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Transforming the Network Edge With VMware SD-WAN

Edge computing continues to grow in relevance across the technology world. The Internet of things (IoT) finally reaching critical mass is another reason for the increasing importance of the network edge. With 5G networking and its lower latency expanding across the globe, expect the optimized network edge to become a critical competitive differentiator between businesses. In short, organizations not focusing on their network edge infrastructure are likely to be left behind.

Thankfully, new networking innovations like software-defined wide area network (SD-WAN) help companies truly transform their entire networking infrastructure, including at the edge. The innovative VMware SD-WAN™ by VeloCloud® helps companies optimize their network while improving performance and increasing security. Cloud applications become faster with the organization improving its operational efficiency as a result.

Additionally, security is critical for a lot of organizations these days. SD-WAN plays a vital role in securing your data at the edge. The seamless migration and deployment of an SD-WAN infrastructure helps companies easily migrate to their new networking platform. Zero touch provisioning (ZTP) gives these businesses the operational flexibility they need. SD-WAN also helps companies on their journey to the cloud. Whether first considering a cloud approach or already embracing multi-cloud, VMware SD-WAN fits perfectly within this architectural scope.

This eBook will cover the challenges and limitations of wide area networks (WAN) today, the role SD-WAN plays in optimizing your mission critical traffic, and an overview of VMware SD-WAN and our infrastructure.

Traditional WAN Challenges—Expensive, Complex, and Inefficient

Companies currently suffer from a variety of problems caused by their outdated WAN infrastructure. They include the following:

- Expensive and inflexible private lines and Multiprotocol Label Switching (MPLS) circuits
- Slow deployment times causing networking bottlenecks
- Problems with efficiently connecting to the cloud
- Poor application performance hampering employee productivity

These bottlenecks essentially siphon the productivity of the entire organization. Network engineers found installing network upgrades or integrating branch sites suffered from a slow and costly process. Note these remote network installations are typically conducted on-site with the associated travel costs.

In addition to travel expenses, traditional networking equipment comes with significant capital expenditures. All the operational costs, especially hardware maintenance and upkeep, also interfere with any company's profitability. In the end, the traditional WAN is outdated, obsolete, and expensive.

Thankfully, any difficult network deployments and those other notable pain points are easily addressed by using an SD-WAN approach.

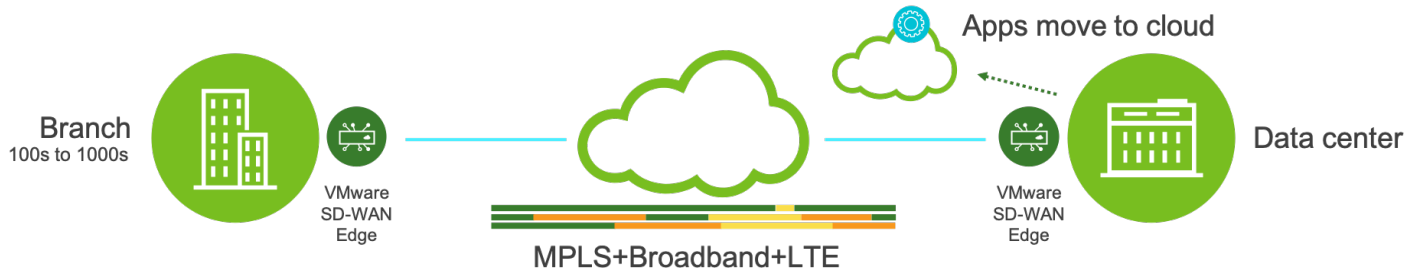
VMware SD-WAN Network Benefits

Simply placing a software layer on top of a network offers a business many tangible benefits. This is definitely the case with VMware SD-WAN. These advantages include:

- Seamless access to multiple network transport layers with significant cost savings
- Easy deployment that doesn't impact existing network traffic
- Simple and scalable cloud access
- Assured application performance and optimized traffic over transport layers

In essence, this transformation of the network edge occurs at a company's data center as well as all branch sites. Deploying to new branches is also a simple process using VMware's ZTP, which allows network administrators to activate a branch site by merely clicking a link.

A business following this networking approach is also able to take full advantage of cloud-based applications delivered using the software as a service (SaaS) model, such as Salesforce, Office 365, and more. Employees become more productive with access to their work over the cloud on a 24/7 basis. Performance is enhanced by our innovative Dynamic Multipath Optimization™ (DMPO), which optimizes traffic over multiple network transport layers.



VMware SD-WAN Solution Components

The VMware SD-WAN platform includes three major components that adhere to true software-defined networking (SDN) principles.

VMware SD-WAN Edge

The **VMware SD-WAN Edge** gets installed at branch sites, in the cloud, or even a centralized data center. It includes the following features:

- Available as either a virtual or physical device.
- Hardware is currently manufactured by VMware, with Dell also offering devices in the future.
- Deployment flexibility includes hardware, a VMware SD-WAN Edge using the cloud or white box, or even a virtualized network function (VNF).
- We provide a full line of VMware SD-WAN Edge devices meeting a variety of needs for both size and network bandwidth.

VMware SD-WAN Gateway

The **VMware SD-WAN Gateway** component serves to onboard external traffic to the VMware SD-WAN infrastructure. Its feature set includes the following:

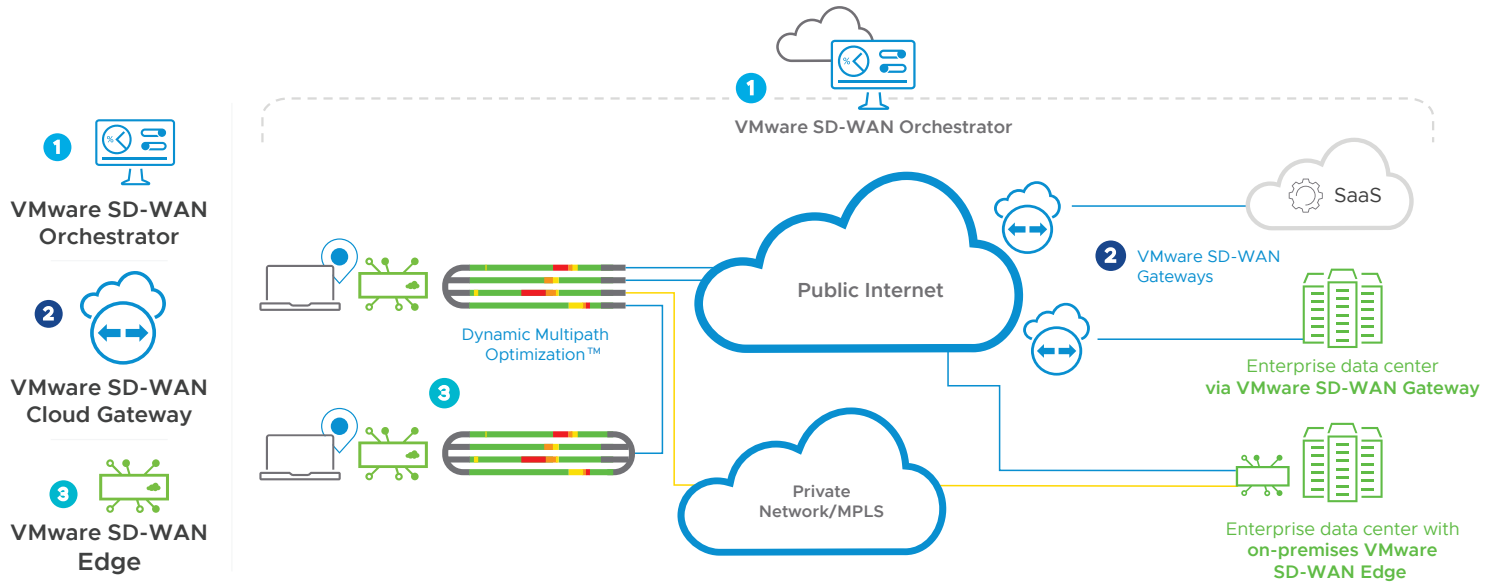
- Serves as an on-ramp for both cloud-based SaaS and infrastructure as a service (IaaS) traffic.
- A multitenant component managed by VMware and/or service providers.
- Optimizes traffic from a data center or VMware SD-WAN Edges to the cloud, including providers like Azure, Amazon Web Services (AWS), Salesforce, and more.
- Available in strategic locales all over the world at top-tier network points of presence (PoPs).

VMware SD-WAN Orchestrator

The **VMware SD-WAN Orchestrator** serves as the management hub for this modern network architecture. Its functionality includes the following:

- A multitenant cloud-based network management, monitoring, and configuration portal.
- Managed either on-site at a data center, or by using a cloud-based service from VMware or a service provider.
- Allows management of VMware SD-WAN Edge devices using a simple web-based graphical user interface (GUI) from a single portal.
- REST API-based, including business policy abstraction, which enhances integration with other third-party applications.
- Enables the zero touch deployment and applications that are the hallmark of our VMware SD-WAN platform.

VMware SD-WAN Solution Components in Action



This diagram illustrates the three solution components as part of the entire network architecture. The branch sites leverage DMPO for redundancy and resilience. They are routed through the public internet or the private lines connecting back to the data center. Any cloud services use the VMware SD-WAN Gateway for optimized network access to SaaS providers. At the very top resides the VMware SD-WAN Orchestrator, which manages all the branch sites, including monitoring, functionality, and configuration.

Note that gateways are not mandatory. The primary reason for the VMware SD-WAN Gateway is providing an on-ramp to the cloud. The two mandatory components of the VMware SD-WAN solution are the VMware SD-WAN Edge and the VMware SD-WAN Orchestrator. With many organizations using cloud services, they tend to buy the VMware SD-WAN Gateway as well. But for banking or financial institutions or any company not using any cloud services, the VMware SD-WAN Gateway is not a required component.

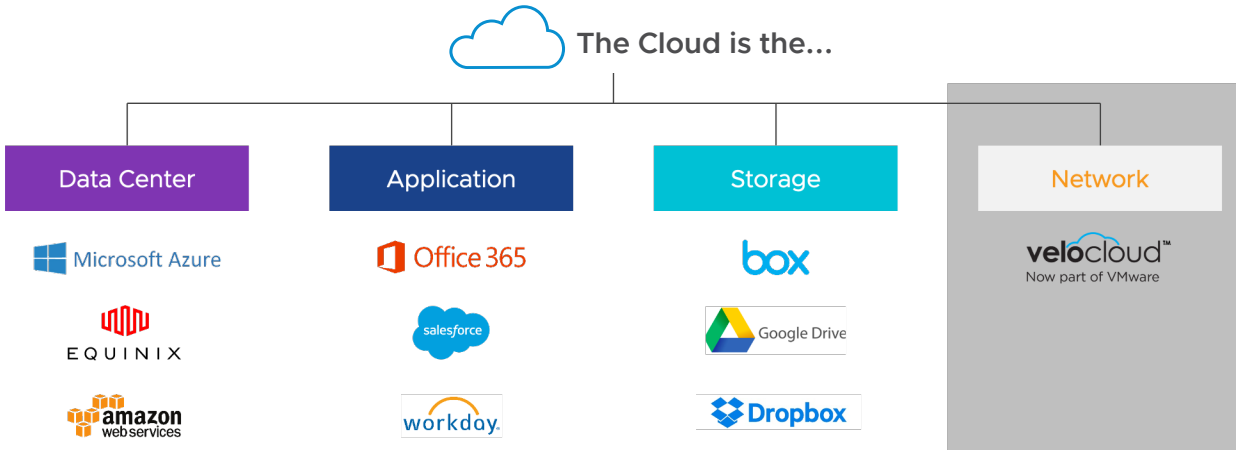
The VMware SD-WAN solution components work together seamlessly to provide businesses with the state-of-the-art network operations that are the calling card of the VMware SD-WAN approach. Their flexibility and interoperability allow them to be used in different ways to handle a variety of networking use cases. This design approach is a major reason why VMware SD-WAN remains an industry leader.

A Cloud Delivered Network for Today's Cloud Era

Advancements in cloud technology effectively allow organizations to host their data center in the cloud if need be. Cloud providers like Microsoft Azure, AWS, and Equinix enable companies to easily embrace the IaaS and SaaS business models. The advantages of this approach are numerous.

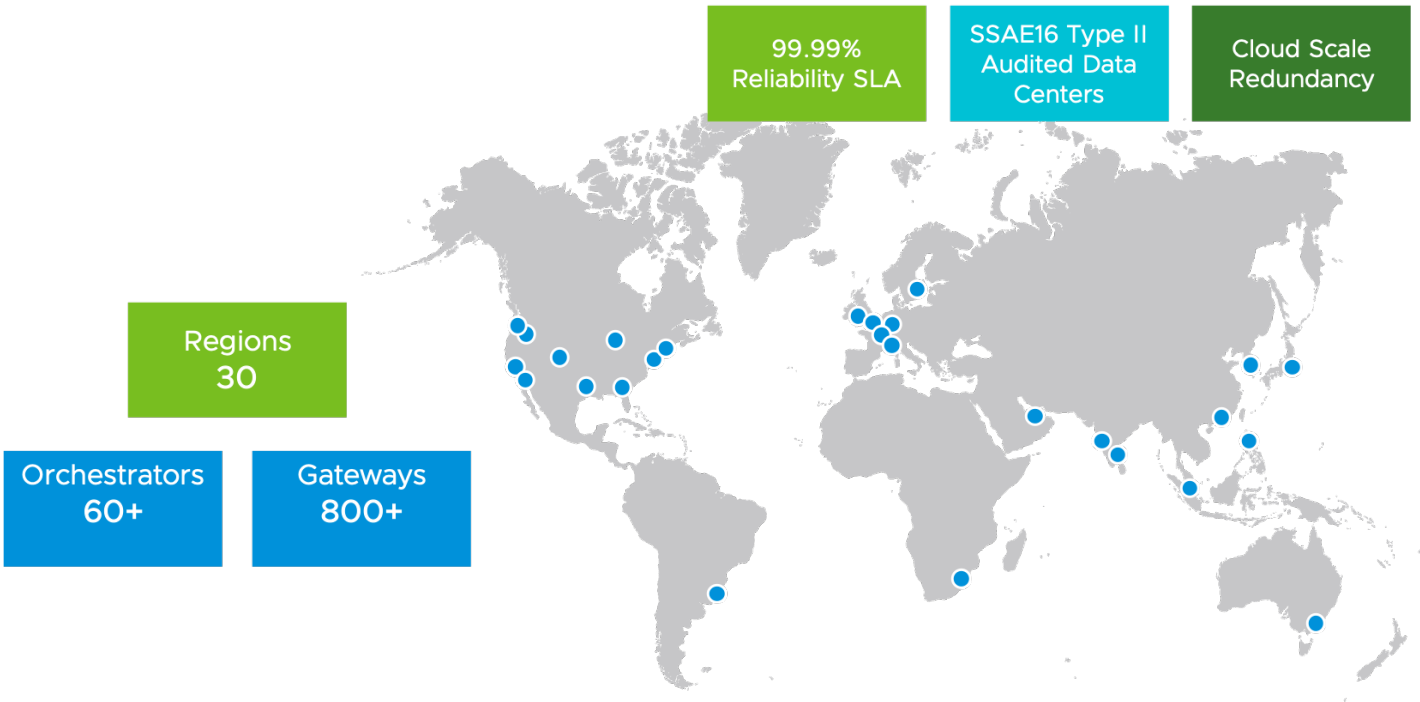
Additionally, storage providers, including Dropbox and others, provide similar cloud-based solutions for storage. Of course, significant business applications like Office 365 and Salesforce also rely on the cloud to the benefit of companies of all sizes. It's an IT approach providing significant cost savings and organizational flexibility.

With all these parts of a traditional IT structure moving to the cloud, it stands to reason that networking itself would also become a cloud-based service. In this environment, adopting a best-of-breed SD-WAN platform like VMware SD-WAN becomes essential. The VMware SD-WAN Orchestrator component is a perfect example of companies leveraging the cloud and SD-WAN for optimized management and monitoring of their network infrastructure.



VMware SD-WAN Cloud Infrastructure

The current cloud infrastructure of VMware SD-WAN continues to expand to support additional worldwide traffic. While the solution started in the United States, it is now growing internationally and implementing more components of the solution across the globe. VMware currently has installed over 800 VMware SD-WAN Gateways and over 60 VMware SD-WAN Orchestrators all over the world. Regardless of where your company is located, VMware SD-WAN has you covered, as evidenced by the 99.99 percent service level agreement (SLA).



Optimizing Your Mission Critical Traffic with DMPO

VMware SD-WAN DMPO is a key innovative capability within our VMware SD-WAN platform that provides a significant boost to network and application performance. It's a core technology within our SDN strategy. Here is a deeper look at how DMPO is a true gamechanger for the VMware SD-WAN platform.

Deep application recognition feature helps the VMware SD-WAN detect what critical applications need optimized performance at each VMware SD-WAN Edge in the network. For example, this allows important application traffic to receive preferred routing over YouTube or Netflix data.

Secure overlay helps manage all different transport layer types, including broadband, LTE, or even legacy MPLS circuits.

Link qualification provides a boost to the entire network by quickly vetting each link for quality.

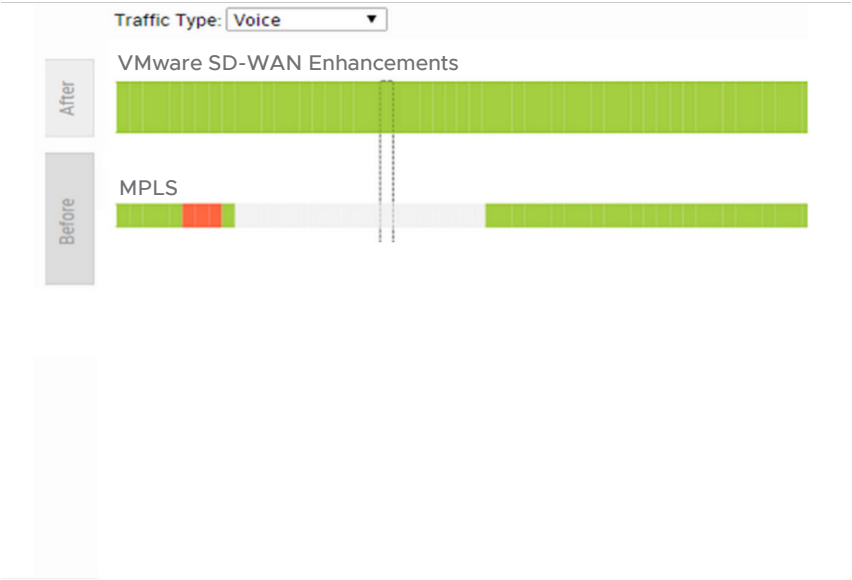
Application-based steering works with the deep application recognition feature to optimize traffic based on criticality.

On-demand link remediation monitors each link for network jitter and packet loss, ultimately helping to improve the overall quality of network traffic.

VMware SD-WAN DMPO—Measure, Steer, Remediate

Looking more closely, DMPO offers assured application performance over any type of link. It continuously monitors each link for latency, jitter, and packet loss. This monitoring allows VMware SD-WAN to automate and optimize each link's performance on the network. Dynamic per packet steering ensures critical network traffic never suffers from a bottleneck.

For example, consider a scenario with an MPLS link and a broadband link. If the MPLS link is experiencing jitter on a per packet basis, we are able to steer it seamlessly without dropping the session. It's that simple.



Continuous Link Monitoring

- Drives automation and optimization

Dynamic Per Packet Steering

- Sub-second steering without session drops
- Aggregated bandwidth for single flows

On-demand Remediation

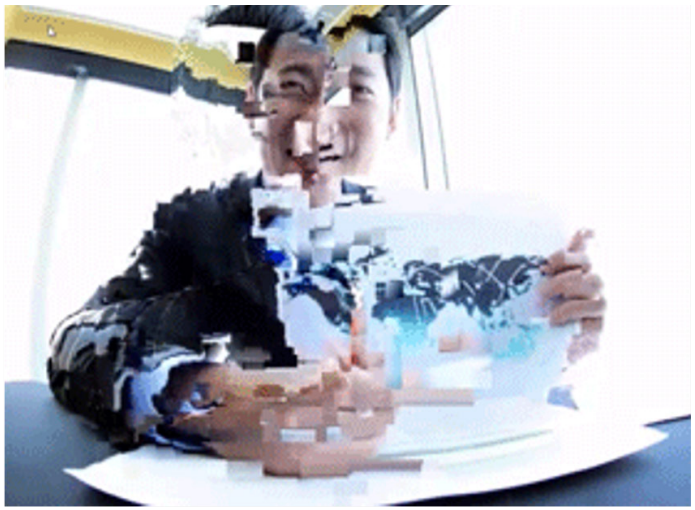
- Protects against concurrent degradation
- Enables single link performance

Maintaining QoE Over Degraded Link Conditions

The VMware SD-WAN platform also automatically remediates poor links with forward error correction (FEC) or other techniques as needed. This is the true essence of DMPO. Let's look at another example.

Consider a video stream over degraded link conditions while comparing SD-WAN versus older networking technology. On the left-hand side, we have a legacy router transmitting a web-based video stream with two percent packet loss. When employing the VMware SD-WAN platform, expect a much clearer picture and video feed. This real life example illustrates one of the more tangible benefits of VMware SD-WAN, especially with a use case as ubiquitous as streaming video.

Video conference over dual WAN link with 2% packet loss



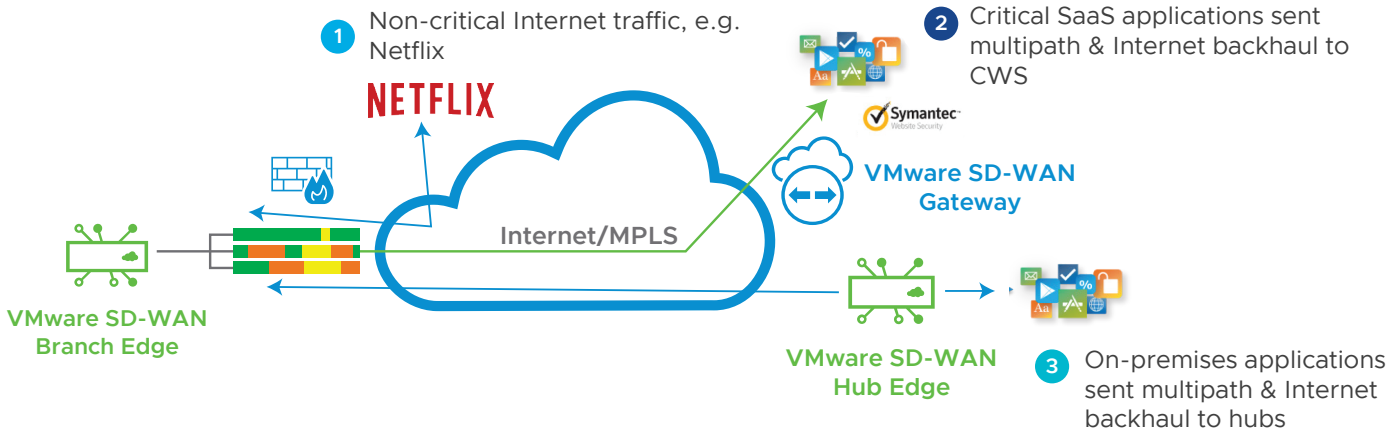
Legacy Router

VMware SD-WAN

Application Aware Traffic Redirection

As noted earlier, DMPO also redirects traffic as necessary based on the application itself. Typically, this traffic is routed in three directions. Noncritical traffic, like Netflix, gets routed directly. Critical traffic, like a SaaS application, is routed to the VMware SD-WAN Gateway. Finally, on-premises applications and traffic can be routed back to the VMware SD-WAN Edge and then to the data center where all applications and data are stored.

DMPO helps make VMware SD-WAN's assured application performance capability a reality. It continually monitors links and is able to dynamically route packets and perform on-demand remediation based on network conditions. In the end, VMware SD-WAN maintains quality of experience (QoE) even in the degraded link conditions typical of many legacy networks.



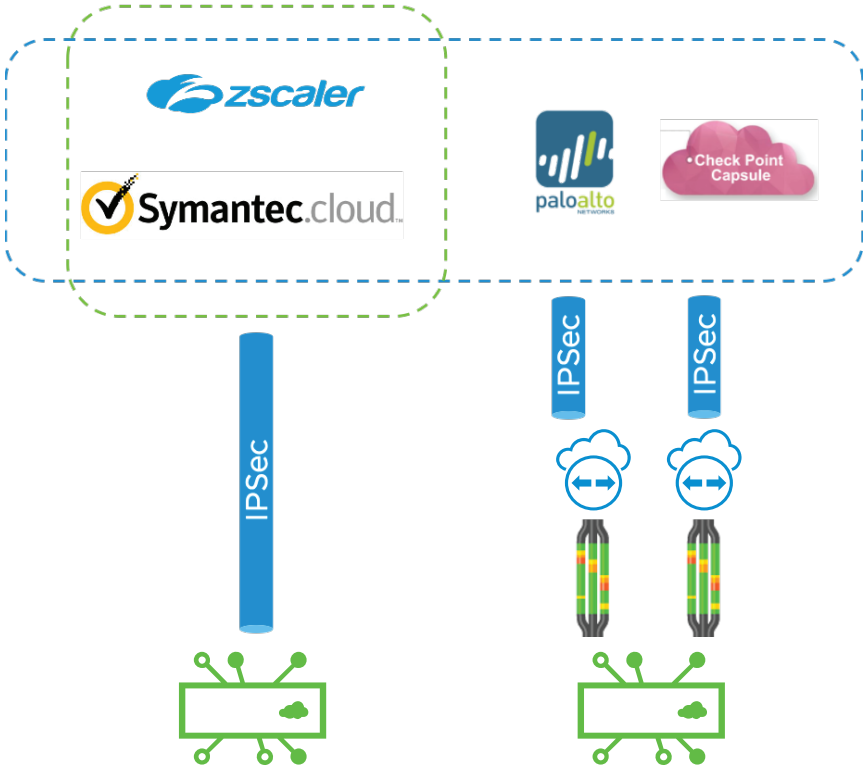
Security Architecture Support

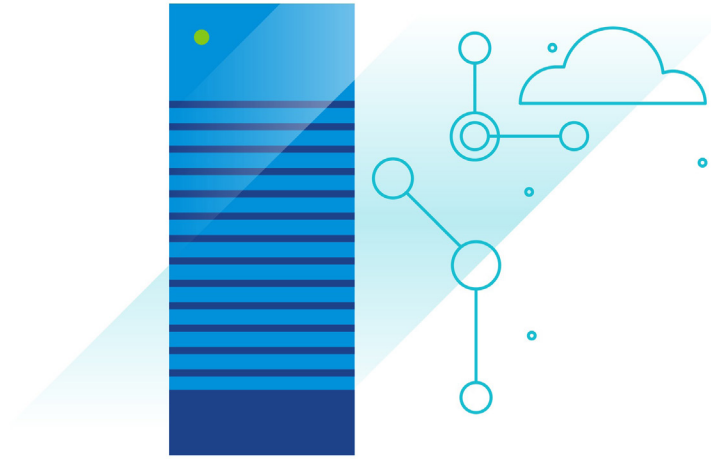
VMware SD-WAN supports a number of options for securing network infrastructure. It seamlessly integrates with existing security provider solutions and its security support capabilities include:

- A **built-in firewall** with an embedded option that's also application aware. It includes an integrated rule set with the ability to be disabled in favor of an external physical firewall.
- **SWG integration** with existing secure web gateways (SWG) is another option, including from providers like Zscaler, Forcepoint, and Palo Alto Networks Prisma. Use a business policy to redirect traffic to the selected SWG provider.
- The **centralized firewall** approach involves backhauling traffic to the data center and its existing security infrastructure. Using a backhaul might result in some latency, but VMware SD-WAN does support it. Once again, a business policy can be used to route selected traffic to the data center.
- **Firewall VNF** involves using a VNF as a firewall. This best-of-breed integration is located at the VMware SD-WAN Edge, using a hypervisor and fixed service chaining.

SWG Integration Options

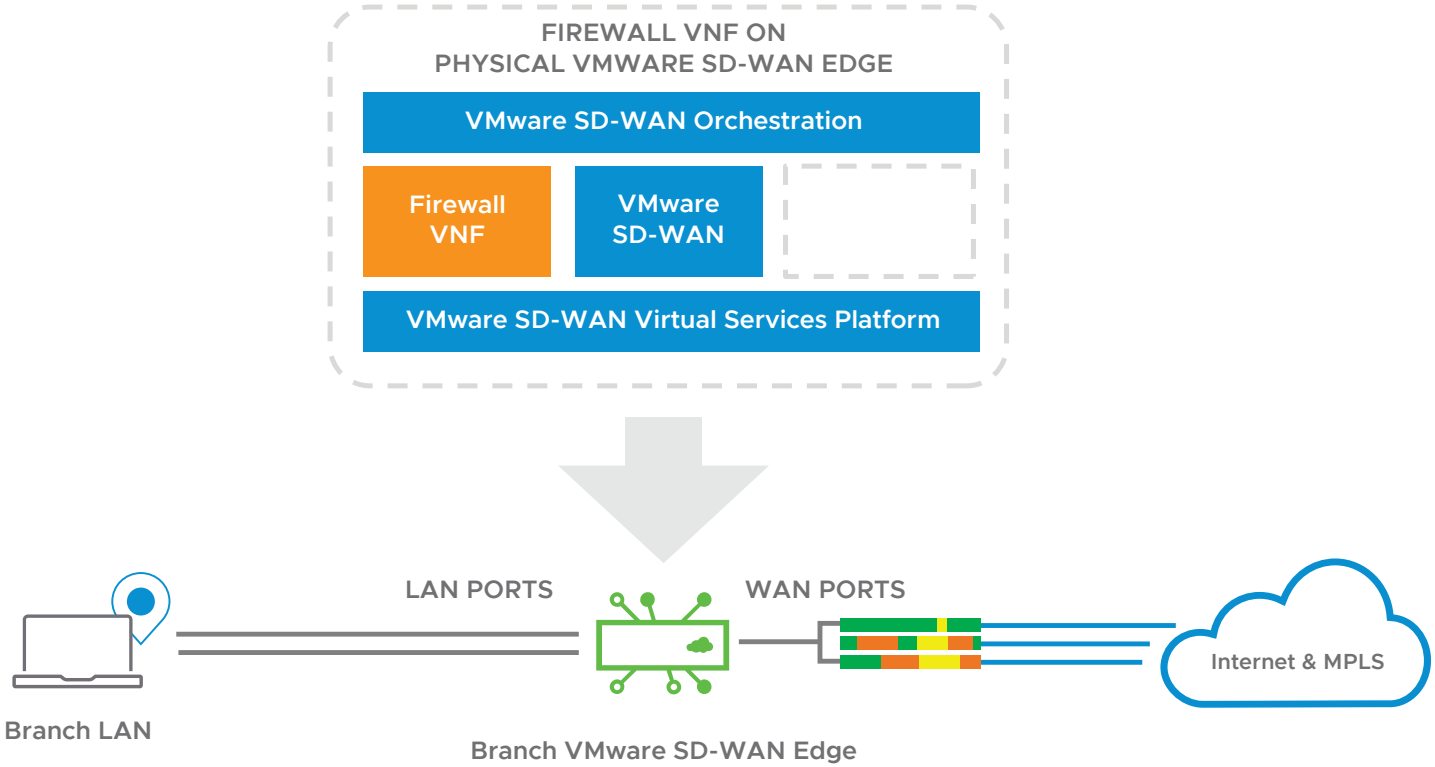
The VMware SD-WAN solution provides numerous options for SWG integration. We support multiple third-party security providers, including Zscaler, Symantec, Palo Alto Networks and Checkpoint. One possibility involves a direct IPSec connection from the VMware SD-WAN Edge straight to either the Zscaler or the Symantec cloud service. Additionally, when utilizing our VMware SD-WAN Gateways and DMPO, you can also leverage those same third-party security services. With this option, the Gateways are in very close proximity to where those providers are hosting their cloud web security (CWS) services, which helps improve performance.





VMware SD-WAN Virtual Services Platform

The VMware SD-WAN Virtual Services Platform supports the integration of third-party firewalls as VNF. This virtual firewall integration takes place at the VMware SD-WAN Edge. The VNF approach to the firewall leverages the VMware SD-WAN security ecosystem, partnering with some of the most popular and best in class security firewalls able to run as a VNF directly on the VMware SD-WAN Edge. The insertion of these VNF firewalls is very simple and can be done using the VMware SD-WAN Orchestrator.



Simple SD-WAN Migration and Deployment

Hosted vs on-premises

When it comes to deploying a VMware SD-WAN solution, both hosted and on-premises options are available, including a mix of both approaches. Obviously, companies using the hosted option with a VMware SD-WAN Orchestrator and VMware SD-WAN Gateways are essentially operational within a few minutes. This convenient approach is a boon for smaller organizations without large IT staffs. This approach still receives full support from VMware.

What transport?

The VMware SD-WAN platform also supports a variety of transports, including MPLS, broadband, LTE, and any combination of the three. The fact that swapping out transports is possible without any disruption of traffic provides peace of mind to companies fretting about the migration process. Additionally, our flexible service insertion technique seamlessly coexists with existing routers. This includes both hardware and even virtual services.

Appliance?

When it comes to network appliances, VMware sells our own hardware for the operation of our VMware SD-WAN platform. Of course, this solution also easily runs on top of existing data center equipment. We support either universal customer premises equipment (uCPE) or a hardware option using equipment from HP, Dell, and others.

Application policies

Crafting application policies for handling network traffic is also part of this migration and deployment process. This is typically accomplished using the VMware SD-WAN Orchestrator. Ultimately, our solution supports all network architectures, including companies with non-SD-WAN branch sites.

Communication with Non-VMware SD-WAN Sites

But how does the VMware SD-WAN handle communication with these existing non-VMware SD-WAN sites? Depending on latency and bandwidth considerations, traffic can be routed through a hub site or directly from a VMware SD-WAN branch.

Use hub site as transit

As traffic to and from the non-VMware SD-WAN sites go through transit sites first, the hub choice provides more bandwidth but with higher latency.

Direct from SD-WAN branch site

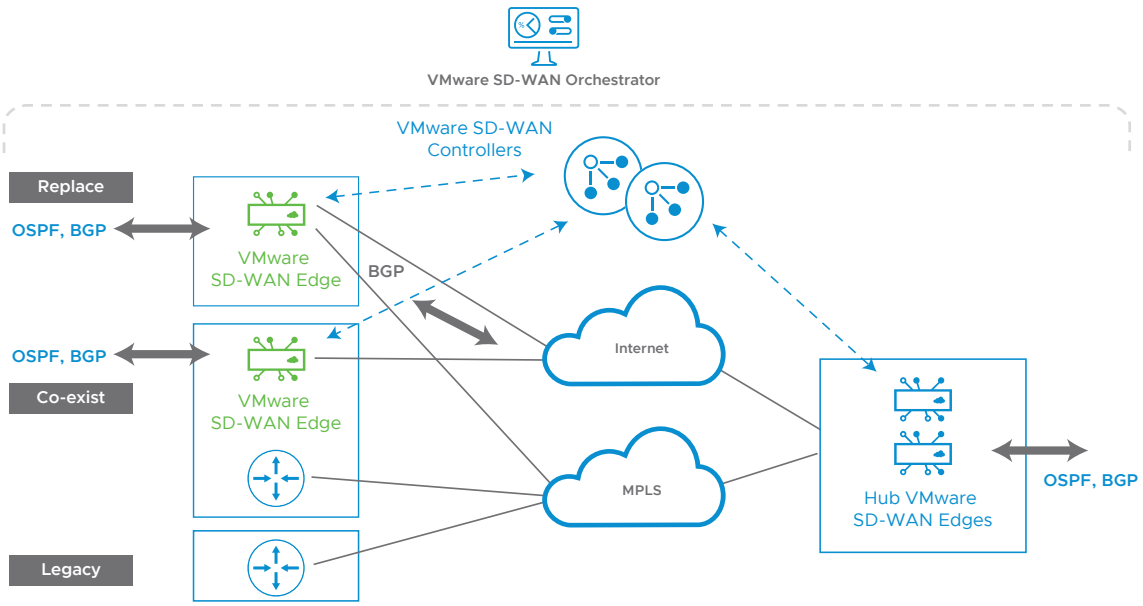
In this option, traffic to and from the non-VMware SD-WAN sites go directly to MPLS. The transit site is then used as a backup. This provides the opposite case where latency is lowest but there is less available bandwidth.

Simply put, the fact we support both communication options makes it easier for companies to deploy their new VMware SD-WAN architecture. The important thing is to look at the pros and cons of each approach and choose the best option for the company's current and future networking needs. This flexibility inherent with the VMware SD-WAN solution helps ensure a successful deployment.

Incremental and Interoperable SD-WAN Rollouts

Since no enterprise wants to make major changes to their networking operations, a simple SD-WAN deployment with no disruptions is critical. The VMware SD-WAN platform even supports the replacement of existing networking equipment with new hardware and/or software supporting our platform. Since this "rip and replace" approach likely involves downtime, thankfully, it's not the only option.

A hybrid approach works best for companies that want minimal downtime. For example, one hybrid solution allows for both a developed VMware SD-WAN Edge as well as a non-VMware SD-WAN cloud edge to both operate simultaneously within the data center. Even a full non-VMware SD-WAN legacy branch site is supported under the VMware SD-WAN umbrella. It's yet another example of how the VMware approach offers companies flexibility by supporting an incremental rollout of their new network architecture.

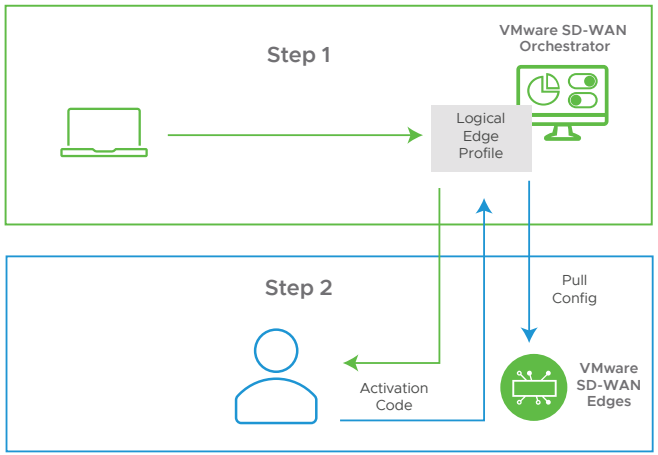


VMware SD-WAN Zero Touch Provisioning (ZTP)

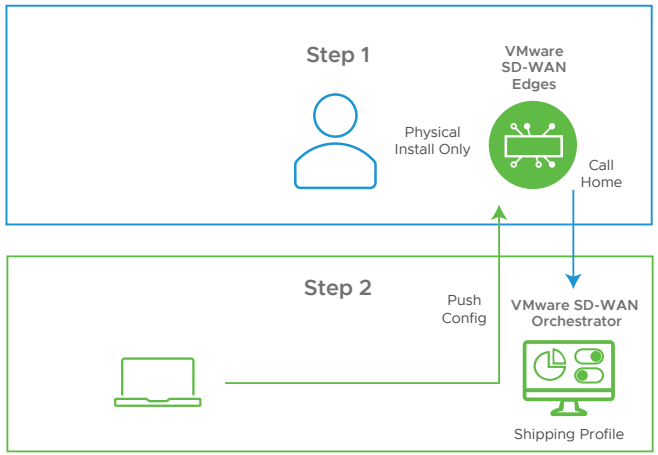
Traditionally, companies sent their IT personnel to branch sites to manually configure routers and install edge equipment. In contrast, the ZTP feature of VMware SD-WAN ensures migrating to the network happens in a seamless and automated fashion. By utilizing pull activation, ZTP creates a new account when a VMware SD-WAN Edge device is connected to the network. The VMware SD-WAN Orchestrator is used to create the account and activate the VMware SD-WAN Edge. It's essentially a one-click process using an activation code. After clicking a link in an activation email, the VMware SD-WAN Edge pulls the configuration from the VMware SD-WAN Orchestrator itself, and the automated configuration happens.

ZTP lets companies configure their new VMware SD-WAN architecture with no IT staff on site, no pre-staging, and no security risk if the box is lost or stolen. Additionally, no site by site link profile is required.

Pull Activation - Handles static IP / No serial number tracking



Push Activation - No activation code to installer



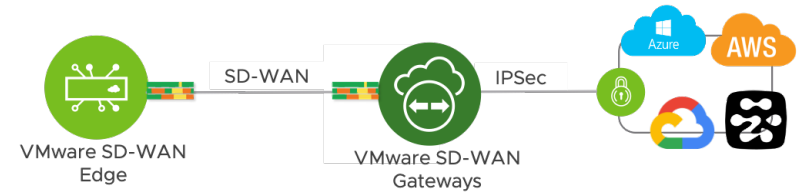
VMware SD-WAN On-Ramp to IaaS

Our VMware SD-WAN Gateways support multiple Internet links all while reducing network management cycles. It's a great solution to on-ramp Internet traffic into an organization's SD-WAN infrastructure. Essentially, it places a company's SD-WAN infrastructure on the doorstep of a cloud-based IaaS provider.

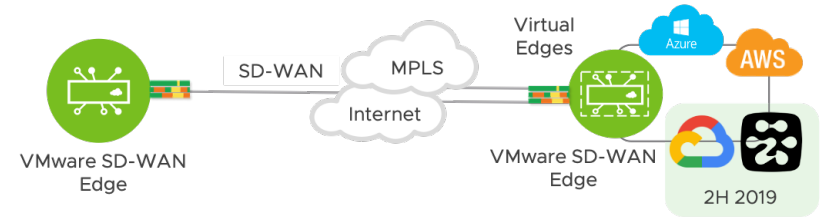
Additionally, using a VMware SD-WAN Edge is another option for connecting to the cloud. This method supports providing a true end-to-end SD-WAN approach. Instead of using a VMware SD-WAN Gateway, we can use a VMware SD-WAN Edge within Azure, AWS, or another cloud IaaS provider.

For example, if your company currently uses the cloud for IaaS and wants to make a direct connection without a VMware SD-WAN Gateway component, simply install a VMware SD-WAN Edge directly in Azure or AWS for an optimized cloud connection.

VMware SD-WAN Gateways
- Support multiple internet links
- Reduce management cycles
- Extend SD-WAN to IaaS door step



VMware SD-WAN Edge
- Support hybrid connection
- Enable end-to-end SD-WAN
- Launch virtual edge from marketplace



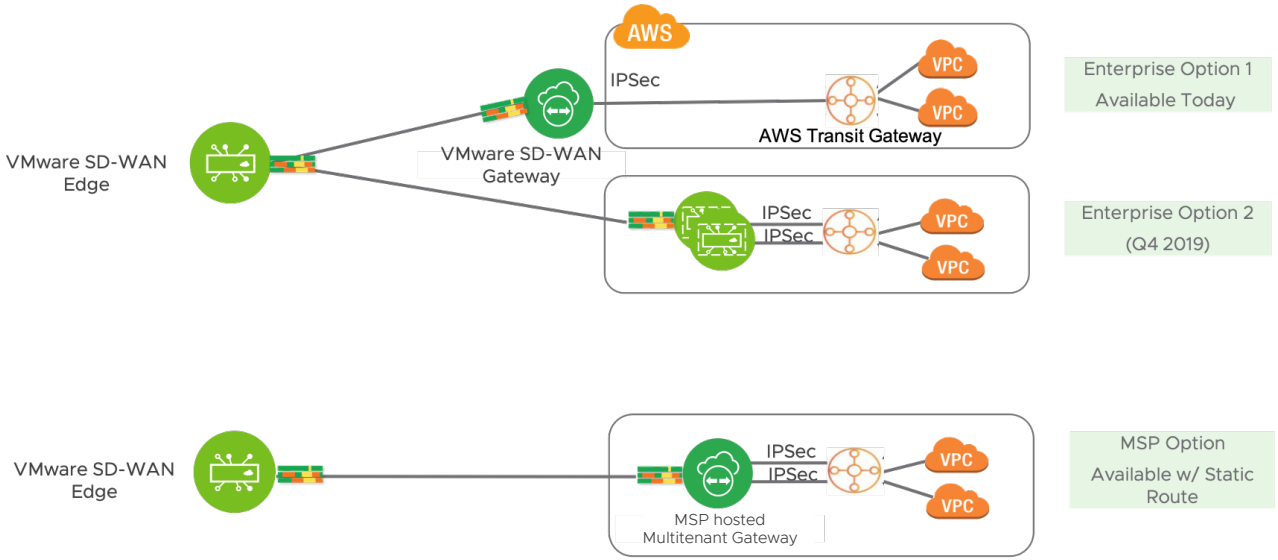
VMware SD-WAN and AWS

VMware SD-WAN can leverage AWS to provide a native transit Gateway solution. With this approach, traffic starts at the VMware SD-WAN Edge and flows to the VMware SD-WAN Gateway. At this point, it's able to connect directly to AWS.

Another option involves installing a second VMware SD-WAN Edge within AWS, where it is easily accessible to VMware SD-WAN traffic over IPSec. Using either method provides companies with a simple way to leverage its investment in both VMware SD-WAN and the AWS cloud platform.

A third option leverages a multitenant gateway provided by a managed service provider. These managed service providers actually host the VMware SD-WAN Gateway within AWS, making it a simple process to directly connect the organization's VMware SD-WAN traffic.

In any of these connectivity scenarios, DMPO ensures an optimized flow of traffic to any cloud provider, including AWS. This approach of optimizing cloud connectivity gives companies reliability, connectivity, and resiliency when embracing the cloud. In short, it's a perfect way to either begin or continue your organization's journey to the cloud.



Transforming with VMware SD-WAN

VMware SD-WAN offers companies flexibility when it comes to securing their network infrastructure. This includes a wide array of options and seamless integration with products from the top information security providers in the business.

Ultimately, the VMware SD-WAN platform offers companies a state of the art solution to transform their network edge. It's a networking approach featuring the integration and superior functionality to keep businesses ahead of the competition. We at VMware are here to guide you through the entire process of deployment and post-sales support.

For more information see, www.velocloud.com.

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