SteelConnect SD-WAN solution to stay competitive in a rapidly changing industry.

With several large competitors entering the market, the company wanted to distinguish itself through outstanding customer service across its 44 clinics. It had been regularly adding new services, applications and locations, which took a toll on the network and the IT staff. Indeed, adding a single service could take up to four months. The company needed the agility to support the new traffic it was generating while giving the IT department greater control over network management.

Combining Riverbed's SteelConnect and SteelHead WAN optimization solution into a single appliance simplified networking; sped the deployment of new apps, services and locations; and improved network performance.

Overcoming the Challenges of SD-WAN

Organizations don't generally deploy SD-WAN solutions without a specific reason. It might be that their routers are nearing their end of life or their circuit contracts are coming up. WANs are notoriously complex, so as organizations approach equipment refreshes or contract renewals, they may consider SD-WAN. But the technology comes with its own obstacles.

Business leaders, aware of SD-WAN's challenges, have been proceeding cautiously. In a [2018 IDG Market Pulse report](#), 51 percent of executives surveyed cited interoperability with existing infrastructure and costs as their top two concerns about SD-WAN, and 48 percent worried whether they had access to the skills needed to implement it.

SD-WAN systems are more expensive than traditional WANs, and while they can reduce costs in the long run, they require a significant upfront investment in new equipment and deployment. Further, SD-WANs can indeed simplify ongoing network management, reducing operational expense. But achieving this objective often involves a steep learning curve with equipment that can be difficult to roll out. The key to simplifying network operations is to ensure proper planning and design, focusing on business intent and standardizing as much as possible.

Without adequate preparation, organizations can struggle to realize the promised value of simplifying network operations.

Many organizations also face a challenge in realizing the improved performance of SD-WAN. For instance, many newcomers to the technology struggle to understand what applications they have throughout their organizations and what SLAs they require, so they miss out on one of the primary benefits of the technology. Something as simple but impactful as GeoDNS can easily be missed as well.

Some organizations choose to implement SD-WAN on their own, while others opt for managed SD-WAN services. Typically, if an organization has had a positive experience with a carrier, it might choose a hands-off approach and continue working with the carrier as its managed SD-WAN provider — especially a large organization with thousands of branches to manage. In fact, carriers began offering managed SD-WAN solutions because SD-WAN itself posed a threat to the traditional MPLS networks they provided. Their SD-WAN services offered a new way to retain relationships with their customers.

But many organizations move to SD-WAN to break free from carriers, and they're eager to gain control of their networks.

Get Help for SD-WAN Deployments

A partner such as CDW can help organizations overcome SD-WAN challenges in a variety of ways so that they can realize the technology's full potential without a lengthy learning curve. Support can range from advisory, planning and design services to full rollouts. Since SD-WAN solutions' feature velocity is so high, ongoing consultation with CDW engineers can also ensure organizations get the most out of their investment as new capabilities are introduced to an already deployed solution.

In addition, noncarrier managed service providers such as CDW can manage an organization's SD-WAN deployment as well,

further reducing administrative workload. The key difference is they provide a transport-agnostic option, so customers aren't locked into one carrier's circuits.

That's an important distinction because transport

independence can translate into long-term cost savings and improved performance. It also puts businesses back in control of their networks as opposed to being limited to the offerings of their service providers.

Simplifying SD-WAN

To deliver the value of SD-WAN, you need orchestration from CDW.

There are so many factors in the SD-WAN equation that it can be intimidating for organizations considering the technology. Which vendors will still be around in a year? What goes into a deployment? How can organizations divide their traffic between transports for the most reliability and cost efficiency? An SD-WAN solution requires careful planning.

CDW can help. At planning and design sessions, solution architects explain the intricacies of SD-WAN, identify needs and potential problems, create customized designs and help organizations plan their rollouts.

CDW's Aggregation, Infrastructure and Managed (AIM) Services team can help customers assess their WAN transports and procure circuits. CDW's Enterprise Networking Group can then manage those circuits for businesses. Our experts can also help organizations plan their SD-WAN deployments, inventory their applications, develop SLAs and create templates to standardize and simplify network management.

Organizations that leverage this type of engagement find that deployments go more smoothly and help expedite the performance enhancements, cost avoidance and improved user experience that SD-WAN promises.

The CDW Approach

ASSESS



Evaluate business objectives, technology environments, and processes; identify opportunities for performance improvements and cost savings.

DESIGN



Recommend relevant technologies and services, document technical architecture, deployment plans, "measures of success," budgets and timelines.

DEPLOY



Assist with product fulfillment, configuration, broad-scale implementation, integration and training.

MANAGE



Proactively monitor systems to ensure technology is running as intended and provide support when and how you need it.

Technology trends such as SD-WAN can be confusing. To shed light on how your organization can benefit from emerging solutions, download "[The Modern IT Infrastructure Insight Report](#)" by CDW.

Want to learn more about how CDW can help your organization deploy advanced networking solutions such as SD-WAN? Visit [CDW.com/SDNetworking](https://cdw.com/SDNetworking)

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