WHITE PAPER

Demystifying SD-WAN's Relationship to WAN Optimization

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As software-defined wide area network (SD-WAN) continues to become a mainstream technology, its relationship to wide area network optimization (WANop) will be examined by many prospective buyers. At first glance, the two can appear alike, and are often erroneously mentioned as synonymous technologies. A deeper examination however, will reveal two distinct and highly complementary technologies with very limited feature overlap. This document will demystify the relationship between the two technologies, outline the market shifts that have led to reduced demand for WANop, and provide a recommendation on when to deploy either technologies in an enterprise wide area network (WAN).

WAN Optimization Features are Less Relevant Than Ever

WANop used to be a widespread necessity for improving application performance when applications were accessed over WANs where bandwidth constraints were present and latency between the client and application server was impacting application responsiveness. WANop appliances have used the following mechanisms to solve for these mid-mile network performance issues:

- Data deduplication is used as a mechanism to extract repeating data patterns from traffic flows to reduce the volume of application traffic that is transferred over the WAN. The patterns are stored on disk at each end of the link and only a token to the pattern is transmitted. The patterns are injected on the receiving appliance to reconstitute the original data transmission.
- Compression is used as an additional mechanism for reducing the volume of non-repeating patterns transmitted over the WAN.
- Transmission control protocol (TCP) optimization is used to mitigate the negative effects of high latency on application performance by speeding up the TCP acknowledgement (ACK) process, creating the appearance that the destination server is closer to the client than it is. The WAN optimization controller (WOC) uses a specialized TCP stack that is customized to maximize throughput over high capacity but high latency networks.
- Application proxies such as server message block (SMB), network file system (NFS), and file transfer protocol (FTP) are used to offset the effects of application protocols that were originally designed to be used on the local area network (LAN) and have an expectation of a high capacity network. Some of these applications do not work very efficiently over long latency and low bandwidth links, as the message exchanges are too frequent for even very basic operations. To the end-user this translates to long wait times for simple operations to complete when accessing a remote resource.

In recent years, shifting market trends have lessened the need for these mechanisms on a broad scale and led to a contracting need for WANop. These trends include:

- Last mile bandwidth has become significantly less expensive and higher capacities are more readily available. However, the quality of broadband links has historically not been sufficient to support business critical applications. The need for compression and data deduplication fades as available bandwidth improves.
- Broadband links can be provisioned in shorter timelines as compared to private (MPLS, FR, T1) links. It is not uncommon to have two to three months of lead times for private links and this increases as the endpoints are in different countries. Broadband links can be brought online in a matter of one to two weeks. Enterprises are gravitating towards installation of direct Internet access (DIA) broadband links and adding investment protection with WANop to maximize effectiveness of the MPLS circuits is decreasing.
- Applications are moving to highly distributed cloud providers, and in the process, applications are becoming available closer to the end user, eliminating excessive latencies that resulted from the centralized corporate data center approach. TCP optimization is not effective when latencies to the applications are reduced.
- Applications are now constructed to operate efficiently over the WAN. It is expected that an application must be available over the Internet on a global basis. As an example, server message block version 3 (SMBv3) has significant performance improvements compared to SMBv1 when operating over the WAN, eliminating the need for application proxies to be deployed with a WANop device. The application proxies are only needed for long distance transport of inefficient protocols over the private MPLS network.
- Software-as-a-service (SaaS) providers natively encrypt all traffic hiding it from the data deduplication capability of WANop. To counter this, traffic flows could still be decrypted at the WANop appliance and re-encrypted after data deduplication and compression services have been applied. However, this is a very central processing unit (CPU)-intensive operation and is only cost-effective at lower bandwidth points. The complex logistics of obtaining the certificates from the SaaS providers to decrypt the traffic flows also must be taken into consideration.
- Equipment stack complexity reduction: organizations seek to eliminate complex network functions from the branches where increasingly limited or no IT staff is available. WANop is one of these functions that is increasingly deployed at regional hubs or data centers where it is primarily focused on reducing the impact of latency when applications need to transmit over great distances.

As bandwidth has become readily available, the need for data deduplication or data compression to offset low capacity links is no longer necessary and, in many cases, can add a layer of unnecessary complexity. Additionally, enhancements such as TCP optimizing and application-specific proxies have become less applicable as applications are closer to the end user. The distributed nature of modern applications and cloud native-design has eliminated the impact of latency and many once-needed optimizations have been incorporated into the applications.

This movement away from WANop has been mirrored in the analyst community as well. For instance, Gartner no longer publishes a Magic Quadrant (MQ) for WANop but has now expanded this to a WAN Edge Infrastructure Magic Quadrant where WANop is mentioned, but SD-WAN is the core functionality for the quadrant.

SD-WAN Has Emerged as a Powerful Tool

While the demand for WANop has been contracting, the SD-WAN market has been rapidly expanding, as organizations seek to lower branch operating costs by leveraging broadband links and reducing the complexity of managing devices. By operating as an overlay network, SD-WAN spreads the risk of outages and network degradations across multiple links and transport technologies. This allows the SD-WAN solution to steer traffic over more than one link on a real-time basis and achieve network quality levels of MPLS but at a fraction of the cost. Enterprises can also choose to complement existing MPLS capacity with broadband capacity to serve bandwidth intensive applications, hosted in the cloud. A series of broadband links can provide assured SaaS application performance while the MPLS links provide access to applications hosted in the corporate data center.

This is the core functionality of SD-WAN, but it also offers a host of additional benefits, such as:

- Automatic link qualification and characterization, providing the ability to use multiple links simultaneously.
- Dynamic link steering, and mitigation techniques such as forward error correction (FEC), de-Jitter buffering, and allowing for real time reaction to changing link quality conditions.
- Ease of installation and a simple user interface, including REST APIs to rapidly integrate with other network and ticketing systems the organization may already use.
- Cloud VPN to rapidly and securely enable networking capabilities between locations that don't have an SD-WAN appliance.
- Cloud on-ramp to provide performance optimizations when accessing SaaS applications.

Feature Comparison: SD-WAN vs. WAN Optimization

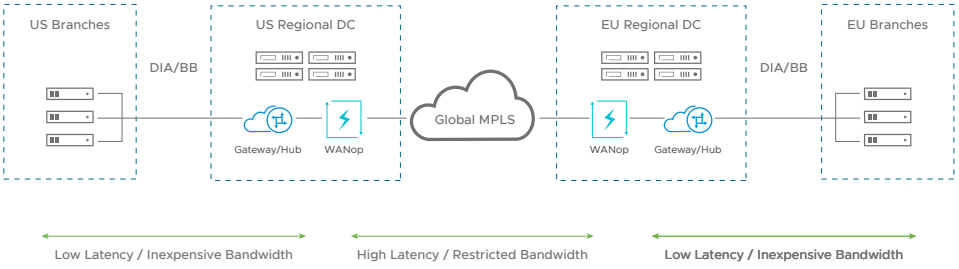
An examination of WANop and SD-WAN side-by-side illustrates their key distinctions:

	SD-WAN	WAN OPTIMIZATION
Problem Addressed	Link quality, policy mgmt.	Latency, congestion
WAN Segment Focus	Last mile	Mid mile
Traffic Steering	Yes	No
Link Remediation	Yes	No
Application Classification	Deep Application Recognition	5-tuple
REST API	Yes	No
Zero Touch Deployment	Yes	No
Overlay VPN	Yes	No
QoS	Yes	Limited
TCP Optimization	No	Yes
Application Proxies	No	Yes
Data Deduplication	No	Yes
Compression	No	Yes

A Modern Business WAN

Ultimately, it is up to each company's network administrator to determine the optimal configurations for their networking needs. When considering the relationship between these two technologies, it is quite simple. The two products are not competitive but address different problems.

For multinational corporations, you can keep the WANop functionality in regional hubs. The diagram below depicts such a scenario where SD-WAN is deployed to leverage low cost broadband links within a region. One or more locations are used as a regional branch that is connected to the global MPLS backbone. It is in these locations that WANop can be deployed, as traffic transmitted to another region could be subject to significant latency and very often is over-subscribed and can benefit from compression and data deduplication techniques.



By deploying SD-WAN broadly across your network to address the last-mile connectivity for branch locations while strategically placing WANop appliances on the high latency intercontinental MPLS links, you can achieve a robust

and cost-efficient network posture. By using both, network administrators can improve the day to day user experience, while getting the most out of high quality but high cost MPLS links.

Learn More About SD-WAN

Whether you are looking to increase network flexibility, cut down on costs, or streamline data movement, SD-WAN can help. Reach out to an SD-WAN expert today to learn how SD-WAN can transform your networks and bring them into the modern era of networking. To learn more visit, *www.velocloud.com*

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