The great thing about technologies is the way they go beyond their intended uses into areas no one expected. For instance, when Intel first created the microprocessor, the chip maker thought its purpose was limited to desktop calculators. When Tim Berners-Lee envisioned what we now call the Web, it was a document management system. Virtualization, even long after it had broken away from its mainframe roots, was originally viewed as a way to run legacy operating systems on modern hardware.

Now virtualization has advanced even further, rewriting the rules of server utilization, storage consolidation and network configuration. The latter category of virtualization, software-defined networking (SDN), is especially strong. Research firm IHS recently predicted that the SDN market would jump from $781 million in 2014 to $13 billion in 2019.¹ The abstraction of hardware and software reduces the need for specialized network hardware and increases enterprises’ ability to create networks that conform to business needs, rather than the other way around.

SDN is evolving and moving from the data center into the wide-area network. Another IHS survey that asked 150 North American businesses about their data centers found that 45 percent intend to increase spending on software-defined wide-area networking (SD-WAN) over the next two years.² What does this expansion of the initial usage of SDN mean to CIOs in the enterprise? What should they do to make the most of SD-WAN, and what benefits should they expect to derive?

**OPTIMIZING THE SOFTWARE-DEFINED WIDE-AREA NETWORK**

WITH NETWORK VIRTUALIZATION EXPANDING INTO THE WAN, ENTERPRISES NEED TO UNDERSTAND THE OBSTACLES AS WELL AS THE OPPORTUNITIES.
THE DIFFERENCE BETWEEN SDN AND SD-WAN

Although initially it may seem like there’s little difference between software-defined networking and software-defined wide-area networking, the latter actually has the ability to tackle a higher level of complexity. After all, within a centralized data center, there’s likely to be one network architecture. Virtualizing it delivers value, certainly; for instance, increased agility in deploying applications. However, when branching out into a wide-area network, network administrators have to deal with public infrastructure that provides little reliability in terms of performance plus increases complexity in management due to lack of visibility or control. As enterprises become increasingly global, dependencies on public infrastructure only increase, resulting in a complex hybrid network — a topology spanning across MPLS links, the public Internet and cloud service providers. Mobile workers can add another dimension to this with their use of 3G and 4G wireless networks.

The ability to leverage technology to manage this added complexity in a cost-efficient manner will be a key differentiator for enterprises in the near future. For instance, in the case of branch offices, data traffic can move between multiple data sources and among multiple paths. It can move between the corporate data center and the branch, between the branch and a SaaS application in the cloud, or within the branch itself. In the first two scenarios, it can travel over an MPLS connection, an Internet connection or some other connectivity option available at a different price point. With a traditional WAN, all of that needs to be configured and deployed. With an SD-WAN, which has the WAN routing intelligence abstracted from the hardware, an entirely new kind of flexibility arises.

Ask any network administrator: Configuring and managing a network isn’t easy. It’s not something an enterprise should continually tinker with. But by shifting the intelligence into software, the challenge indeed turns into opportunity. Consider the scenario of a branch office that needs to upload financial reports at the end of each month. By deploying an SD-WAN, network administrators could program uploads from the branch at month’s end to automatically use faster, more secure network connections — and then revert to less expensive connections the rest of the month.

Or consider the connection between an enterprise and its SaaS providers. Because not all data is created equal, network administrators can give priority to certain applications at important times — say, an HR application during open enrollment for new insurance — and ratchet it back at other times.

One last important facet to the SD-WAN: Most organizations can’t justify having network administrators in branch offices, based on cost and workload. So having a technology like SD-WAN, which helps centrally manage networking capabilities, means enterprises can have more control over networks in remote offices without having to staff them individually.

FIVE BENEFITS SD-WANS CAN DELIVER

Because of this dynamic flexibility, software-defined WANs provide a variety of benefits for enterprises hoping to reduce the complexity of network and cloud management. These include:

LOWER COSTS. Consider the capital expense of providing networking capabilities at branch offices, for instance. If the application is abstracted from the underlying hardware, it’s less likely that an enterprise needs to procure a sophisticated router; a white-box option will suffice. Consider, too, the operational expense of rolling out an application to an enterprise’s sites. Hardware provisioning and configuration take time, which can impact a rollout. The longer a deployment takes, the bigger the impact on the business. SD-WAN also allows companies to improve bandwidth quality on high-cost MPLS links by channeling less urgent traffic (say, email) to less.
expensive Internet connections. That, in turn, can help employee productivity by ensuring the most important traffic moves fastest.

**INCREASED FLEXIBILITY.** SD-WAN gives network administrators a higher level of independence when choosing among appropriate networks to connect branch offices, remote offices, cloud-based applications and other data sources. There’s no longer rigidity looming over the decision to use MPLS, metro Ethernet, broadband, wireless or the Internet, because applications can be programmed to use a specific network at specific times, depending on the implications of traffic, business need, security or other factors.

**POLICY-BASED APPLICATION DEPLOYMENT.** By abstracting the physical network away from the application and the data, network administrators can set up automated policies that ensure data is transported by the most logical — though transport-agnostic — option. They can determine, for instance, that YouTube videos and LinkedIn access are always shifted to the slowest connection — unless they’re being accessed, respectively, by a server designated for training purposes or the human resources department.

**ENTERPRISE-WIDE SECURITY.** That same kind of policy-based deployment applies to security as well. Rather than beefing up security on all network connections — an extremely costly proposition — network administrators can instead ensure that sensitive data is always transmitted across encrypted networks. This makes it easier to scale global security policies, because they apply to the data, not the network.

**DEVICE MANAGEMENT.** Because SD-WAN capabilities can be programmed, they can also easily track and monitor application traffic. These reports and analyses can help network administrators become even more sophisticated about how and when to best route traffic.

All of these capabilities add up to significantly increased agility for enterprises. They can institute an increasingly popular precept — matching policies to workloads, rather than to network connections themselves.

This means enterprises can launch new services and reconfigure old services with greater efficiency. In a network of thousands of nodes, having an automated, business-driven policy means faster rollouts and more reliable transmissions. Enterprises can turn their network into a competitive advantage, no matter how dense or complex it might get. Even better, IT can shift resources from manual reconfiguration to more strategic activities.

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**THE POTENTIAL OBSTACLES OF SD-WAN**

Make no mistake, undertaking the shift from traditional WANs to software-defined WANs is advantageous, but not without its obstacles. One is cost: Enterprises have invested billions in sophisticated networking equipment that is not yet close to becoming obsolete or unsupported, and equal numbers in training IT resources to use them. Even though SDN equipment is initially less expensive, enterprises should be aware of the costs of transitioning to SDN.

Another issue is establishing interoperability between traditional WANs and SD-WANs. This is an issue that the industry has been grappling with since the creation of SDN, and while some proponents believe that open-source technology will help smooth the ability of enterprises to achieve such interoperability, enterprises still need to consider how to make different kinds of networks work seamlessly together.

Finally, whenever a new technology appears, the inevitable follow-on question becomes: How will this be managed? There are still gaps in the concept of policy routing for the SD-WAN, including the ability to ensure quality of service (QoS) over different bandwidth links and applications. No doubt these tools will appear soon, but as enterprises and service providers craft service-level agreements, they should be aware of how they will track and ensure QoS.
ULTIMATE PAYOFFS OF SD-WAN

The aforementioned obstacles are typical for a new technology and will ultimately be addressed to make SD-WANs enterprise-ready. That said, enterprises should focus on the fundamental payoffs that come from SD-WAN technology.

First, there’s the ability to deploy hybrid networks easily. The days of the homogeneous network are gone, with global enterprises in need of flexible links between headquarters, divisions, branches, cloud-based data sources and SaaS applications. They need technologies that give them the ability to take advantage of these options, but without delaying deployments.

Second, there is the ability to establish global policies relating to bandwidth and security, while still maintaining local enforcement of those policies. The more consistency an enterprise can apply to data, the easier it is to transmit and secure that data. Why should enterprises pay the same to transmit and secure recreational content as they would to secure the transmission of intellectual property via other file-transfer methods between campuses?

Finally, SD-WANs give enterprises the ability to be application-centric, to tie business needs to the network provisioned. Such technology provides the ability to apply network programmability at a highly granular level, to match applications and networks as carefully as possible. With traditional configuration methods, it’s impossible to match daily or seasonal latency needs to networks, but with SD-WANs, enterprises can be as dynamic as they need to be with network provisioning.

Ultimately, SD-WANs not only help the business, but they serve IT’s goals as well. One of the biggest criticisms of IT in the enterprise is its inability to respond quickly to business needs, but with SD-WAN, IT can provide a higher level of agility when it comes to service provisioning — and do so in a way that’s consistent, secure and reliable.

How Riverbed Can Help

Riverbed’s forte has always been application-centric wide-area networking — accelerating applications and optimizing bandwidth. Now, however, Riverbed has extended its solution to provide dynamic business-defined control on application performance. It provides single-pane-of-glass management for the enterprise; network administrators have better visibility and control over the applications running on the WAN — no matter what the underlying transport mechanism might be, while still accelerating and optimizing data transmission. With the spurt in number of applications — on-premise or SaaS — that run on any enterprise network, Riverbed offers an automated process to group applications, manage SLAs and track performance. In addition, Riverbed has long provided secure optimization for encrypted applications, and has extended that capability to furnish application-level visibility and control over hybrid and software-defined WANs.

All this is done without having to replace existing network hardware immediately, by simply inserting Riverbed appliances in an existing network topology. As a leader in the WAN optimization business for eight years, Riverbed’s technology helps global enterprises deploy scalable, reliable WANs in large and complex real-world environments.

With these new developments, Riverbed provides all of the SD-WAN advantages discussed above, in branch-to-data center, branch-to-branch and branch-to-cloud communications, while circumventing several obstacles that a typical SD-WAN solution would create.

Riverbed, in addition to supporting software-defined delivery methods over the WAN, also provides single-pane-of-glass visibility into network health, greatly reducing MTTR. Further, it’s the only vendor that supports centralized management and delivery of branch-local applications from within the data center.

Riverbed has been working closely with the Open Networking User Group (ONUG) to ensure open-source components contribute to the capabilities of software-defined WANs. These include ensuring the open programmability of branch office routers; the ability of SDN controllers to provide centralized overlays that understand the entire network topology; and the ability to use white-box devices in branch offices for lower costs.