SOFTWARE-DEFINED NETWORKING
WHAT IT IS, AND WHY IT MATTERS

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When discussing business networking and communications solutions, the conversation seems invariably to revolve around cloud services, and more often than not turns to Unified Communications (UC). One topic that has been coming up more and more frequently in these discussions is Software-Defined WAN or Software-Defined Networking (SDN). Given its importance and potential to transform the entire field of business communications, it's a topic that truly does need to be discussed.

The purpose of this white paper is to provide a basic understanding of what SDN is, and to briefly examine a few of the ways it can be beneficial to a business.

WHAT IS SDN?

Traditionally, business WAN setups have made use of Multi-Protocol Label Switching (MPLS) for routing and network shaping. MPLS has the advantages of being fast, reliable, and consistent. In a modern, dynamic, and fast-paced world, however, it also has several drawbacks that are becoming increasingly difficult to overlook. This is where SDN comes into the picture.

MPLS attains its speed and reliability at the expense of flexibility, adaptability, and scalability. SDN reclaims those characteristics by separating network controls from the forwarding functions of the network. This results in a number of other advantages as well, and all without sacrificing speed or reliability to any significant degree.

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SDN provides significant infrastructural advantages over MPLS. MPLS is tied to a much longer hardware development cycle, while SDN benefits from a much shorter and more agile software development cycle. Understandably, upgrades to a hardware-defined system take much longer than improvements to a software-based system. Most changes to MPLS systems have to be programmed manually and usually involve physical hardware modifications. Adding a circuit can take months. On the other hand, SDN allows changes to be easily incorporated through a programmatic interface, and even allows the network to automatically adapt to changing conditions. Provisioning of new circuits can happen almost instantly, and resources can be allocated dynamically, as they are needed, often without direct human involvement.

NETWORK AS STRATEGIC ASSET

Historically, the network has been considered a cost item—a necessary part of doing business, but of real no value beyond its basic function. With SDN, though, it starts to make more sense to think of the network as a strategic asset—something that can be leveraged and utilized properly in order to gain advantage.

To be an effective strategic asset, the network needs to be:

- Transparent, but practical to operate
- Secure and reliable
- Flexible, adaptable, and scalable

A well-designed and -operated SDN is all of these things.

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SDN BENEFITS

TRANSPARENT, BUT PRACTICAL TO OPERATE

SDNs take all the network control structures from hardware and implement them in software. As a result of this, the control software has an always available, real-time map of the network, and those tasked with running the network are thus able to get an "overhead view" of the entire network. This has implications in terms of transparency and reporting abilities, as well as ease of use.

As part of its normal operation, SDN control structures track the entire network at all times. This enables robust and comprehensive network analytics that would be incredibly costly, if not impossible, with traditional networks. This also has the carryover effect of enabling equally robust optimization schema. SDNs actually allow access to information that wouldn't be available in other systems and provide the mechanisms that make such information actionable.

SDNs are also vastly easier to operate than traditional systems. Many functions, such as setting routes, that would have involved manual intervention in the past are automated under an SDN. Managers are able to set business-level policies and let the network do all the heavy lifting of implementing the policies. That's not to say that the network itself is simpler with an SDN. The network and its functions are just as complex and complicated under an SDN as they ever were with MPLS; it's just that most of that complexity is taken

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care of automatically, out of view of those using the network.

SECURE AND RELIABLE

Security and reliability are two key features of traditional, hardware-centric business networks, and there are some understandable apprehensions about whether or not SDNs can approach the same level of security and reliability. The short answer is: Yes, they can.

The long answer is slightly more nuanced.

SDNs are like other formerly hardware-based technologies that have transformed into software-based solutions. Cloud services are another example. One of the standard practices in any off-premises cloud-based service is to encrypt everything that travels across the network, and SDNs are no different in this regard.

An SDN that uses encryption well can be more secure than even a private, dedicated MPLS network that doesn't use encryption at all. With encryption, unauthorized access to one part of the network or one bit of data does not automatically confer access to the rest of it. With an unencrypted network, access to some quite often gives access to all.

Reliability is a key issue in most business environments—one that can justifiably make or break the adoption of new technology. MPLS networks achieve their reliability by seldom changing. If it worked yesterday, it should work today, and tomorrow, and so on. SDNs, on the other hand, change all the time. They are constantly reconfiguring

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to accommodate user demand and real-world conditions. With that much change and chaos going on, how reliable can an SDN really be?

The answer here is that they are reliable enough for most of the better service providers to offer SLAs that include 99.999% uptime. This is possible because of the network redundancy that exists in software rather than in hardware. While hardware is still necessary to run the software, specific pieces of hardware are not at all necessary, and this allows everything to be run across multiple pieces of hardware. If one fails or is taken offline, the system continues to function.

FLEXIBLE, ADAPTABLE, SCALABLE

This is the one area where SDNs really distance themselves from the old MPLS systems. The real-time overview of the entire network gives the ability to do real-time routing based on actual, real-world network conditions. If the routes to servers X, Y, and Z are suddenly congested, for example, some or all of the traffic can be routed through servers G, H, I, and J until the congestion clears up.

Likewise, resources in an SDN are allocated on the fly, as needed. One of the major drawbacks of MPLS networks in this area is that the resources available to the network have to always be available, whether or not they are needed at the moment. “Always available” means always paid for, and paying for resources that are only occasionally needed is an often necessary evil with traditional networks. With an SDN, resources are allocated as they are needed. The network is able to grow during peak usage, and then shrink down again as usage falls off.

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In terms of adaptability, it's important to note that provisioning in an SDN is centrally managed through software rather than in a physical way via hardware. This means that services can be provisioned or de-provisioned remotely, and more or less instantly. Opening a temporary branch office during a particularly busy time becomes a relatively simple, painless, and inexpensive process with an SDN. With a traditional hardware-based system, this is not the case.

This is what makes SDNs scalable in a way that MPLS networks can't be. As a business grows, shrinks, or changes over time, the network can scale to fit. This can have significant implications with regards to cost and efficiency, as well as business responsiveness. It is conceivable that a company running a hardware-based network might take so long to roll out increased network resources that they are unable to capitalize on the business situation that necessitated the additional capacity. On the other hand, a business using an SDN can respond quickly and effortlessly to the same situation and make the most of it.

INTO THE FUTURE

The past decade has seen great strides in data processing, business communications, collaboration software, and hardware capabilities. Unfathomable 20 years ago, big data, cloud computing, real-time video conferencing, telepresence, and processing power are now readily available to all. However, one area of business technology that has remained relatively unchanged over this time is the networking infrastructure that connects it all together.

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What we are seeing now, for the first time in a very long time, are significant advances in the way that networking infrastructure functions. Those advances are, in turn, pointing toward some fundamental changes in the way we communicate and the things we expect our networks to be able to do. In addition to simply doing things better than traditional networks, SDNs also do a number of things traditional networks can't do at all—and we are only just beginning to see the possibilities.

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