The Role of High Performance WAN in Enterprise Cloud Transformation

FROST & SULLIVAN

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INTRODUCTION

The enterprise wide area networking (WAN) landscape is changing fast. Gone are the days of deploying separate networks for each application—T1/T3 for voice, Frame Relay for data, and ATM for video. IP-based networks have driven convergence of enterprise applications onto a single network, thus reducing multiple network management costs and burden, and improving operational efficiency. Enterprise adoption of IP-based WAN is driven by fast-changing business requirements that include: increasing business agility with the adoption of virtualization and cloud computing; providing distributed employees, suppliers, and customers with anytime, anywhere access to enterprise applications; and planning for the evolving hybrid IT architecture that is increasingly cloud-centric.

While business requirements are changing fast, available IT budgets are declining, thus pressuring enterprise IT to do more with less. Cloud computing significantly reduces enterprise IT costs by shifting the IT spend model from CAPEX to OPEX. Enterprises are increasingly offloading some of their business applications to the cloud—either to public or hosted private cloud Infrastructure as a Service (IaaS)—and/or replacing certain applications with Software as a Service (SaaS) solutions; while keeping mission-critical applications on-premises, leading to a hybrid IT model. A hybrid IT environment can consist of any combination of on-premises data center, colocation, managed hosting, and private or public cloud. The WAN plays a critical role in enterprise transformation toward a cloud-centric IT environment, by connecting the myriad pieces in a secure manner.

In this paper, we discuss the business trends that are driving enterprise IT transformation, the role of WAN services in a cloud-centric IT environment, and how Windstream can help with its high performance WAN solutions.

BUSINESS TRENDS DRIVING ENTERPRISE IT TRANSFORMATION TO A CLOUD CENTRIC ENVIRONMENT

To Address Data Center Challenges

Enterprise IT organizations are struggling to meet new technology needs as IT budgets continue to decline, but data storage and processing requirements continue to grow exponentially. By leveraging cloud computing, businesses can introduce operational efficiencies, improve application availability, and control costs like never before. **More than 50% of the IT decision-makers who responded to Frost & Sullivan's 2017 Cloud survey indicated they currently use cloud Infrastructure as a Service.**

Exhibit 1, below, shows the key data center challenges highlighted in the survey, and how cloud addresses these challenges.

Exhibit 1: How Cloud Computing Addresses Key Data Center Challenges

Data Center Challenge	How Cloud Can Address the Challenge
Capital Budget Constraints	With limited budget to replace old hardware and add new capacity to support growing data volumes and a flood of new applications, IT is increasingly looking to the cloud. Cloud services shift the IT spend from CAPEX to OPEX, giving enterprises the flexibility to pay only for the resources they use, and defer hardware purchases.
Administrative Complexity	In a cloud model, because the cloud provider is responsible for purchasing and installing infrastructure components, the enterprise avoids investment in equipment and labor, instead paying a monthly subscription fee from the operating budget.
Difficulty Scaling Applications	Traditional data center configurations do not easily accommodate scaling. Enterprises have traditionally built their data center infrastructure for peak usage, which means server capacity remains idle for a majority of the time. Cloud infrastructure supports scaling of applications. Capacity is allocated among applications, as needed, on demand.
Aging, Inefficient Servers/ Equipment	In traditional IT departments, 80% of resources (time and budget) go toward maintaining existing systems, and only 20% is invested in exploring new initiatives. With cloud services, infrastructure maintenance is offloaded to the cloud service provider, freeing up in-house resources, which can be devoted to strategic initiatives.

Source: Frost & Sullivan

Need to Reduce Total Cost of Ownership and Improve Operational Efficiency

As enterprises' IT departments work to keep up with growing data compute and storage requirements; provide 24x7 access to employees, partners and suppliers; and roll out new applications, the cost and effort of deploying new data centers can be prohibitive. A hybrid IT environment can help businesses reduce the total cost of ownership by keeping highly mission-critical applications in private data centers, and offloading certain workloads to more cost-effective external cloud environments.

Cloud-based services shift the IT spending model from capital expenditure to operational expenditure, wherein the IT department can deploy IT resources in an on-demand manner, as and when the need arises. The flexibility and agility offered by cloud services further enable enterprises to align (and re-align) IT services with business goals, and track IT costs by the departments requesting the resources. In the Frost & Sullivan 2017 Cloud survey, **58% of survey respondents stated that cloud helps them support business agility and improve market responsiveness.**

Need to Improve Business Agility

The emergence of cloud computing has greatly enhanced the speed with which enterprises can deploy applications, procure IT resources to support distributed employees and partners, and enter new markets

without having to invest in local data centers. In the 2017 Cloud survey, **61% and 69% of the respondents, respectively, cite "improve business agility and flexibility" and "deliver business applications faster" as key business drivers for implementing cloud.**

Need to Accommodate Technology Trends Such as Big Data, Unified Communications and Collaboration

Big data—or, more specifically, the ability to analyze growing volumes of data to derive business insights—has flooded into businesses of every size and industry. Stratecast research indicates that the global market for analytics and business intelligence (BI) solutions is estimated to be $48 billion in 2016; and is forecast to grow at CAGR of 12% through 2019. To support line-of-business demands for business intelligence and analytics data workloads, IT departments are increasingly turning to the cloud.

Exhibit 2 shows the percent of businesses that currently use cloud as their primary environment for Collaboration, Unified Communications, and BI/Analytics.

Exhibit 2: Cloud Deployment Models for Specific Applications
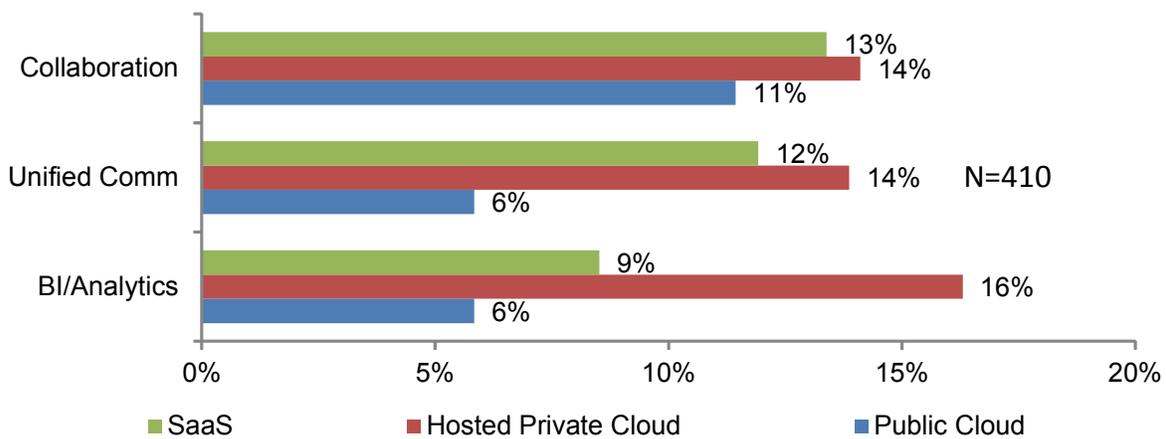
Source: Frost & Sullivan

Primary factors driving user adoption of cloud-based or hosted unified communications and collaboration are the need for faster access to advanced features and capabilities, and the ability to supplement limited in-house IT staff. Despite persistent concerns about control and security when considering cloud solutions, larger distributed organizations are choosing flexible cloud delivery models in order to consolidate and more economically scale their communications infrastructure, and support mobile and remote workers effectively.

ROLE OF HIGH PERFORMANCE WAN SOLUTIONS IN ENTERPRISE CLOUD TRANSFORMATION

As enterprises undertake their cloud transformation journeys, the high-performance WAN takes on several important roles.

Address the Exponential Growth in Enterprise Bandwidth Needs

According to Cisco's virtual networking index (VNI), United States business IP traffic will grow three-fold from 2015 to 2020, at a compound annual growth rate of 21%, to reach 8.3 exabytes per month in 2020—the equivalent of 2 billion DVDs per month, or 3 million DVDs per hour. Seventy-seven percent of the 8.3 exabytes of traffic will come from business Internet (consisting of video, mobile data and fixed Internet traffic), with the remaining 23% coming from IP WAN services in 2020.

IP-based network services, such as multiprotocol label switching virtual private network (MPLS VPN) and Layer 2 Ethernet, support the movement of large amounts of enterprise WAN traffic in a secure and reliable manner. Convergence of enterprise applications, and the need to connect hybrid IT deployments, is contributing to the growing demand for MPLS VPN services. Frost & Sullivan estimates that the market spending on MPLS VPN services will grow from $13.7 billion in 2015 to $21 billion in 2019. Additionally, there is an increased focus on hybrid WAN in the market, with enterprises evaluating MPLS and Internet-based IPsec or SSL VPNs to connect remote company locations.

Hybrid Networking as a Path to Software-defined or SD-WAN

Hybrid networks consisting of MPLS and Internet-based VPNs are common in enterprise WANs. However, the traditional approach still depends on the network service provider to provision and manage every circuit, thus causing provisioning delays and taking network control away from the enterprises. The traditional hybrid WAN approach also adds managed services cost to the already expensive MPLS links. Software-defined WAN, or SD-WAN, aims to simplify hybrid WAN deployments by replacing traditional branch routers with virtualized customer premises equipment (CPE) that abstracts the underlying WAN service. SD-WAN solutions use network overlay mechanisms to aggregate several network circuits—MPLS, Ethernet, Internet, LTE—to choose the most desired link for specific applications, based on pre-set policies. Furthermore, the SD-WAN CPE is a plug and play device that branch office personnel can connect to the WAN links, and have the branch connectivity up and running in a matter of hours.

Frost & Sullivan believes that SD-WAN is the next step in evolution of hybrid WAN, or dynamic WAN; to separate the control plane from the data plane, and remotely control the abstracted underlying network infrastructure. As enterprise IT environments become increasingly hybrid, with a combination of on-prem and cloud-based deployments, SD-WAN provides enterprises the choice to use hybrid networks more efficiently— use public Internet and/or private VPN links, while accessing specific enterprise applications. For example, a branch location can connect to a SaaS application using public Internet, and use private VPNs for video conferencing. The software-controlled architecture enables the WAN to be more agile and flexible, which facilitates enterprises to provision bandwidth, as demanded by cloud-centric applications.

Increasing Need for Application Performance Visibility and Management as Hybrid IT and WAN Environments Emerge

As workloads continue to move outside of the internal data center, and into third-party cloud providers, the need for better visibility and control of enterprise applications is increasing. When enterprises adopt secure connectivity services such as MPLS VPN for mission-critical voice, video, data, and cloud-based applications, they are increasingly asking for the ability to monitor and manage their networks. Through such tools, customers can monitor and manage their network bandwidth and application performance via online portals.

In addition to the ability to view network performance metrics (e.g., latency, jitter, packet loss, availability), customers can also log trouble tickets, check status on requests, and increase or decrease bandwidth capacity in real time. In scenarios where the customer is using a hybrid network—for example, MPLS VPN for headquarters-to-data center connectivity, and IPsec VPN service for headquarters-to-branch office connectivity—the customer portal allows users to prioritize bandwidth for high priority applications, based on pre-defined policies.
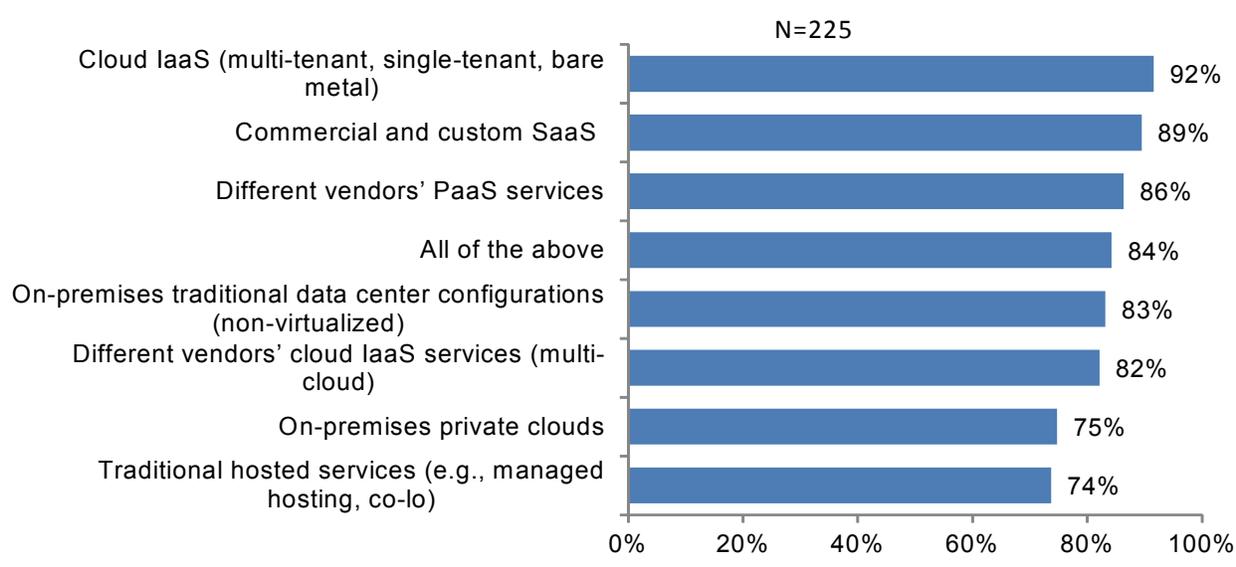
Address Enterprise Concerns Regarding Cloud Adoption

In the 2017 Cloud Survey, 65% of the respondents indicated "unauthorized access to data and applications," and 55% indicated "inability to meet compliance requirements" among top ranked reasons deterring adoption of cloud. Clearly, providers still have a lot of work to do to address security and compliance concerns. Cloud service providers are addressing these concerns by enhancing their services with core or optional security elements. Secure WAN solutions can further enable cloud service providers to take greater liability for data protection through contracts and service level agreements. Alternatively, enterprises can choose secure connectivity to cloud via private networks, to take advantage of the security features already embedded in their WANs; thus minimizing the risks of distributed denial of service (DDoS) or other threats presented in the public Internet.

Fulfill Hybrid Cloud Connectivity Needs

In the 2017 Frost & Sullivan Cloud Survey, 55% of the respondents indicated they currently use hybrid cloud. **A hybrid cloud is defined as, "any combination of cloud, hosting and private data center resources that are managed and controlled as a single pool."** In a hybrid cloud, workloads generally can operate seamlessly across environments; for example, applications may burst across environments, or workload components may be hosted in different environments. Exhibit 3, below, shows the importance of various components in hybrid cloud deployments.

Exhibit 3: Importance of Various Components in Hybrid Cloud Deployments

N=225

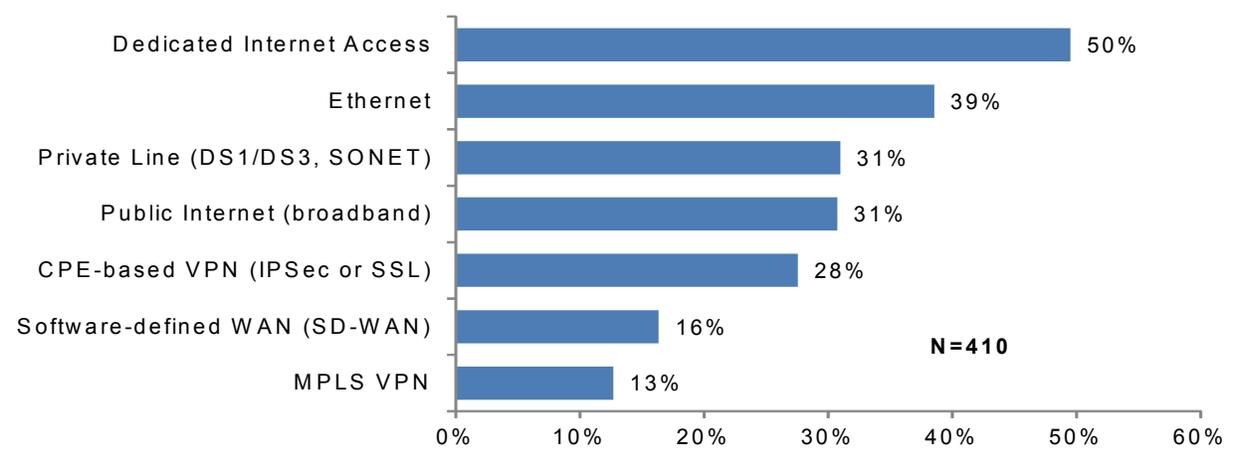| Component	Percentage
Cloud IaaS (multi-tenant, single-tenant, bare metal)	92%
Commercial and custom SaaS	89%
Different vendors' PaaS services	86%
All of the above	84%
On-premises traditional data center configurations (non-virtualized)	83%
Different vendors' cloud IaaS services (multi-cloud)	82%
On-premises private clouds	75%
Traditional hosted services (e.g., managed hosting, co-lo)	74%

Source: Frost & Sullivan

Frost & Sullivan believes that as enterprises increasingly make cloud an integral part of their IT infrastructure, they will place more emphasis on the networks that connect the various pieces of their hybrid IT deployment model.

Private Network Connectivity to Cloud

Several market trends are driving demand for private network connectivity to the cloud, or secure cloud connectivity, with the movement towards a hybrid IT architecture being key among them. Secure cloud connectivity comes integrated with the security and reliability of a private network, such as Layer 2 Carrier Ethernet or MPLS VPNs, and eliminates the security risks of connecting to the cloud over the public Internet.

Exhibit 4 shows the responses of IT decision-makers on how users currently access cloud applications in their organizations.

Exhibit 4: Network Service Used to Access Cloud Applications

Network Service	Percentage
Dedicated Internet Access	50%
Ethernet	39%
Private Line (DS1/DS3, SONET)	31%
Public Internet (broadband)	31%
CPE-based VPN (IPSec or SSL)	28%
Software-defined WAN (SD-WAN)	16%
MPLS VPN	13%

N=410

Source: Frost & Sullivan

While 50% of the respondents indicate they use Dedicated Internet Access, or DIA, to access cloud services, when combined with the other responses, an impressive 83% of the respondents indicated using some type of private network services—Ethernet, Private Line, or MPLS VPN. It is important to note that while only 13% of the respondents chose MPLS VPN, and 39% chose Ethernet, we believe that respondents using Ethernet access to connect to MPLS VPN could have chosen Ethernet, thus resulting in a higher percentage for the service. Nevertheless, the survey results do reflect the adoption trends for private network connectivity to cloud.

Private cloud connectivity services come in several general forms, with escalating degrees of integration.

- **Direct connect** services establish a direct, private link between the enterprise and a specific cloud center, usually via an interconnect center or carrier hotel. AWS DirectConnect is an example of this, as offered by a cloud services provider (CSP). In addition, most network service providers (NSPs) support this type of connectivity.

- **Cloud interconnect services** allow enterprises to designate cloud service providers as nodes on the corporate VPN. Typically, the NSP has already established a connection to cloud service providers. Unlike direct connect, this model is designed for multi-point connectivity, thus enabling the enterprise greater flexibility in connecting to multiple cloud providers from multiple company locations.

- The **cloud exchange**, introduced by Equinix, is related to the direct connect model. The Equinix Cloud Exchange (ECX) enables direct cross-connects between any network or cloud service provider resident at the exchange center.[1]

Being connected to third-party data center service providers such as Equinix offers network service providers (NSPs) an extensive marketplace that includes enterprises, cloud service providers, content providers, and other NSPs. NSPs can drive incremental revenue for themselves by selling connectivity to ECX (i.e., more bandwidth, services, new destinations for traffic termination). Additionally, for NSPs that do not have their own cloud service offerings, ECX provides an opportunity to take advantage of the network connectivity demand for cloud computing.

HOW WINDSTREAM CAN HELP

Future-Proofed Network Capabilities

Windstream's nationwide network assets include 147,000 route miles of fiber and enterprise-class data centers that provide IP coverage across more than 90% of the United States. The company supports a broad range of technologies including Ethernet over Fiber, Fixed Wireless and Copper, TDM, 4G and Broadband (DSL, Cable). With its primary network services focus on SD-WAN, hybrid networks, and MPLS VPNs, Windstream has positioned itself in high growth areas. Frost & Sullivan research also indicates that the attach rate of VoIP/SIP trunking is more than 60% with MPLS VPN services sold by service providers. Windstream's Unified Communications as a Service (UCaaS) and SIP trunking services complement its primary network solutions offering.

To take advantage of the growing trend toward Hybrid WAN deployments, Windstream launched its SD-WAN offering in 2016. The solution consists of a managed premises-based edge device (from partner VeloCloud) and stateful firewall, for optimizing business networks in a cloud-connected world. Considering Windstream's success

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[1] See Stratecast | Frost & Sullivan report, *Equinix Cloud Exchange: Simplified Multi-Cloud Connectivity for a Successful Hybrid Cloud Strategy* (SPIE 2014-23), June 2014.

in selling to verticals, particularly retail with highly distributed locations, their SD-WAN solution offering is timely. As retail stores struggle to meet their ever increasing bandwidth needs, while accommodating new technology trends such as mobile point-of-sale terminals, in-store guest WiFi solutions, digital signage, social media marketing, unified commerce and the Internet of Things (IoT), they are increasingly evaluating different types of hybrid WAN solutions.

Software-Defined Wide Area Network (SD-WAN) Capabilities

To address the application performance visibility and control requirements emerging due to hybrid IT and WAN environments, Windstream has launched its SD-WAN service, which supports the market needs with several key features, including:

- **Application visibility and control** for real-time visibility, to identify and see how applications are performing and consuming bandwidth across the network. Network managers can then use that data to set customized business policies to control and prioritize use by location, application, user and time/ date. The result is that mission-critical and latency-sensitive workloads are given priority over less essential traffic, providing improved performance for both cloud- and premises-based applications, and a better customer and user application experience.

- **Dynamic WAN selection** automatically routes applications to and from a site, over two or more active network connections. By leveraging the power of active-active connectivity, network managers can deliver mission-critical reliability and uptime for always-on applications. They can also set policies to dynamically steer or divert applications, in real time, over the best network route available (broadband, MPLS, IPsec, LTE, etc.) at any given moment—virtually eliminating outages and downtime. To further ensure reliability, Windstream offers a 99.999% SD-WAN service availability service level agreement.

- **Fully managed concierge service option** that includes proactive support from an assigned technical service manager, to help customers get the most out of SD-WAN, and focus their internal resources on other initiatives.

- **Application optimization** continuously monitors and improves the network paths, with forward error correction and jitter buffering, for improved application performance. In the event one or more paths are experiencing issues, this enables better performance for high priority packets and applications.

- **Secure network deployment** provides secure encrypted traffic between branch sites and headquarters or data center locations; and can be deployed as fully meshed, partially meshed, or hub-and- spoke topology. IPsec tunnels are automatically established with end-to-end encryption, to quickly enable dynamic branch-to-branch connections. SD-WAN is also interoperable with cloud services and existing Windstream IPsec and MPLS services.

- **Stateful firewall** is an integrated firewall used to easily deploy and centrally manage security policies, while maintaining the ability to selectively enable edge overrides at locations requiring different security policies.

- **Centralized cloud-based network management application** offers a single interface enabling managers to monitor, analyze, and prioritize applications and bandwidth, set policies, execute adds/ subtracts, and create customized dashboards based on predetermined quality of service scores.

- **Zero-touch provisioning** offers improved operational agility. SD-WAN provides enterprises the

ability to add or augment bandwidth using readily available, low cost broadband IP connections. This speeds up and simplifies the process of adding locations, and improves overall cost efficiency.

- **Suite of tailored industry solutions** that can be easily integrated to amplify the impact of SD-WAN, including cloud-based services for unified communications, security and WiFi; along with professional services to help customers design and optimally size their WAN solutions.

Secure Cloud Connectivity

As enterprises continue to migrate mission-critical workloads to the cloud, there is ever-increasing demand for secure, reliable, dedicated access to these resources. Windstream Cloud Connect meets this demand by providing highly secure, performance-optimized virtual and dedicated private access to third party public and private cloud providers, such as Amazon Web Services, Microsoft Azure, IBM Bluemix, Oracle FastConnect, Salesforce, and Google Cloud. Windstream Cloud Connect leverages the customer's existing Windstream MPLS VPN or Switched Ethernet WAN to provide connectivity to these Cloud Service Providers (CSPs) as if they were simply another end point on the network.

Effective Sales Strategy

Windstream has created separate business units—Enterprise, Carrier, ILEC and CLEC—to better align its sales and marketing efforts with specific customer needs. Each business unit focuses on understanding the customers' business challenges, and tailoring solutions to address their respective customer requirements. This approach helps Windstream's Enterprise business unit sell solutions that include SD-WAN, hybrid WAN, MPLS and IP VPN solutions, unified communications, and network security services.

As enterprises make the transition to a hybrid IT environment, their needs are becoming more complex, requiring a deeper level of support from their service providers. The Enterprise business unit understands this segment's needs in detail, and offers differentiated levels of support, allowing customers to derive more value from their WAN investments.

THE LAST WORD

Cloud computing is transforming the way enterprises buy and consume IT resources. As evident from the Frost & Sullivan Cloud End-User survey responses, and market trends analyzed throughout this paper, the market adoption for various cloud configurations continues to evolve, making way for hybrid IT environments. A hybrid IT environment will only work if the networks connecting the different pieces are reliable and meet application performance requirements. High performance WANs are a prerequisite for smooth and seamless functioning of various elements of a hybrid IT environment; and enterprises are increasingly placing a huge focus on cloud connectivity. Windstream, with its comprehensive suite of network solutions, is well positioned to enable enterprises in their journey to a cloud-centric IT environment.

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