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How to Leverage SD-WAN to Accelerate Time to Market and Revenue

The Importance of Service Assurance

A Technical Paper prepared for SCTE•ISBE by

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Introduction

The agility, simplicity and cloud-friendliness of SD-WAN may seem self-evident, but to win customers over, MSOs also need to convince enterprises accustomed to high reliability that they can meet and exceed those expectations. Five key elements of service assurance in a software-defined environment include automatic discovery of network topology, identification of any loss of availability, SLA management, awareness of business impacts, and automated processes. With sophisticated multi-vendor service assurance tools and turnkey models for entering this market, MSOs have the means to quickly engage and generate real revenue with SD-WAN.

Background

More than a decade ago, the cable industry in the U.S. began to accelerate its venture into business services. In 2007, MSOs were generating between $2 billion to $3 billion in this arena. By 2018, they had grown that to $18 billion. In recent years, the rate of growth has declined to roughly 10 percent. While still respectable, the current growth rate has motivated industry leaders to consider new initiatives, such as targeting more of the enterprise segment and expanding into new verticals.[1]

One promising technology that hits the enterprise segment across multiple verticals and leverages the industry's service delivery infrastructure is SD-WAN. Well-suited to organizations that are embracing digital transformation, using more applications from the cloud and hoping to augment their existing WAN without adding cost and complexity, SD-WAN is poised for growth. IDC estimates that the global SD-WAN infrastructure market will grow at a 30.8 percent CAGR from 2018 to 2023, to reach $5.25 billion.[2]

There are two primary ways to deploy SD-WAN. In North America, according to Gartner, more than 60 percent of deployments have traditionally followed a do-it-yourself (DIY) model; whereas much of the rest of the world prefers a managed services approach.[3] To understand the demand on both sides, let's review SD-WAN components, architecture and service characteristics.

1. SD-WAN's Agility and Speed

The software-defined nature of this technology enables service agility, rapid rollout and instant-on WAN that delivers significant benefits to business customers. SD-WAN simplifies today's increasingly distributed branch networking by automating WAN deployment and improving performance over private connections, internet and wireless links.

Enterprises are open to changing or augmenting their connectivity solutions because of the need for alternatives that better support access to cloud applications, increased bandwidth demands and optimized network performance. Cloud-based applications, for instance, drive enterprises to more heavy reliance on internet connectivity and change traditional traffic patterns from a branch-to-data center to a branch-to-cloud. The legacy network design of traffic flow from branch-to-data center causes inefficiencies that impact cloud applications, while driving up costs and complexities.

From a service provider's perspective, the multi-tenant architecture of an SD-WAN orchestrator can enable easy provisioning of new customers and service management across multiple customers. Each

[1] "US Cable Set to Rake in $18B in Biz Services Revenue in 2018," Jeff Baumgartner, Light Reading, Nov.11, 2018
[2] SD-WAN Infrastructure Forecast, IDC, July 2019
[3] Magic Quadrant for WAN Edge Infrastructure, Gartner, October 2018

business can be given access to its own self-service web portal for monitoring and policy configuration. A CPE or vCPE edge device can be provisioned with zero-touch deployment, which enables a service provider to deploy a new branch's WAN within minutes, as opposed to weeks or longer with legacy solutions.

The branch edge is provisioned either as a VM or customer hardware shipped to the branch office, where a non-technical person can plug in a few cables. Activation, configuration and ongoing management are all handled in the cloud. The edge device efficiently integrates LAN, WAN, Wi-FI and 4G-LTE connectivity, along with other dynamic virtualized functions or business applications, such as next-gen firewall, application performance monitoring or dynamic multipath optimization. (See Figure 1.)

Once enabled, an edge device can automatically detect circuit characteristics, such as bandwidth, latency and more, then build a secure overlay network with SD-WAN gateways across all available links and begin steering applications per the configured policy. While these features and components, including gateways, are not universally available from all providers, they are key to SD-WAN's value proposition.

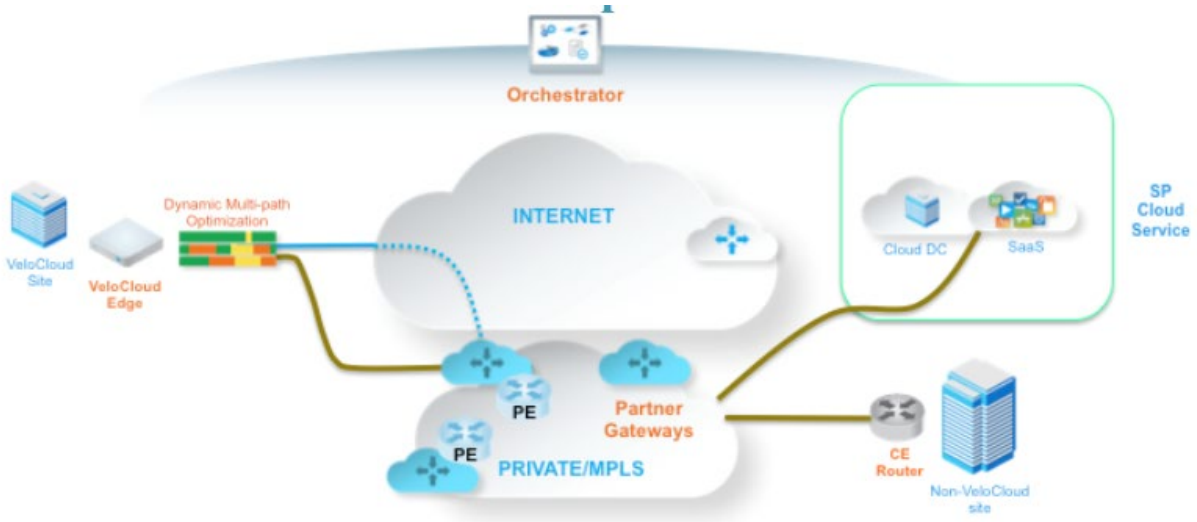

Figure 1 - SD-WAN Service Provider Solution Architecture

2. Defining the SD-WAN Challenge

The number of companies offering SD-WAN technology and services either directly to enterprises and/or through service-provider channels has grown into the multiple dozens, which makes for a busy and fluid marketplace. Exactly what SD-WAN providers and their service provider partners offer has come under scrutiny, and the divergences led the Metro Ethernet Forum (MEF) to propose common terms.

Embodied in the MEF 70 Draft Standard, released in May 2019, are four primary components: 1) edge, whether physical or virtual; 2) controller, which maintains centralized management of edges and gateways; 3) orchestrator, which handles the lifecycle service orchestration (LSO) of SD-WAN and other services – and could incorporate the Controller; and 4) subscriber web portal, enabling subscriber service ordering and modification.[4] The MEF definitions also specify the SD-WAN user interface, the underlay

[4] Draft Standard MEF 70 (R1): SD-WAN Service Attributes and Services, May 24, 2019

connectivity service (UCS), tunnel virtual connections (TVC), visibility into the application layer, control over the application layer extending to dynamic path selection, analytics tools, and more.

In addition to the recent definitions, there are other reasons why the SD-WAN market seems to be a work in progress. One analyst at Light Reading's Future of Cable Business Services event in November 2018 indicated that a lot of enterprises were "just kicking the tires at this point" and that some service providers were "giving it away."[5] While it is true that many enterprises are still getting their heads around SD-WAN and service providers are figuring out how to sell – and in some cases trying to avoid cannibalization of existing network revenues – we can offer further commentary.

As a leading SD-WAN provider in this space with more than 60 service provider agreements, [6] we know that enterprises are doing more than just considering SD-WAN. They are purchasing infrastructure and services, from both technology companies and service providers. One challenge, however, is that to win customers, you also need to convince them that you can assure their service.

3. Five Service Assurance Use Cases

Service providers should aim to go beyond baseline specifications of SD-WAN. Service assurance is one way to do so. Many enterprise IT leaders, for instance, value the high reliability of their existing connectivity, including MPLS. From their perspective, any replacement or addition to it needs to not just maintain but also exceed existing performance.

The right SD-WAN solution can drastically improve overall performance, resiliency and security of hybrid and internet wide area networking. But to many enterprises, the technology is still new. If you're delivering SD-WAN, you should take pains to explain how, whatever the underlying connectivity, it is mature enough to handle any incidents. Important ways to assure SD-WAN service include being able to automatically map network topography, identify a loss of availability, actively manage SLAs, understand how incidents impact business, and automatically identify any issues that arise. Here is more detail on these five use cases, their data sources and likely scenarios:

3.1. Topology Discovery

It is hard to manage what is out of sight, and what service providers need first and foremost is some means of dynamically discovering SD-WAN devices, gateways, networks, tunnels, customers/tenants, services and how they interact. The data for building these maps come from the orchestrator, the cloud-computing virtualization platform, the IP/MPLS fabric, configurations and profiles. (See Figure 2.) Invoking this function would involve the capability of discovering:

- Devices – The SD-WAN edge, gateway and hub devices at the customer premise, along with redundancy for both physical and virtual edges.
- Connectivity – All overlay (tunnels) to underlay from the edge device over LTE/3G, MPLS, DIA and termination to gateways, orchestrator and other edges, hubs (edges), and cloud services.
- Services – LAN-side and Cloud SaaS services profiled at the customer/branch SD-WAN edge.
- Customers – Identity of customer to device edge and infrastructure mapping, for both physical and virtual via integration with the orchestrator.

[5] "Vertical Systems: SD-WAN Not Profitable Yet," Light Reading, Nov 29, 2018
[6] Magic Quadrant, Gartner, ibid.

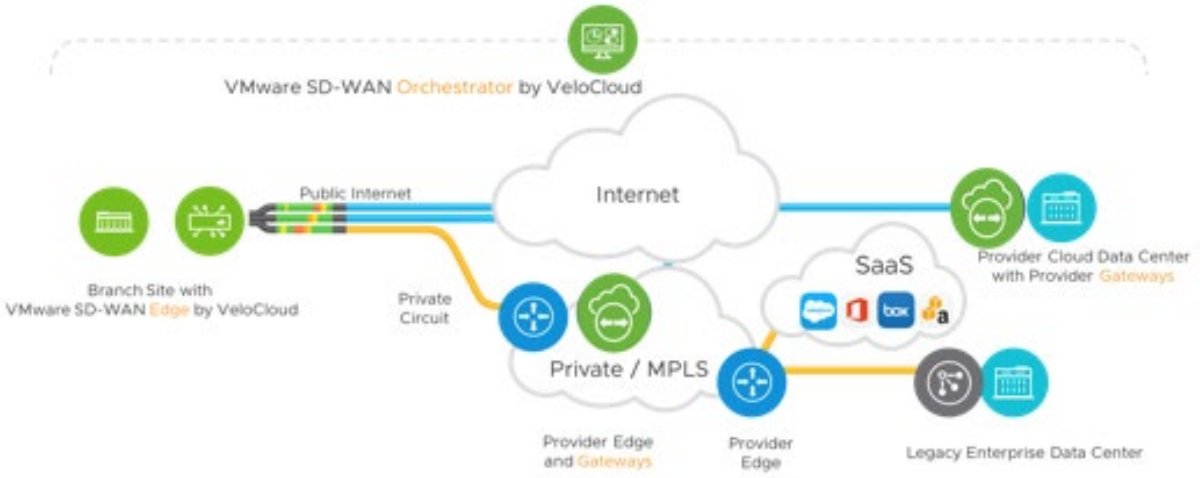

Figure 2 - Topological Mapping of SD-WAN Deployment

3.2. Availability

Just-in-time root cause analysis can help identify any loss of availability that could impact and/or degrade service. As with automatic topology discovery, the sources for discovering any impact on uptime include fault data from the orchestrator, cloud-computing virtualization platform, IP/MPLS fabric, as well as any wireless infrastructure. (See Figure 3.) The scenarios related to availability could involve:

- RCA – Symptom and signature-based RCA is used to isolate issues from a multi-domain service delivery stack.
- Edge Down – The reasons could include downing of box, power, primary gateway, underlay, links or VM.
- Link or Tunnel Down – Reason could include downing of underlay MPLS or ISP, edge-side adapter, or provider side adapter.
- Link Down, 3rd Party – Symptoms would require service provider visibility of WAN equipment and faults.
- HA Impacted – High-availability of redundantly configured edge devices and gateways could be impacted by downing of HA link, one of the edge devices, one of the edge VMs, one WAN link or one tunnel.

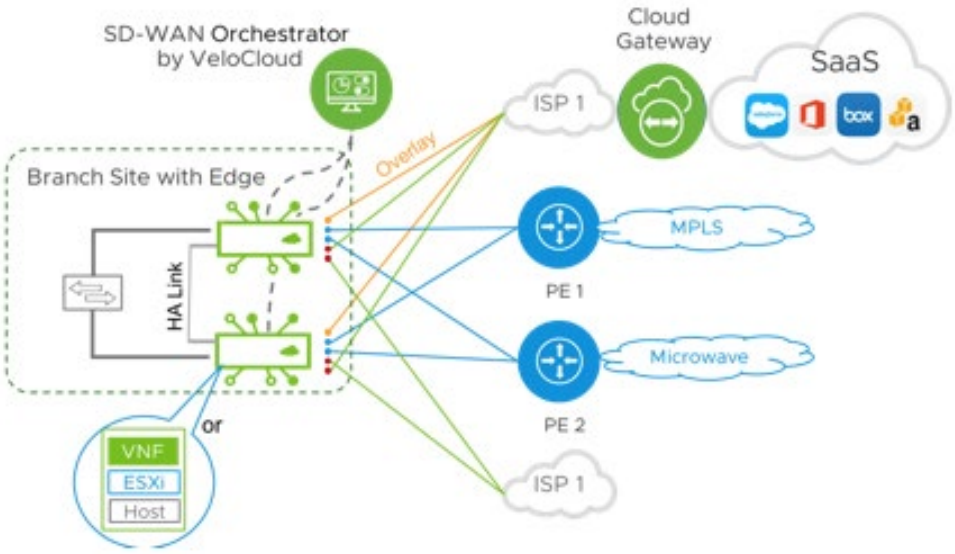

Figure 3 - SD-WAN Branch Site with High Availability Link

3.3. SLA Management

Each SD-WAN branch site has its own profile with unique services to assure. (See Figure 4.) The goal and sources with SLA management would be largely the same as with availability. The scenarios, however, are different and would include:

- SLA Violations – Reporting on SLA violations involving metrics such as customer type, throughput, downtime, number of faults by severity; and using CRM integrations and business parameters.
- Poor Availability Edges – Reporting and ranking of edge sites based on availability, criticality of downtime, maintenance downtime, and cost ratio as a function of overall weighted value.
- Prioritization – Reduction of penalty violation costs by prioritizing customer revenue value; assigning cost weights to services and infrastructure and prioritization of remediation based on higher-risk customers.

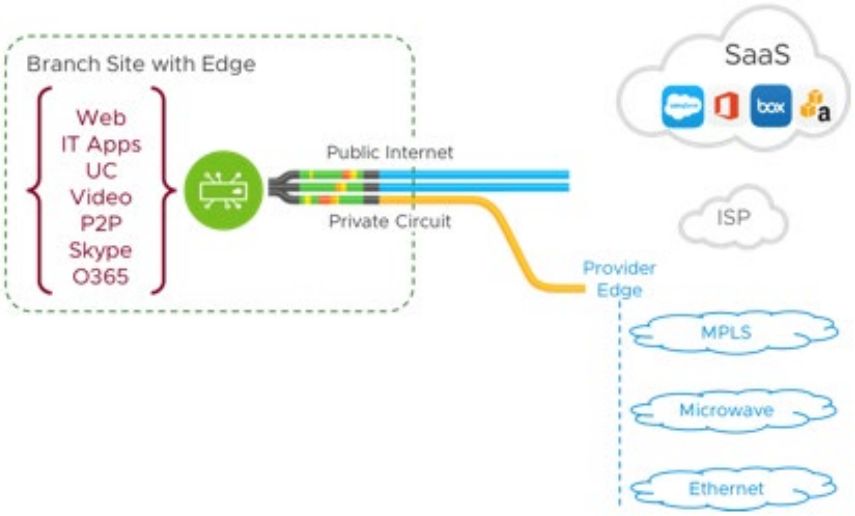

Figure 4 - SD-WAN Branch Site with SLA-Driven Services

3.4. Business Impact

The goal here is to understand the business integrity of the services offered to customers and any potential impact to revenue. Sources for making these assessments come from the orchestrator's fault data, trouble tickets, cost tables, and profiles of customer and edge device. (See Figure 5.) Ascertaining the impact would involve:

- Prioritization – In a multi-tenant environment with a mix of customer SLAs, the takeaway is to prioritize the remediation of impacted services.
- Most Impacted Customers – Identify the most impacted edges and customers to understand the operational integrity and reliability of infrastructure and services.
- Lost Revenue – Report on the business impact of customer and services based on standard penalty schedules, outages and severity.
- Repair prioritization – Prioritize network repairs and optimization based on impacted customers and their net value.
- Edge Device Profiling – Profile the edge devices to understand their reliability and serviceability based upon various parameters.

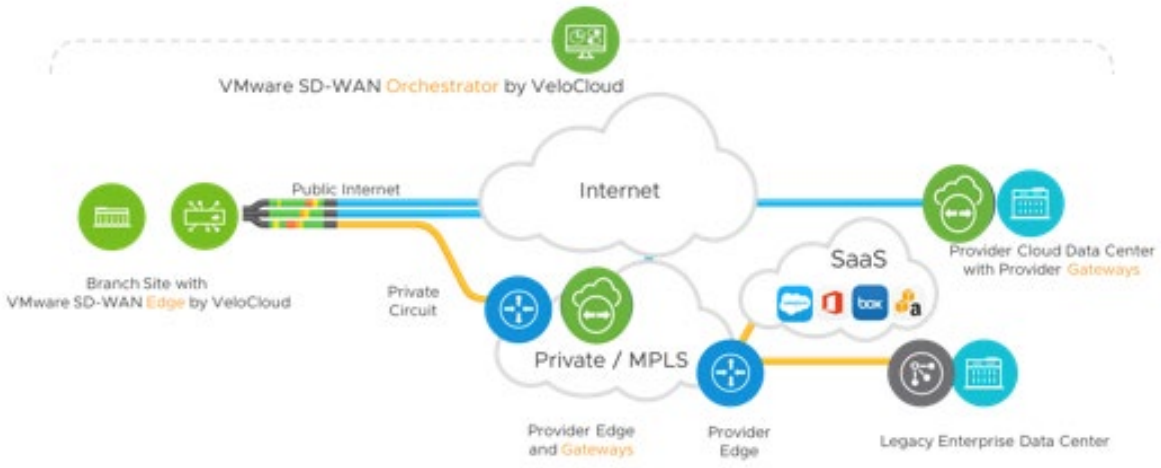

Figure 5 - SD-WAN Branch Site, Network and Services

3.5. Automation

The premise of this last use case is that the timely identification of issues, when integrated within an automated and self-optimized workflow, is crucial for maintaining SLAs and performance QoS. Sources include root-cause intelligence, policies and intent. (See Figure 6.) The scenarios involving this functionality include:

- FM alerts – RCA for fault management events are cross-correlated across application, virtual, physical, LAN and WAN transports. Alerts from the RCA signatures can be used to automate the remediation of availability issues.
- VNF Notification – Notify the VNF manager for a soft Edge deployment to carry out typical LCM remediations such as healing, scale out and scale in.
- Trouble Ticket – Integrate with an ITSM system to open trouble tickets as an automatic or manual trigger.

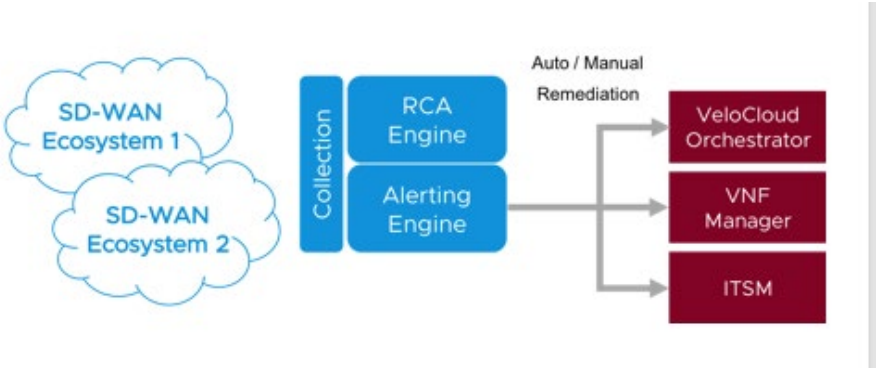

Figure 6 - SD-WAN Automated Alerting

4. Two Practical Examples

How does these functionalities play out in practice? Two examples, which illustrate the application of service assurance, involve triaging managed services and conducting RCA across an entire network.

4.1. Managed Services Outage

Let's say you're managing a plethora of vendor devices and multi-vendor SD-WANs with multiple management tools. Branch site of tenant 1 is down, and branch site of tenant 2 is down. Which branch and service do you prioritize? What is the case of the outage? What applications are associated with it?

An optimal service assurance model would correlate the edge to authorized services and applications; and tenants to devices, virtual tunnels and services. Then assign an impact and cost score to each app/service/tenant. Finally, determine a root cause, such as a router misconfiguration, identify which customer is running which service and correlate the business impact.

The result would be an impact score that flags priority, based on tenant, applications, service and costs. Alerts are revised automatically in SA notifications, while suppressing extraneous alarms. The system would automatically trigger of trouble ticket via API integration with your ITSM. The upshot is to decide on tenant 2 and prioritize based on SLA and associated costs.

4.2. Cross Network RCA

In this challenge, five branches connected via SD-WAN cannot access the company database. There are multiple management tools for different services and devices. What is the cause of the outage? Switch, router, SD-WAN edge, hub or gateway, server, configuration, or application?

The optimal case is to discover and monitor complete network topology and relationships. Automated RCA pinpoints problem as a hub between five branch sites and downed data center, identifies the application/service associated with edge devices, and automatically triggers alerts. The resulting impact score in this case flags priority (based on application/service and/or VIP status) and results in a faster resolution for priority sites, improved MTTI/MTTR for faster resolution, and lower OpEx.

5. How to Become an SDN Provider

As the SD-WAN market matures, the need for comprehensive service assurance is becoming more clear. On the one hand is a very large number of SD-WAN solutions; on the other is interest from enterprise IT leaders in their capabilities, but strong attachment to certain aspects of legacy connectivity, such as reliability. Fortunately, service assurance tools supporting integrated monitoring of SD-WAN solutions exist and can lay the foundation for multi-vendor SD-WAN management.

MSOs who have already begun delivering SD-WAN should review their service assurance operations and capabilities. For those who have not, we recommend keeping these concerns in mind but launching SD-WAN with all deliberate haste. There are three basic models for doing so: over the top (OTT), hybrid and fully managed. The fastest is the OTT approach. In this scenario, the entire SD-WAN service is hosted by your technology provider, including physical and virtual appliances and support, employing either CapEx or OpEx models. The benefits to this approach include:

- Fast time to market to establish market presence and leadership
- Quick deployment with customers and prospective customer

- Immediate revenue stream
- Proactive enablement of technical, sales, and marketing teams proper to a full deployment

In hybrid scenario, you manage some of the infrastructure, such as gateways and edge devices, while your technology provider handles the more encompassing network orchestrator. The advantage is that the network is managed until all team members are fully trained and able to manage the system independently, thereby simplifying the transition to full integration.

In this full scenario, you assume management of all components, including support. The full-service integration allows you to truly differentiate your capabilities and layer in other services. As with some enterprise customers, service providers with certain size and capabilities might try the DIY equivalent and go the fully managed route. But for the rest, and for those looking for quick go-to-market strategies, the turnkey approach makes most sense.

Conclusion

The strong interest in SD-WAN indicates an ongoing shift in thinking about enterprise connectivity. Gartner estimates, for instance, that by 2023, more than 90 percent of WAN edge infrastructure refresh initiatives will be based on vCPE platforms or SD-WAN software/appliances rather than traditional routers, which is a more than two-fold increase from today.[7]

It makes sense on multiple levels for MSOs to enter this market. For those who haven't, the turnkey OTT approach affords the quickest entry strategy. But SD-WAN, for all of the agility and efficiency that it can deliver to enterprises, will not necessarily sell itself. To avoid giving it away or turning it into a loss-leader for the additional sale of broadband connectivity, MSOs should aim high. Deploying SD-WAN along with rich service assurance functionality can help settle any doubts about reliability and protect the tremendous value that it can deliver.

[7] Magic Quandrant, ibid.

Abbreviations

API	application programming inteface
CAGR	compound annual growth rate
CapEx	capital expenditure
CPE	customer premises equipment
DIA	dedicated internet access
DIY	do it yourself
HA	high availability
ISP	internet service provider
ITSM	IT service management
LAN	local area network
LCM	lifecycle managment
LSO	lifecycle service orchestration
LTE	long-term evolution
MEF	Metro Ethernet Forum
MPLS	multi-protocol label switching
MSO	multiple systems operator
MTTI	mean time to identify
MTTR	mean time to resolve
OpEx	operating expenditure
QoS	quality of service
SA	service assurance
SD-WAN	software-defined wide area networking
SLA	service level agreement
TVC	tunnel virtual connections
UCS	underlay connectivity service
vCPE	virtual customer premises equipment
VM	virtual machine
VNF	virtual network function
WAN	wide area network

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