SD-WAN Ushers in the Era of the Routerless Branch Office

White paper

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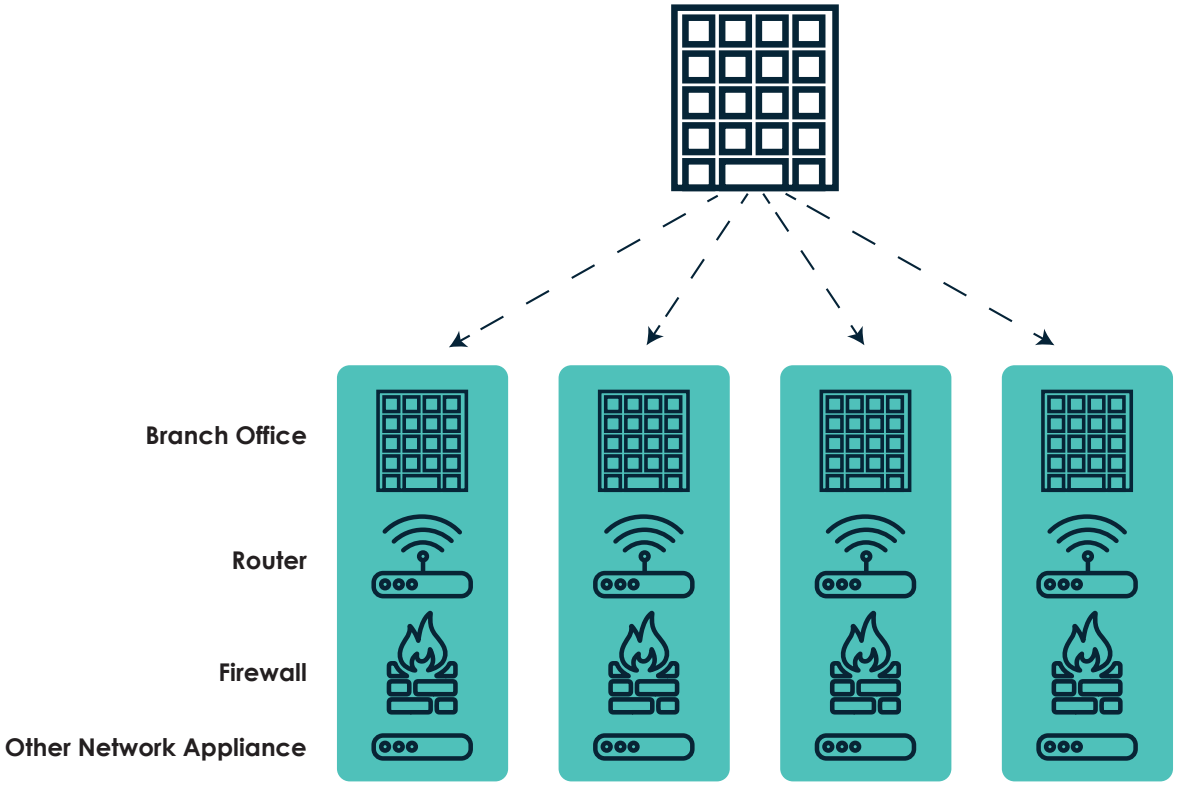
By Zeus Kerravala

Introduction: SD-WAN is now mainstream

"Software is eating the world," so the saying goes, and no area of technology is immune. Software-defined WAN (SD-WAN) has moved into the mainstream to displace an architecture that has been in use for more than 30 years. Think about that—those legacy WANs were initially designed in the client/server era, when "best effort" traffic was good enough. Does any other technology from 30 years ago still really work in today's enterprise? The technology behind enterprise infrastructures has turned over multiple times because needs change, technology ages, and new opportunities crop up, but the clunky old WAN just kept chugging along. In the recent past, the cloud, unified communications (UC), and mobility have changed traffic patterns so drastically that those vintage WANs simply couldn't keep up and were unable to support businesses.

Exhibit 1: **Hardware-centric WANs lack agility**



ZK Research, 2018

Those legacy WANs are built on hardware, and this hardware-centric view provides little in the way of service agility, which is so critical in today's fast-paced world. With a hardware-based WAN, the branch office infrastructure that enables and secures connectivity is located on a dedicated, on-premises appliance. Typically, each function requires hardware (Exhibit 1), so a business that needs a router, firewall, and VPN concentrator would have to purchase three appliances. Every feature that is added requires yet another appliance. One of the biggest limitations with this hardware-centric model is that each appliance, such as a branch router, needs to be managed independently in each location, so even simple changes can often take months to complete. A hardware-based WAN lacks the speed, agility and flexibility required in an increasingly software-defined world. Changing the applications and compute infrastructure without evolving the network would be like supercharging a new sports car and putting worn-out, low-performance tires on it.

Tasks such as spinning up new services, adding more locations, anticipating traffic patterns and serving existing customers requires the kind of turn-on-a-dime technology that a hardware-centric WAN can't handle. There should be no doubt that legacy WANs are holding organizations back.

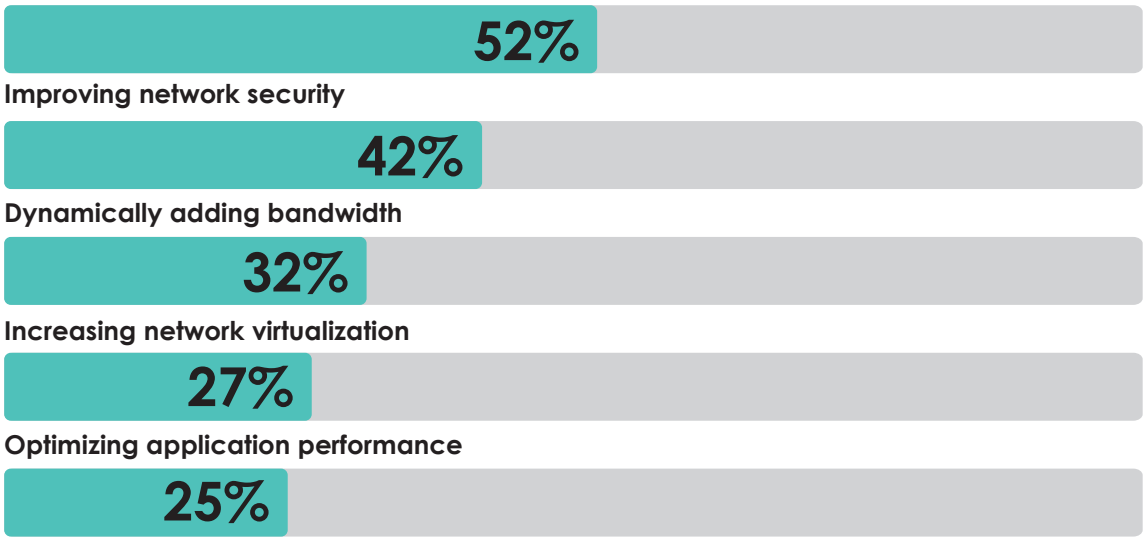
Digital transformation is gaining momentum. How much momentum? The ZK Research 2017 IT Priorities Survey found that 84% of businesses now have digital initiatives underway. Success in the digital world is based on speed, which is why companies have adopted cloud computing, mobility, Internet of Things (IoT), and other new technologies. However, the network has stood still with an architecture that has been in place for over three decades.

Legacy networks are built on Multiprotocol Label Switching (MPLS) with a hub and spoke architecture in which each branch is connected to a central location, as depicted in Exhibit 1. This design is optimized for client/server computing, where the majority of a company's data and applications are stored in the data center. Now that things have moved to the cloud and mobile devices, traffic patterns are completely different. Also, the number of users and devices continues to grow, as does the average file size of documents, increasing bandwidth needs. Also, security requirements continue to change, requiring updates to be made to the network more often and faster. The ZK Research 2017 Network Purchase Intention Study showed that the need to improve network security and the need for more bandwidth are the top two priorities for network professionals today (Exhibit 2). Legacy WANs can't adapt fast enough for these challenges to be met.

As mentioned earlier, the major building blocks of the digital transformation revolution—such as IoT, mobility, and the cloud—are network centric. With these new enterprise priorities, the network is now the business for most companies.

Exhibit 2: **Digital businesses require network agility**

What are the main challenges associated with running your network?



ZK Research 2017 Network Purchase Intention Study

It is hard to underestimate the impact of SD-WAN. It is the biggest evolution of the WAN in decades and brings WAN into the modern, software-centric era. Many organizations have looked to reduce their WAN transport services as the main source of ROI by using SD-WAN. That is certainly one way to save, but the total cost of running a WAN is based on many factors. WAN transport accounts for a significant chunk, but the operational expenses (OpEx) are more than 50%. The OpEx costs are so high because adding new services is typically manually intensive, as skilled technicians need to be dispatched to every branch office. This also contributes to the lengthy cycles associated with making network changes, which is why the biggest area of efficiency gain comes from increasing service agility. Moving away from branch routers can significantly increase service agility—and not just save companies a substantial amount of money, but also create agile ways to generate revenue with new services and products. Examples of such services are enhanced UC capabilities, new security capabilities, and cloud-based applications.

It's time for enterprises to move away from routers as the sole devices offering routing. SD-WAN offers all the routing capabilities an organization could ever need, plus it delivers agility, flexibility, scalability, and easy management—all things that hardware approaches aren't able to deliver.

Starting with a look at the challenge branch routers present, in this report, we explore the burgeoning SD-WAN market and how SD-WANs can move organizations to a routerless future.

Section II: The challenge with branch routers

There is a lot of misinformation out there. Many network engineers think that legacy branch routers are the key to an effective WAN design and that the router is must-have gear. That was once true. Thirty years ago, traditional routers were at the core of every enterprise WAN and played a key role in the growth of the Internet, and they stayed at the core until very recently—same technology, same hardware, same approach. But times change and so have traffic patterns; what used to work just doesn't get the job done anymore.

With a trend toward a mix of 80% Internet traffic and 20% private link traffic in the enterprise (the inverse of just 10 years ago, when routers were necessary to manage traffic), traditional routers are no longer suited for the job. Routers and routing are one and the same, which means that just because routers should go away, routing network traffic will still need to be retained—but in a new form with different technology.

Routers are physical hardware devices that perform a specialized function; they forward data packets to the correct destination. They do a great job of optimizing traffic in the local branch but struggle to optimize traffic across the whole network because every box must be individually configured, typically by an expensively trained technician. Routing is the act of determining where those packets go and ensuring they arrive seamlessly at their target destination. This is a critical function for every enterprise to ensure the business keeps running.

Routing and routers should not be inextricably linked, but they have been tied together in hardware for as long as there have been networks humming away in the enterprise and branch offices.

Today's enterprises and branch offices require the flexibility to add functions as needed. With hardware routers, options are limited for adding services. Think of security services like firewalls; they must be located at the router, which limits options and increases complexity. If your organization needs thousands of routers, it will need thousands of firewalls—each one separately deployed, manually installed and managed in isolation. These kinds of tasks—whether at initial deployment or installation or for regular maintenance—are prone to human error. And if one component in the field has an error on installation, other errors likely will exist throughout the network. Identifying the errors and applying a fix can be extremely time consuming and labor intensive because of the large number of devices on the network.

SD-WAN is often viewed as a bolt-on for traditional routers, and so businesses keep their current routers in place for the T1 and E1 interfaces. However, SD-WANs introduce branches to broadband that offer an Ethernet handoff. Therefore, keeping both the old hardware and a new SD-WAN deployment operating in tandem is unnecessary and expensive. Businesses that hang on to legacy routers because "it's the way we've always done it" will end up paying an unnecessarily high cost.

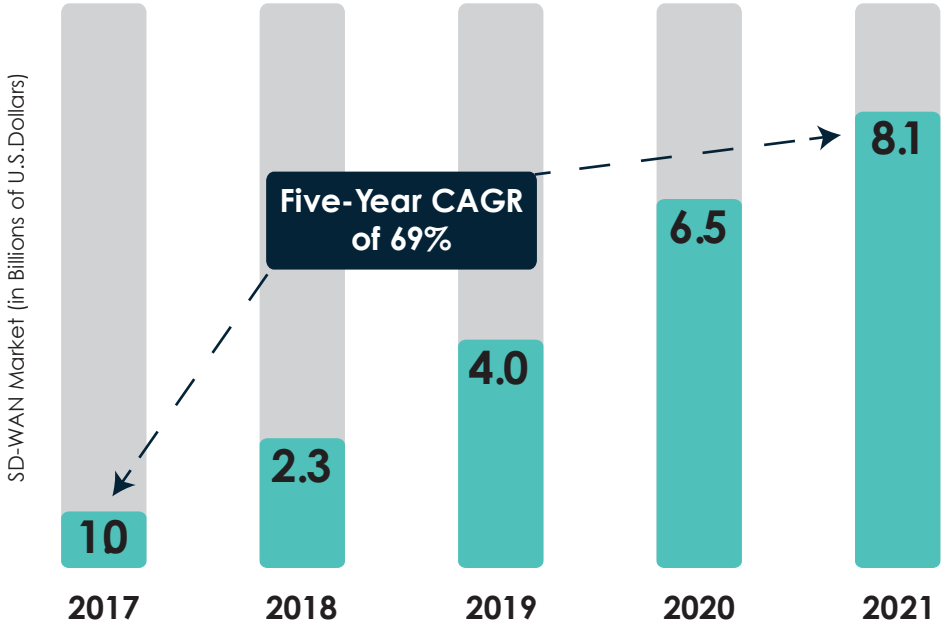
Simply put, branch routers are capital expenditure (CapEx) hogs. Plus, after the initial capital expense, they require high-cost maintenance that never ends, and they must be maintained and managed by highly trained and costly technicians. Skimping on the training for those engineers can result in a voided contract or significant liability. Perhaps more troubling, each one of those routers requires separate and expensive on-premises configurations and updates, which can bloat the truck-roll budget.

In contrast, a SD-WAN solution provides Network as a Service, which can pull all the associated costs into a single contract that includes maintenance and support, push updates and configurations, and deliver all content across multiple transport methods dynamically. With such simplicity and functionality, SD-WAN enables routerless branch offices.

Section III: SD-WAN paves a path to the routerless branch office

The branch router market is slowing to a crawl. Estimates for growth over the next several years show a market struggling to reach the high single digits in CAGR. On the other hand, the SD-WAN market is booming. According to the ZK Research 2017 SD-WAN Forecast, by the end of 2017, SD-WAN was a member of the billion-dollar club. The market reached the $1 billion level only two years after sitting at around a total of $200 million. From 2017 on, the growth will be astounding—reaching just north of $8 billion by 2021, for a CAGR of 69% (Exhibit 3).

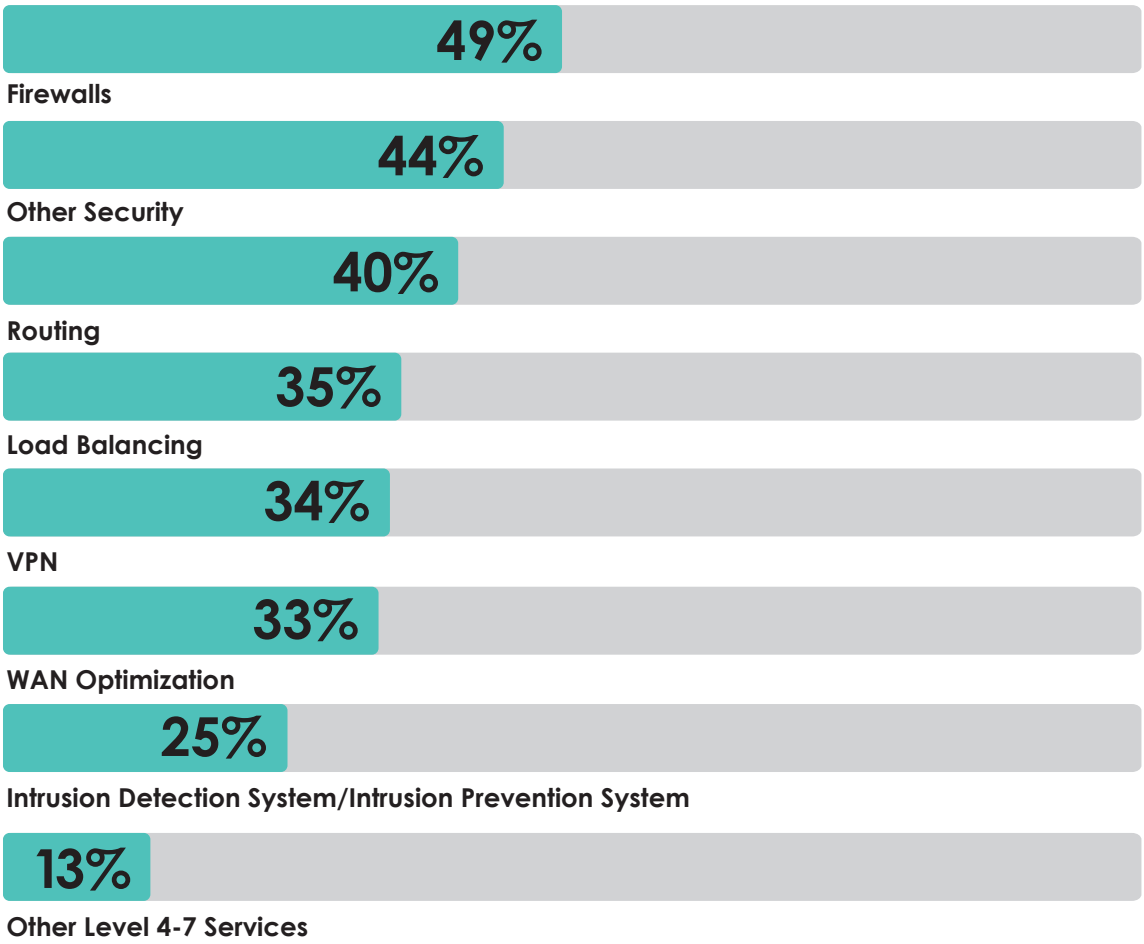
Exhibit 3: **The SD-WAN market will grow at a dizzying pace through 2021**



ZK Research 2017 SD-WAN Forecast

So, what's behind the exponential shift to SD-WANs that is currently underway—other than the reasons we just outlined? First off, an SD-WAN is based on principles that underlie software-defined networking. As such, the control plane and data plane are abstracted, which facilitates the centralization of configuration and management.

Exhibit 4: **Security and routing are the low-hanging fruit for NFV**



Typically, large-scale WANs are tough to operate and manage because there are so many points to worry about, whereas SD-WAN is simpler to manage centrally. Best of all, SD-WAN enables enterprises to replace all those expensive routers with low-cost physical or virtual edges in each branch. Instead of using a piece of hardware to route data, an enterprise can perform the routing in the cloud from a single console (rather than the collection of dashboards that come with a legacy network), allowing the enterprise to manage every function of the new network.

With SD-WANs, optimization, which was once a one-and-done proposition, can now be done at every point in the data path, up to and including a cloud service—something a legacy network simply could not do. SD-WANs can connect to a cloud gateway that might be colocated with cloud applications, enabling faster and more efficient access to those critical services—something that is well beyond the capability of even a specially configured express route circuit.

These are software-powered networks, but they are also cloud delivered, so they are at home working with the critical cloud-based applications that power every modern organization. In the SD-WAN world, new network and security services can be added as network functions virtualization (NFV) services, a capability that allows customers to choose the best-of-breed solutions that suit their needs every time. SD-WANs support all connection types, including broadband, Long-Term Evolution (LTE), MPLS, and even traditional services like Frame Relay and Asynchronous Transfer Mode (ATM). Some enterprises even use satellite connections for branch offices in areas where transport options are limited.

The projected exponential growth in the SD-WAN market along with a large addressable market has drawn a large group of vendors that claim to have SD-WAN offerings, but what they are really selling might not be the full stack of capabilities that an enterprise needs. A true SD-WAN solution includes everything—from routing capabilities, such as application programming interfaces (APIs), to the necessary routing protocols, network address translation (NAT), encryption, and other functions. The ZK Research 2017 Network Purchase Intention Study found that firewalls, other security, and routing were the top three functions an organization would consider running as an NFV service (Exhibit 4).

Once an enterprise has decided to make the move to SD-WAN, there are countless migration options to achieve a routerless future. If the enterprise is at a natural upgrade point for its existing routers, then a move directly to SD-WAN is a simple replacement operation. Some businesses will want to retain their routers for many reasons, such as having a bit of life left or a significant capital investment. If that is the case, it's easy to place an SD-WAN edge alongside the router. To ease this transition—which is sometimes more of a mental block than a real issue—some vendors even offer trade-in programs to accelerate the enterprise into a routerless future.

The importance of cloud delivery

Cloud delivery is a critical innovation in SD-WAN. When every aspect of the SD-WAN is delivered over the cloud, businesses reap the following benefits:

- **Elimination** of most on-premises infrastructure.
- **Centralized configuration** and easy management via a web-based portal.
- **Faster time to market**, so that any enterprise can get it set up without consuming IT resources, triggering a truck roll or wasting planning cycles.
- **Rapid updates**, which minimize downtime.
- **Direct connectivity** to cloud providers, which improves security and performance.
- **Rapid innovation**, because the entire service is delivered via the cloud.

NFV up close

NFV takes network functions from expensive dedicated hardware and shifts them to the virtual world (Exhibit 5). Working hand in hand with SD-WAN, this approach can take numerous functions that traditionally have sat on dedicated hardware devices spread throughout an enterprise, such as security, and move them into a single physical server. When undertaken across an enterprise with branch offices, this approach reduces costs and minimizes the need for truck rolls and hands-on maintenance.

Section IV: The business benefits of removing the router

Moving on from the router into a bright, routerless future can be a liberating experience for admins and IT managers who have spent years worrying about devices that require an extensive amount of reactive, manual management. In addition to fewer sleepless nights, there are other benefits that accompany the act of removing routers from branch offices.

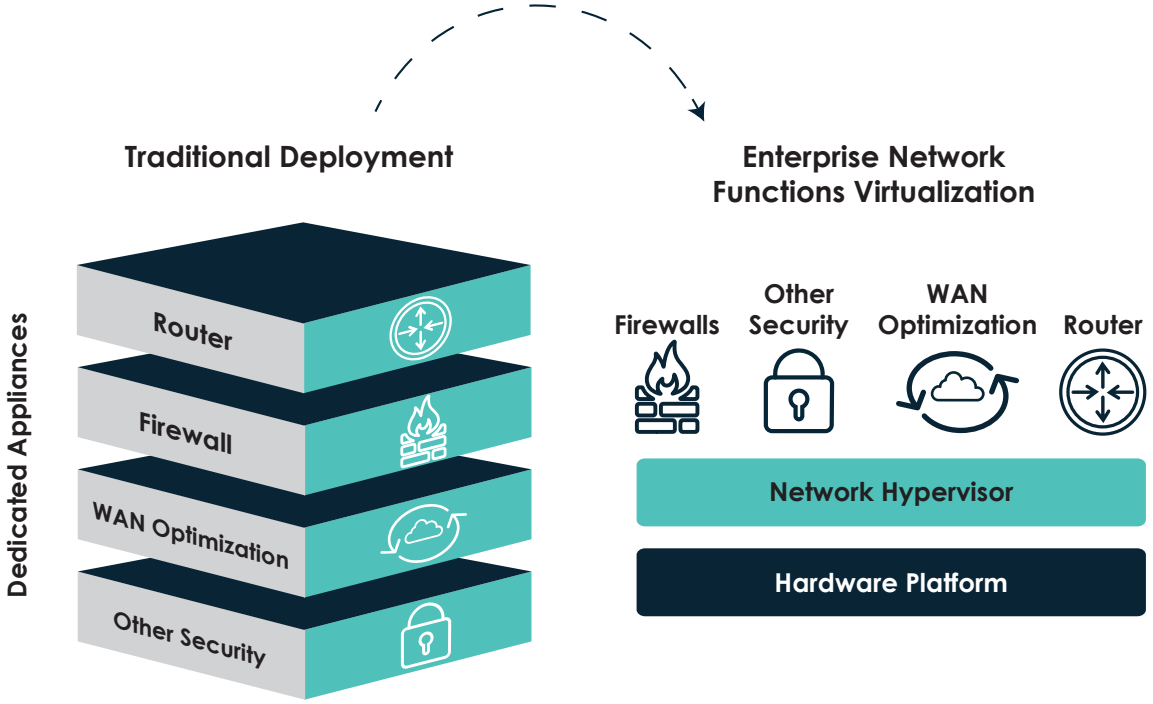
The following are important areas in which SD-WAN can help:

Lower total cost of ownership. With fewer hardware devices to deliver, install, maintain, and monitor, an organization can substantially reduce its labor costs. In addition, edge devices are cheaper than expensive specialized router hardware devices, which can shift the costs from big capital line items to the easier-to-manage operating budgets. Add on the simpler centralized management, and the math almost does itself.

End-to-end visibility. Blind spots are endemic in legacy WANs. With an array of routers in the field, some working better than others, it's hard to get a cohesive view of the WAN. SD-WAN operates as a single network with visibility from end to end so that any disruption or unexpected behavior is immediately detected and quickly handled.

Complete control. Some old WANs are hard to control, as they require truck rolls to go and investigate. SD-WANs are completely different. From a central location, every aspect of SD-WAN can be managed, controlled, and configured to operate at a peak level. There is no need for teams of engineers to hop in trucks and head to remote locations.

Exhibit 5: **Network functions virtualization simplifies networks**



ZK Research, 2018

Resilient network. Branch routers are expensive, often costing more than $10,000 for high-end ones. Creating resiliency often requires deploying two per location, which is too steep a price tag for many businesses. SD-WANs operate with low-cost routing devices, so building in network resiliency is very affordable. Alternatively, routing can be done in the cloud, minimizing the dependency on on-site hardware. With SD-WAN in place, an enterprise can be assured that the network will be resilient and will keep up with every challenge.

Faster scalability. As businesses change, the ability to scale a network to meet demand can often hold back an enterprise—at least that was the case with legacy WANs. SD-WANs, on the other hand, can easily adapt to new technology and networking needs and scale on demand as a business needs additional capacity.

Security. With the ability to offer security services as network functions, SD-WANs easily outstrip the ability of legacy WANs to help secure branch operations. Branches have been the source of numerous security issues, so using the centralized management functions of SD-WAN to deploy security as a network function ensures that an enterprise's security is as solid at the edge as it is in the corporate office.

Section V: Conclusion and recommendations

The SD-WAN market is growing fast and generating lots of buzz, and many enterprises are interested in the possibilities it presents. Deciding to move away from legacy WANs and expensive branch routers is an important watershed moment for any enterprise. To ensure that enterprises take the right steps, ZK Research has assembled a few recommendations for getting started:

Get the full stack. Some vendors market elements of SD-WANs but not the whole package. A true SD-WAN solution should include routing capabilities, APIs, the necessary routing protocols, NAT, encryption, and other functions.

Ensure the SD-WAN has routing functionality. SD-WAN should be able to select the most appropriate path based on link health and business policies as well as optimize the transport to maximize bandwidth and quality of experience. Plus, it should be able to detect and fix lower-quality routes to eliminate degraded application performance.

Get network security built in. Built-in firewall capabilities and scalable site-to-site security are table stakes. An enterprise should be able to define business and security policies easily and identify network and WAN segments.

Make sure management is simple. Tasks such as managing and configuring each new service and updating network policies should be easy. One click should propagate changes throughout the entire network immediately.

Move to an OpEx model. The high-stakes CapEx model drains budgets and slows the development of new initiatives. The SD-WAN OpEx model shifts an enterprise to a predictable, low-cost, Software as a Service (SaaS) approach that frees up IT budgets for projects that generate revenue.

Get ready to scale. Old legacy WANs could not scale, so ensure that you can do so when you shift to SD-WAN. An enterprise should be able to scale to tens of thousands of branches and cloud services. While that happens, the SD-WAN should be able to interoperate with existing infrastructure and troubleshoot problems remotely without costly truck rolls.

VeloCloud Cloud-Delivered SD-WAN provides limitless and optimized access across the entire enterprise organization for cloud applications and services while simplifying implementations and centrally managing all network activity. Using a flexible, agile, and scalable delivery model, VeloCloud is the only SD-WAN solution fully able to leverage all benefits of the cloud.

The adoption of cloud technologies, such as SD-WAN, requires a comprehensive strategy along with the trust and reassurance of a proven IT partner.

OnX Canada helps organizations on this journey by providing tailored cloud solutions that result in significant cost savings and improved operational efficiencies. Consistently recognized as a leading technology innovator, OnX helps companies of all sizes by developing cloud migration strategies that address not just their overarching corporate goals, but also the needs of individual lines of business. Architecting tailored cloud solutions that achieve measurable business outcomes, while managing and monitoring your solution after installment, make OnX the preferred IT partner.

OnX is a leading technology provider to enterprises in all industries, including dozens of Fortune 500 and Global 2000 companies. What sets us apart is the agility, flexible delivery models, and client focus of a smaller company coupled with the ability to deliver the resources, scale, and capabilities required by large organizations.

Ask how OnX can help you capitalize on the cloud today.