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SDN meets the real world part two: SDN rewrites the WAN manual

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Executive summary

Software-defined networking (SDN) is rapidly being accepted as the most logical way to approach a data center's networking needs. SDN's ability to abstract data-center networking operations away from the underlying networking hardware decreases networking costs, reduces time-to-market, and greatly increases the flexibility that organizations have when looking at their networking needs.

Wide-area networking (WAN), the part of the enterprise network between applications and end-users, is traditionally a slow, expensive, and inflexible area and hence, ripe for innovative new approaches. SDN is broadly applicable to other parts of the networking requirement, so offering up a pool of resources that can be programmatically controlled by software should be explored in different contexts and settings.

This report lays out a conceptual approach whereby SDN can be applied to the WAN to drive cost savings, agility, and flexibility for enterprise customers. The growing SDN trend permits more flexible networking and agile IT departments.

- SDN has been applied to problems with data-center networking, but is also applicable to comparable peripheral services.
- WAN deployments are typically complex to configure and deploy, inflexible, and offer a low return on investment (ROI).
- Applying the SDN framework to WAN deployment increases flexibility and decreases costs.

SDN: what is it?

In a [previous, related report](#), Gigaom Research discussed software-defined networking (SDN) and the benefits it brings to organizations and their data centers. But SDN drives benefits beyond the data center, as we'll discuss in this report.

The key to the success of SDN within an enterprise and service-provider setting has been its ability to abstract the network complexity away from the application and to automate the network paths required for the application, both within the data center and from the data center to the outside networks. Parking the technology to one side, SDN's business value has been its ability to streamline workflows and synchronize the network with the dynamic and responsive nature of virtual compute.

Businesses utilize several different networking approaches when distributing information to their employees and others: data-center networks, local-area networks (LANs) within individual branches, and WANs between remote locations and the applications stored in data centers.

So the question is, if SDN can breathe new life into the networks within the data center and drive a change in agility and flexibility, can it do the same for the key network connectivity between the data center and the applications' end-users?

This report will describe how the SDN approach can be applied to WANs and then discuss the benefits that can accrue from broadening the usage of SDN.

Current WAN constraints

We need to think of delivering applications to end-users holistically. In recent years, data centers have become more efficient and flexible, with SDN being just one of the improvements. Unfortunately, the speediest and most efficient data center in the world doesn't help when the wire connecting it to the end-user is slow to respond to change. Quite simply, application performance is a function of the weakest link in the chain. If the WAN delivers a constrained and torturous path, the end-user's experience will be correspondingly poor.

WAN technology has been fairly stagnant over the last decade or two. While the technologies may have evolved, the provisioning and deployment of WAN links has remained largely the same. This is true, despite related technologies (storage, data-center networking, and compute) having seen a veritable revolution in the way they work.

The supply of connectivity faces the similar economics that other mass-market products do. Typically, enterprises purchase connectivity services from a service provider based on a product set that's been engineered to support the basic requirements of the largest possible market. This has resulted in a high number of enterprises then having to deploy additional network elements (firewalls, routers, etc.) to provide the functionality their businesses need. This approach required additional networking devices and specialist resources.

The one-size-for-all approach counter-intuitively drives individual customization and complex bespoke networking. The issue is that traditional approaches to WANs don't make customization easy, thus they create a double issue for customers: a generic service that isn't ideally suited to their use-case and customization that is complex and inefficient.

Applying SDN to the WAN

We've already seen that SDN is driving efficiency and agility within data-center networks. We've also seen that another aspect of the network – the link between data centers and individual users – is statically configured and constricted. Together, these two facts create a fascinating concept: what if you could apply SDN to the WAN and therefore remove its existing constraints? Can SDN, with its software layer abstracting the hardware away from the provisioning of networks, be used to change the way that WANs are provisioned and operated?

The answer is “yes, this is possible” *if* an organization can regard its network capability as a pool of undifferentiated resources and by overlaying software intelligence and flexibility on top of those networks, it can create the ability to provision and prioritize network links at will.

This ability to abstract an end-customer's service from the service provider's physical network is a concept whose time has come. This approach will drive several benefits for organizations. By providing a vast pool of resources, the network can be managed centrally. Automation of network provisioning is far easier and results in less complexity, faster provisioning, and ultimately, fewer costs.

The provisioning of a WAN link, managed from a central point and using an SDN approach, could be as simple and economical as the price of a regular broadband connection. The combination of WAN-performance with broadband price and implementation time could create a revolution for the WAN in the same way that SDN has done for the data center.

Leveraging SDN: case studies

The change in the way IT consumes services is not lost on the world's service providers. For example, AT&T recently launched an innovative service aimed at applying the ease-of-use that enterprises are receiving from the cloud to corporate network services. AT&T and many others are now looking to technologies like SDN to change the way they offer network services, with the goal of putting the enterprise firmly in the driver's seat.

A significant change in network operating dynamics brings an opportunity to change the way the network reacts and hence an opportunity to drive innovation for service providers and results for their customers. Some examples of how this can be used are informative. While these case studies are conceptual, they are taken from real-world situations.

Case study: retail banking

Many banks are looking to implement a high-quality video-conferencing experience within the physical branch. Normally, this would involve a major refit of the WAN environment, with changes to the bandwidth at the branch locations, and would also necessitate a large capital investment to match the network-equipment processing power at the branch to the required new throughputs. This has impacts on economics and the internal resources needed to roll out the project.

Implementing an SDN-based WAN provides these banks the ability to augment their existing network services, so they can provide traffic steering of videoconference sessions over an adjacent, encrypted internet link. This would provide them with a cost-effective transport option for the higher bandwidth requirements of the video application and considerable savings in service-provider spend compared to increasing the premium VPN services they currently use. The key to enabling the traffic-steering function at the branch is the centralized management available from SDN-based WAN solutions. This simplifies the deployment and reduces the requirement for specialist network resources to manage the change.

Case study: financial services

Information security is paramount for financial institutions that are ensuring the integrity of their corporate assets and providing compliance with any industry- or government-imposed regulations. Because of this double requirement, financial institutions implement strong application-level control. Notwithstanding this, they must still provide evidence of security across their whole environment including their remote locations.

Today's VPN deployments require a labor-intensive compliance program to audit the logical network paths and branch accesses. This is a manual process, so it tends to be costly, time-consuming, and inefficient with the next audit often beginning soon after the current cycle is completed. The centralized control and visibility that an SDN-based WAN service provides can simplify both the compliance process and the auditing point for the network.

All network management is centrally maintained, which eliminates any unauthorized remote access that could configure network equipment at the branch. This provides a secured environment for the centralized auditing function to be completed with minimal human interaction. The compliance audit can be initiated on a schedule with an auto-generated report on the current state of the network configuration including paths, traffic rules, and logical topology – all within a matter of minutes.

The key benefit with this approach is the increased visibility into the current state of the network with a report of all the implemented policies provided with 100 percent accuracy.

Case study: international connectivity

Large multi-nationals have a burden associated with providing ubiquitous access to corporate information systems for locations outside of their home markets. Generally this involves offshore contractual relationships with service providers and an increased operational load to manage those international connections.

SDN-based WAN services provide an advantage in the separation of the service from the network connectivity. For multi-nationals this simplifies the management of their WAN from the international accesses used in each country where they operate. The organization can therefore choose IP connectivity on a per-site basis and select the most cost-effective provider. This can mean a significant reduction in the “per-bit” cost, because business-class internet services could be used instead of international VPN circuits.

As the network service is controlled centrally, specific policies for inter-location connections can be enforced, including the use of encryption. This enhanced ability to set up and remove sites from the corporate service gives IT the flexibility to adapt to an ever-changing business environment. As an example, sites can be deployed as required and can utilize short-term connectivity contracts rather than the traditional multi-year contracts prevalent with international VPNs. This flexibility improves the dynamic nature of the network.

Key takeaways

- The growing SDN trend allows networking to be more flexible and IT departments to be more agile.
- While SDN has traditionally been applied to the problems of data-center networking, the concept is applicable to similar peripheral service types.
- Typically, WAN deployments are complex to configure and deploy, inflexible, and uneconomical.
- Applying the SDN framework to WAN deployment and management workflows will increase flexibility and decrease costs for enterprises.

About Ben Kepes

Ben Kepes is a technology evangelist, an entrepreneur, a commentator, and a business adviser. Ben covers the convergence of technology, mobile, ubiquity, and agility, all enabled by the Cloud. His areas of interest extend to enterprise software, software integration, financial/accounting software, platforms, and infrastructure as well as articulating technology simply for everyday users. He is a globally recognized subject-matter expert with an extensive following across multiple channels.

Ben currently writes for *Forbes*. His commentary has previously been published on ReadWriteWeb, Gigaom, the *Guardian* and a wide variety of publications – both print and online. Often included in lists of the most influential technology thinkers globally, Ben is also an active member of the Clouderati, a global group of cloud thought leaders and is in demand as a speaker at conferences and events all around the world.

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