Predictable Internet Connectivity and Investment Protection: Keys to Mainstream Enterprise SD-WAN Adoption

May 2018

By Rajesh Ghai and Rohit Mehra

Sponsored by Tata Communications

This paper highlights the importance of predictable Internet connectivity and technology investment protection in enabling enterprises to adopt a software-defined wide area network (SD-WAN) and hybrid WAN, and thus accelerating cloud adoption without compromising network security.

Introduction

Embracing Digital Transformation (DX) leads to improved efficiency, new revenue streams, and better customer engagement and experience. Cloud computing is a key pillar of DX and often the starting point in the process of creating a digital business. Accessing applications from the cloud provides enterprises with the flexibility, agility and efficiency to enable DX without typical upfront capex. Hence increasingly, applications are being delivered from the cloud [e.g., software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS)].

As enterprise applications continue to migrate to the cloud, WAN needs to evolve. The hub-and-spoke WAN architecture that served the needs of the enterprise when applications were delivered from the datacenter must evolve to serve the needs of the era of cloud applications. SD-WAN is the WAN's response to this paradigm shift in application traffic to the cloud. While SD-WAN has emerged as a key enabler of secure and seamless direct cloud application access from the enterprise branch, it has brought into focus the importance of the transport underlay and the technology investment — both past and future — that an enterprise needs to consider before adopting SD-WAN. This IDC paper spotlights two critical success factors for driving mainstream enterprise adoption of SD-WAN:

- Predictable and robust Internet connectivity

- Investment protection (of installed legacy network equipment or new technology) as the WAN evolves to support applications delivered from the cloud

As mission-critical enterprise applications move to the cloud, the demand for deterministic and predictable performance of the Internet underlay is likely to increase close to levels that enterprises have come to expect from their multiprotocol label switching (MPLS) circuits. Furthermore, considering the vast differences amongst enterprises in their respective state of infrastructures and risk tolerance toward adoption of new technologies, they are likely to demand a choice of solutions and deployment approaches as they look to evolve their WAN architectures.

This paper also provides an overview of Tata Communications' IZO WAN family of solutions (IZO SDWAN, IZO Internet WAN, IZO Hybrid WAN and IZO Private Connect), which are designed to offer enterprises a compelling array of WAN architecture deployment choices that protect enterprise technology investment while leveraging predictable and robust transport underlays — MPLS and the Internet.

Apps are Migrating to the Cloud: SD-WAN and Hybrid WAN Have Emerged as a Solution

Cloud usage in all its various forms — SaaS, IaaS and PaaS — continues to rise with more than 90% of survey respondents in an IDC survey on SD-WAN indicating they were planning to use the cloud for enterprise apps in the next 12 months. Importantly, from a networking perspective, the importance of cloud usage as a driver of WAN technology choice is also growing.

IDC's SD-WAN survey suggested "security requirements related to web apps" and "complexity associated with connecting multiple transport types" are the top two WAN challenges in the enterprise (see Figure 1). A solution that enables application and network policy management across multiple transport types (MPLS; broadband Internet and Long-Term Evolution, a high-speed wireless communication standard) and which secures Internet-bound traffic across all transport is a top of mind need for most enterprises. SD-WAN integrated with application security addresses these issues directly.

Figure 1

WAN Challenges

Q. Select the three most important WAN challenges (from the following) that best relate to your company?
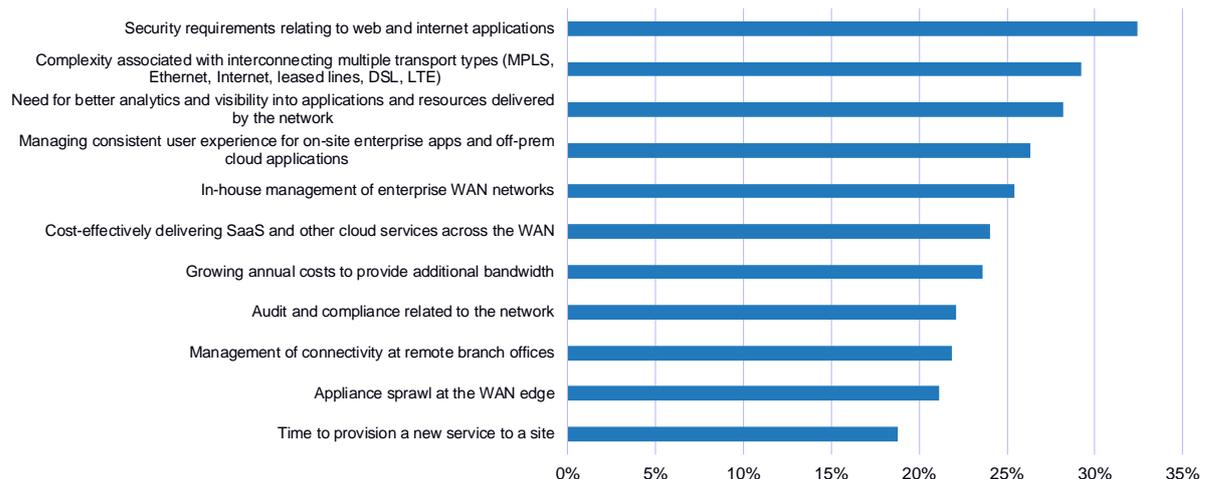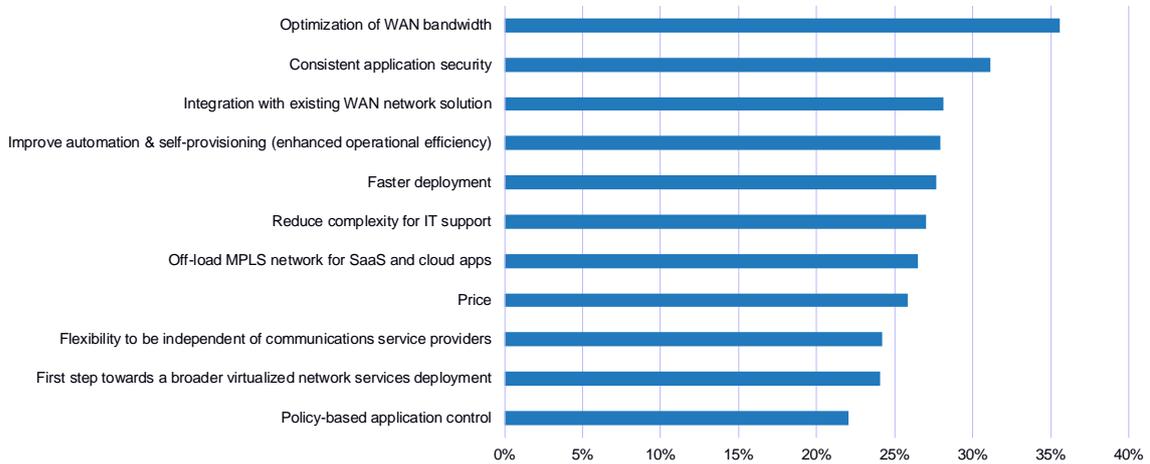

N = 1,208

Source: IDC, 2017

The same survey also revealed that bandwidth efficiency/optimization and consistent application security for all apps (cloud and datacenter) are the top enterprise motivations for SD-WAN deployments. SD-WAN secures direct access to cloud applications over an Internet connection possible for branch users.

The key challenges highlighted in the survey can be addressed by the key capabilities delivered by SD-WAN in terms of aligning the appropriate WAN connectivity option with application traffic destination — MPLS for datacenter-bound traffic and Internet for backup to MPLS and public cloud-bound traffic. Implicit in this survey result is the rising importance of predictable and robust Internet connectivity options, especially as more mission-critical enterprise applications migrate to the cloud and enterprises seek more predictable performance, visibility and control over this traffic. In addition, because of SD-WAN, cloud-bound traffic does not need to be backhauled to the datacenter, which reduces the load on the more expensive MPLS networks and makes the WAN more efficient overall.

WAN Deployment Motivations

Q.   Which of the following are the top three motivations for considering an SD-WAN deployment?

N = 1,208

Source: IDC, 2017

Besides the benefits of optimization of WAN bandwidth (on cost and performance) and improved application security for cloud apps, IDC's 2017 SD-WAN survey also indicates that the agility of IT staff to support business needs is a top perceived benefit of early SD-WAN deployments. IDC believes this is an indicator of the importance of SD-WAN in enabling an enterprise to achieve its DX goals. A solution that enables branch users to access cloud apps efficiently, with an improved user experience and seamless security, accelerates the enterprise's ability to achieve its DX goals.

Making SD-WAN More Appealing to the Enterprise

Despite the promise of SD-WAN, IDC's SD-WAN survey showed that a clear majority of enterprises continue to backhaul Internet traffic from the branch to the datacenter over MPLS before accessing the cloud.

IDC's 2017 SD-WAN survey indicated that only 20% of enterprises were backhauling less than a quarter of their Internet traffic from the branch over an MPLS circuit while 38% were backhauling more than 50% of their branch-originating Internet-bound traffic over an MPLS circuit back to the datacenter (see Figure 3). This data speaks to the potential savings that typical enterprises can unleash by aligning WAN connectivity with the destination of application traffic — thus reducing unnecessary backhaul over expensive MPLS links. It also implies the low rates of SD-WAN penetration in the enterprise.

Branch Internet Traffic Backhaul

Q.   Currently - what percentage of your branch office-originating Internet traffic is backhauled to a primary corporate location/datacenter before being handed off to the Internet?
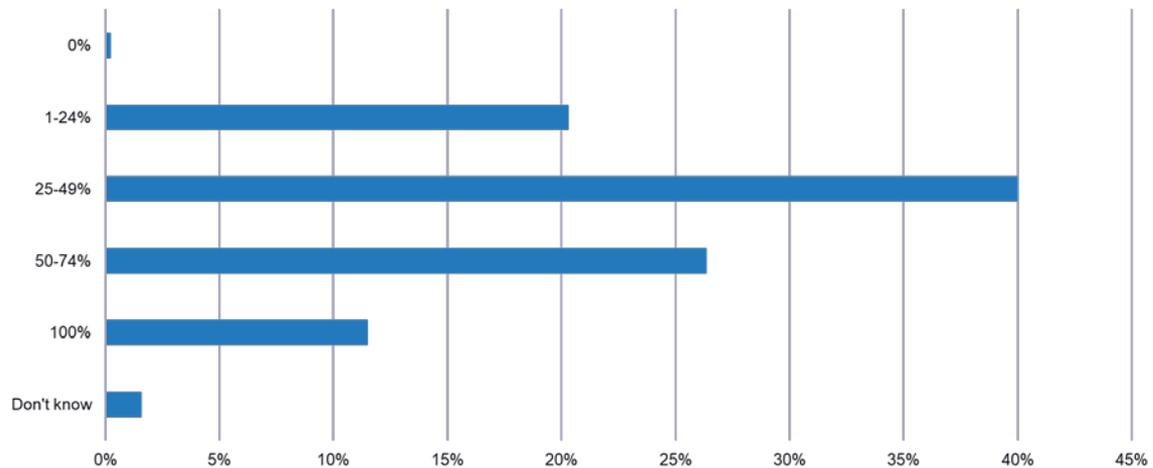
N = 1,208

Source: IDC, 2017

In IDC's view, there are some key concerns that hold enterprises back from embracing SD-WAN more broadly and which keep them from unleashing the benefits of WAN operational efficiency, agility and flexibility.

- **Lack of perceived predictability and application performance over broadband Internet**.
    - MPLS circuits, although expensive and stodgy, have delivered deterministic and secure performance for enterprise applications over the WAN. Enterprise admins expect low latency and high bandwidth performance along with end-to-end packet-level visibility and control of all application traffic. This is usually not the case with Internet which is a "best-efforts" connectivity option for enterprise apps. Traffic can be subject to congestion and inefficient routing at various points on the path to the cloud and the lack of visibility prevents any proactive action from being taken to ensure application performance.
    - This problem is begging for an enterprise-grade Internet underlay solution from a service provider that can provide end-to-end visibility of application traffic as well as predictable latency and bandwidth performance.

- **Significant legacy investment in the form of billions of dollars of edge routers deployed at the branch**.
    - SD-WAN solutions, especially those being offered by the pure-play vendors, often eliminate the need for "purpose-built" routers deployed at enterprise network edges and instead replace them with virtual SD-WAN appliances. This is easier said than done for most enterprises considering the billions of dollars of investment that has been made over the last few years in support of MPLS WANs. Enterprises are unwilling to declare end-of-life on existing network infrastructure just to switch to SD-WAN and in most cases, prefer to repurpose the installed equipment. On the other hand, they remain skeptical of new hardware solutions being proposed, considering they drive WAN traffic over a less deterministic connectivity option such as broadband Internet.
    - Enterprises need several different pathways to reach the end-goal of achieving the efficiency, agility and flexibility that SD-WAN promises. These pathways need to consider existing investment in edge routers, risk tolerance towards adoption of new technology and the enterprises' desired pace for change. In order to address potential

pathways to the promise of SD-WAN, service providers need to offer a choice of deployment options that allow different enterprises to address their respective pain points. Enterprises that have significant legacy investment in edge routers should be provided with the confidence and empowerment to leverage that infrastructure to deploy SD-WAN. Likewise, enterprises willing to invest in modern SD-WAN solutions should have the assurance that they will not only have access to reliable Internet connectivity but also that the risk of adopting technology from a new vendor will be managed, to ensure their new investment has the requisite ROI.

■ **The need for multi-cloud connectivity.**

- Cloud apps, unlike traditional applications delivered from the corporate datacenter, are not hosted in any one location or cloud provider. Most branch users access cloud applications that are hosted in multiple clouds, across cloud providers. The multi-cloud world creates a complex security posture considering the need to connect the branch to apps hosted in multiple cloud destinations. Backhauling traffic to the datacenter and then routing it to various clouds via a centralized cloud gateway can be perceived to be a much more secure solution than potentially trying to connect to multiple clouds from each branch in a distributed enterprise. This perception will be created if the enterprise's service provider does not provide a distributed network of cloud gateways.

- A distributed enterprise with direct Internet access to the cloud from its branches needs a distributed security architecture to secure its cloud application traffic. Service providers with cloud security services like a secure web gateway and virtual unified threat management are well suited to provide this key missing link to enterprises considering secure direct Internet access to the cloud from the branch.

Addressing these issues is critical for driving mainstream adoption of SD-WAN. Communication service providers that possess the requisite technology infrastructure to provide deterministic enterprise-grade broadband Internet connectivity, along with a portfolio of deployment options and a global network of distributed cloud gateways, are in a superior position to address this critical gap in the market. Next, we look at Tata Communications' efforts to address these issues and constraints to accelerate the enterprise's move to the cloud via SD-WAN.

Vendor Profile

Tata Communications is a global provider of telecommunications solutions and services. Beginning as a wholesale service provider focused on India, it has grown to be a large global tier 1 Internet Service Provider (ISP) and telecommunications service provider. Tata Communications' customers include over 2,000 service providers and enterprises in over 200 countries and territories. Its telecommunications network spans the globe and includes more than 500,000km of subsea fibre and more than 210,000km of terrestrial fibre. Tata Communications uses its network to deliver network services and software-defined network platforms, such as private lines, Ethernet, content delivery network, Internet, MPLS and SD-WAN. It has more than 400 Points of Presence (POP) globally with datacenters and colocation in 44 sites.

IZO WAN Portfolio

IZO WAN is a suite of cloud-ready WAN services and ecosystem offered by Tata Communications to address the diverse transformation needs of an enterprise during its digital and cloud journey (see Figure 4). Each of the services in the portfolio comes with enhanced security and 24/7 support. A key element of the portfolio is Tata Communications' global reach, made possible by collaboration with ISPs globally. Its solutions address all types of Internet cloud connectivity requirements that enterprises may have in terms of price, speeds, deployment models, existing infrastructures and security posture.

The key services in the portfolio include the following:

IZO WAN Portfolio Architecture

Source: Tata Communications, 2018

IZO Internet WAN

IZO Internet WAN is Tata Communications' global Internet-based WAN service designed to give enterprises the flexibility and predictability of a private network, along with the global reach of the Internet. Tata Communications sees the robust predictability and end-to-end traffic visibility enabled on its underlay network as a compelling differentiator across its entire IZO portfolio. This is a key underpinning of the IZO Internet WAN service and is a key driver of Tata Communications offering customers Service Level Agreements (SLAs) on performance and security on its Internet WAN service in collaboration with regional ISPs in different parts of the world. The Internet WAN service delivers predictable routing, consistent network performance, end-to-end SLAs and reporting across 121 countries as key features, which are included as part of its enterprise service commitments, while delivering 30% cost savings compared to MPLS networks.

IZO Hybrid WAN

IZO Hybrid WAN integrates Tata Communications' Internet WAN, MPLS and other network technologies to offer enterprises embracing hybrid cloud strategy a compelling one-stop shop for all WAN connectivity needs. It features optional IP-based cloud security with features such as cloud-based antivirus, content filtering, access control, denial of service protection and encryption. IZO Hybrid WAN integrates Internet with Tata Communications' global VPN service to enable a secure end-to-end network service.

IZO Private Connect

IZO Private Connect is Tata Communications' cloud-connect service for enterprise private network (MPLS and Ethernet) customers. Private Connect links to major cloud providers like Amazon Web Services, Microsoft Azure, Office 365, Salesforce, Google, IBM, Alibaba and Oracle. It also allows access from the public Internet to these clouds via interconnect gateways.

IZO SDWAN

IZO SDWAN is Tata Communications' SD-WAN solution delivered as a managed service. While the solution provides the security, dynamic path selection and application policy management that enterprises have come to expect from more reliable service providers' SD-WAN solutions, a key difference in comparison to other service providers' SD-WAN solutions is the investment protection and deployment choice it offers its enterprise customers via two solutions — Prime and Select.

For enterprises with significant edge router deployments which would like a more evolutionary path to SD-WAN deployments, Tata Communications offers the Prime solution which leverages the enterprise's existing edge router. The Prime solution protects an enterprise's investment in its edge routers while leveraging Tata Communications' home-grown SD-WAN management and control

solution delivered from the cloud. For customers willing to take a more revolutionary path towards an SD-WAN deployment which does not involve existing edge routers but leverages a Virtual Network Function architecture hosted on commodity x86 servers, Tata Communications offers SDWAN Select based on technology from Versa Networks. Both types of IZO SDWAN bundle the overlay SD-WAN control and management functions with Tata Communications' underlay networks — MPLS and broadband Internet.

IDC sees among Tata Communications' key differentiators are its alliances with ISPs around the globe and the underlay networks, given the predictable performance and end-to-end traffic visibility afforded by its software and hardware infrastructure. Illustrated in Table 1 below, the predictable performance of the underlay network results in latency and packet loss metrics over Internet WAN that are very close to those of an MPLS private network. Considering the significant price differential between Internet WAN and MPLS, this translates into a very compelling value proposition for global enterprises adopting a hybrid cloud strategy.

Table 1

IZO Internet WAN: Comparison with MPLS

Sample Routes (POP to POP)	IZO Internet WAN		MPLS	
	Round-trip Delay (ms)	Packet Loss	Round-trip Delay (ms)	Packet Loss by Class of Service
Hong Kong < > Singapore	37		32	
Singapore < > London	183		151	
London < > Ashburn	77		77	
London< > Hong Kong	212		182	
London < > Mumbai	121		104	
Mumbai < > Santa Clara	254		204	
Santa Clara < > Sao Paulo	220	<0.3%	177	<0.1%
Sau Paulo < > Miami	130		108	
Sau Paulo < > New York	174		115	
Johannesburg < > London	171		161	
Johannesburg < > Mumbai	211		100	
Stockholm < > Frankfurt	28		28	
Stockholm < > London	38		36	

Source: Tata Communications, 2018

Tata Communications' patent-pending, in-house-developed network overlay technology of IZO SDWAN Prime relies on comprehensive end-to-end network monitoring of application traffic across all remote and hub sites and software-controlled routing leveraging the intelligence and insight obtained from the network flow of data. This real-time network monitoring and dynamic routing capability provides very effective congestion management across the network. The overlay network capabilities combined with the predictable connectivity and performance of the underlay network makes Tata Communications' network particularly well-suited for corporate communications. IDC sees this as a strong differentiator with high barriers to entry for Tata Communications.

Market Challenges

The SD-WAN market — given its attractiveness — is highly competitive. There is a lot of noise about what the technology promises and vendors' capabilities, which are not necessarily healthy for enterprise decision-makers due to the hype and heightened expectations in the short-term. It is a significant challenge both for enterprises to appreciate the true value of the technology and for vendors to communicate their respective features and capabilities that address real-world problems.

For instance, SD-WAN is an overlay technology and does not solve the problems associated with inadequate transport. If an enterprise's transport links do not provide the adequate bandwidth and latency performance necessary for enterprise applications, SD-WAN cannot improve these attributes. It can only optimize applications across the transport links provided to it.

Similarly, while SD-WAN does enable an application with dynamic path prioritization across multiple links, its ability to enable quality of service across a single link is limited. It is important for the enterprise to choose an SD-WAN service provider with the right underlay network infrastructure that can guarantee the adequate latency and bandwidth performance necessary to run mission-critical cloud apps. IDC also believes that SD-WAN is not a solution in search of a problem. The steady adoption of cloud services has rendered the legacy enterprise WAN design untenable, a problem that SD-WAN solves elegantly.

Conclusion

Enterprise apps continue to steadily migrate to the cloud. Considering that the enterprise WAN was designed for apps to be delivered from the datacenter, and for static point-to-point connectivity, there is a clear need for the enterprise WAN to be rearchitected. Direct access based on broadband Internet from the branch to the cloud, given its ubiquity and lower cost, is an obvious solution but, by itself, it is not considered predictable and secure. While the security concern has been addressed by SD-WAN integrating cloud security at various levels, enterprises continue to be skeptical about Internet reliability and predictability.

SD-WAN is also being held back by enterprise concerns that adopting the technology will lay waste to existing investments in edge routing that distributed enterprises have made in the past. Some enterprises are also concerned about committing too early to a new technology vendor in a changing market. Service provider solutions such as Tata Communications IZO WAN suite — which includes IZO Internet WAN (a robust and predictable underlay network for Internet) and IZO SDWAN (that leverages already installed enterprise edge routers with path selection and application visibility) — are solutions worth considering as they address key enterprise WAN concerns and help accelerate mainstream adoption of SD-WAN.