

SD-WAN FOR HEALTHCARE

A Deep Dive Into The Drivers and Solution

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The ability to provide excellent care to patients, to enable access to all medical records regardless of location, and processing transactions between customers, care facilities, insurance agencies and more, are all triggers for today's increasing technology change in the healthcare industry. With mergers and acquisitions on the increase, payments taking place online, and greater and greater amounts of data analytics needed, healthcare organizations need robust, scalable, secure, and easy to manage networking infrastructure that allows them to keep up with changing technology trends.

[Software-defined WAN \(SD-WAN\)](#) has emerged as a game changer for healthcare. Its easy-to-deploy architecture allows organizations to implement it alongside or over-the-top of any existing networking infrastructure, with any transport option available, and to any site regardless of location. With the shift to the use of cloud applications, SD-WAN allows any clinic, remote site, pharmacy, or hospital to quickly and seamlessly gain access to those applications.

In this paper, we'll investigate healthcare's unique use cases, user pain points, and the unique functionality of SD-WAN that will continue to be a major force in this vertical. We'll start with the trends and use cases that the [VMware NSX SD-WAN by VeloCloud](#) is seeing in the industry today.

Healthcare's Unique Networking Use Cases

Availability and uptime: Networking availability and uptime are of the utmost importance in healthcare, even if it means additional expenditure. Depending on legacy networking and connectivity, outages and downtime were huge impediments to providing appropriate patient care or enabling transactions to occur. Customers that have adopted SD-WAN no longer have to worry that lack of connectivity will inhibit their healthcare organization's ability to meet demands.

Visibility: Healthcare IT teams now have visibility into the entire network with SD-WAN. Because SD-WAN uses customer-premises physical or virtual edges that connect to a cloud-based centralized orchestrator, IT managers have a one-pane-of-glass perspective into traffic flows, issues with the network, and deploy configuration or rule changes from the orchestrator network-wide in one step.

Identify and Repair: Using Dynamic Multi-Path Optimization (DMPO), SD-WAN measures the traffic flowing across the network and ensuring critical applications are prioritized over those that are less-critical. This is especially important in blackout/brownout situations, as SD-WAN is able to predict and remedy these situations, often repairing the lines to ensure connectivity stays consistent. It dynamically adjusts to the underlying conditions and either steers or remediates the access and transport of these critical applications.

Turning Up New Sites: Healthcare is no longer relegated to major cities. There is a need to provide healthcare facilities in remote locations where greater numbers of patients can be served. Traditionally, turning up new sites was complex, due to a lack of connectivity options. SD-WAN has changed that as it can utilize any type of connectivity available (private and public links) and for faster deployment, can utilize LTE until other options can be obtained.

Growth by Merger and Acquisition: The number of mergers and acquisitions in the healthcare industry is increasing. In 2017 alone, there were 43 transactions. Following a merger or acquisition, the individual companies must merge their systems, combining many disparate platforms with another, which is a traditionally laborious and difficult task to complete. Initially, the lead company gives the acquired sites limited access to resources and once fully on-boarded, converts them to production standard and provide full access to production and existing corporate sites. However, with SD-WAN, this is no longer an issue, as each site can be brought into the existing network quickly and efficiently.

Standardization: One of SD-WAN's features is its ability to centrally manage and control all sites in the network. Additionally, if policies or configurations must be implemented or modified, the central management orchestrator is able to deploy these changes automatically, without the need to send a trained technical staff to each location. This process also allows new sites or acquired locations to be deployed using standard templates or profiles to eliminate human error and speed up a go-live time.

Tossing Traditional Connectivity: Traditionally, healthcare facilities relied on MPLS as the connectivity between sites and primary centers of data. MPLS is private and highly secure but is difficult to implement in every location, especially smaller offices or clinics, due to its high cost. More and more, healthcare is shifting away from MPLS and adopting SD-WAN either alongside it or as a substitute when MPLS contracts expire. Hybrid WAN allows this shift to occur without compromising security and while keeping in compliance with HIPAA, SOC2, etc.

Segmenting Traffic: There are various forms of networking traffic, and each industry has its unique segments. In healthcare, there is likely to be three types of traffic: corporate traffic, guest traffic, and payment traffic. SD-WAN is able to segment this traffic so that each is routed to the correct destination regardless of point of origin. Corporate traffic is backhauled to the data center for UTM inspection. Guest traffic is dropped off by location at each site. Payment traffic for services rendered, must be PCI compliant and routed through the appropriate payment channel.

Primary Pain Points

Healthcare is no different than other industries in its reliance on the network to conduct business and serve its clientele. And, as just like in other industries, the traditional [wide area network \(WAN\)](#) that it relies on is complex, static, unable or too slow in adapting to the changing dynamics required of healthcare.

The digital transformation and expansion into the cloud is causing a major disruption in the Healthcare industry. To completely embrace this transformation and take advantage of all that it offers requires the industry to scrutinize the WAN and eliminate the obstacle that it poses by forcing adaptation to new technologies and platforms.

Reliability and Security: The primary pain point in the Healthcare industry is the continuous challenge to provide reliable and secure access to information (patient medical records, medical imaging, etc.) to geographically diverse branch site types while remaining in compliance with industry regulations.

Protected Health Information (PHI) is highly sensitive, which makes it extremely attractive to hackers who will go to great lengths to attain the information. The constant threats from this group require increasingly more sophisticated levels of security. This becomes even more complex when WAN architectures differ across various access groups and within each architecture as well as the difference amongst the different types of branch sites an organization might manage. This complexity and variance is a security and operational challenge.

Network Visibility: Additionally, most networks lack a comprehensive and centralized management and monitoring portal that allows complete visibility of the WAN. To truly understand and optimize the WAN, IT managers must be able to measure and assess the application traffic flowing across the WAN as well as prioritize the individual applications while reporting on the individual application's performance. But this situation rarely exists in Healthcare organizations, making it difficult to identify issues, determine how to fix them, and plan for future activity and needs based on the current situation.

The Emerging Profile

So now that we understand the pain points faced in Healthcare, let's take a look deeper into the emerging customer profile with regards to technology needs.

While every potential Healthcare customer varies slightly in the pain points they are looking to solve with **SD-WAN**, the network architecture across these customers is not significantly different from each other.

1. Most have (typically two) centralized data centers that host applications or services.
2. A set of regional hospitals or campuses and several remote clinics or urgent care clinics or individual doctor's offices.
3. Or, they do not have a main hospital or campus, but are made up of many remote clinics or doctor's offices providing specialized services.

The remote clinics can be fixed (meaning they are brick-and-mortar) or mobile. In both scenarios, the remote sites rely on VPN connectivity back to the main data centers. All traffic flow is to and from the regional hospital campus and **remote clinics** to the data center. The remote sites typically do not communicate with each other or send information to each other.

Considering the N-S traffic flow described in this Healthcare profile, the WAN becomes the lifeblood for those organizations that host required applications and services in the centralized data centers. Patient information must be available at all times in order for healthcare professionals to provide care to patients. This requires that the information be stored in the centralized data centers. Because care is provided at the remote sites or regional campuses, the information is uploaded or downloaded to the data centers on a continuous basis. The WAN must be able to support the large files that are constantly traversing it in a secure and efficient manner. The size of the files can be 100s of MB of data at a single time due to the high resolution required by imaging data and medical records.

Outages are detrimental to Healthcare as the inability to access patient records by care providers can cause them to be in breach of HIPAA regulations and unable to deliver care when needed.

The WAN Must Change

SD-WAN has become a saving grace for the Healthcare industry. Because it can be deployed Over-the-Top (OTT) or as a replacement to existing infrastructure, it is a highly flexible and scalable technology that enables Healthcare to continue providing patient care and supporting care personnel with improved efficiency, access, speed, and security.

Why Providers Say “I Gotta Have SD-WAN!”

The advancements in healthcare grow by leaps and bounds and without a strong infrastructure to enable the seamless, secure, and optimized delivery of those advancements throughout the organization, the ability to deliver quality care will be impacted.

SD-WAN has emerged as the technology that is changing the networking status quo for healthcare. It’s ability to deliver on the promise of faster, better, cheaper and more is causing healthcare providers and their IT staff to take notice. [VMware NSX SD-WAN by VeloCloud](#) provides its SD-WAN solution to many healthcare organizations and its use cases, features, and functionality have proven to be an excellent fit.

While SD-WAN has a host of benefits and features that applicable for healthcare, let’s take a closer look at the four major ones that cause healthcare IT organizations to say “I gotta have SD-WAN!”

Number One: Dynamic Multi-Path Optimization (DMPO)

DMPO aggregates all available links including broadband, LTE, and MPLS circuits and using application-aware per-packet link steering and on-demand remediation, achieves optimal performance under all conditions including brown-out or black-out scenarios. This ensures that healthcare data is accessible and transmittable at all times, including the accelerated transfer of radiological images (PACS, DICOM, etc.) and that sub-second failover maintains stable VDI sessions and real-time traffic for voice, video, and telehealth communications.

- **Automated Bandwidth Discovery** - During the deployment of an NSX SD-WAN Edge by VeloCloud, it will automatically detect WAN links, measuring both the up and down bandwidth to the nearest available NSX SD-WAN Gateway by VeloCloud or hub. Using continuous link monitoring at an interval of every 100 m/s, DMPO performs continuous unidirectional measurement of link characteristics: latency, packet loss and jitter of every packet on every tunnel between any two DMPO endpoints.
- **Dynamic Application-Aware Per Packet Steering** - Based on the real-time link measurements and business policy configuration, DMPO can perform application-aware per packet steering in sub-second intervals during blackout and brownout conditions. Because NSX SD-WAN is a packet-based and not flow-based solution, it can steer packets mid-flow with no impact to the overall flow of traffic.

- **Bandwidth Aggregation** - DMPO performs per-packet load-balancing of packets belonging to a traffic flow across all available links to the destination. It takes into account the real-time WAN performance and automatically decides which paths should be used for the flow and then performs resequencing at the destination to ensure there is no out-of-order.
- **On-Demand Remediation (Key Differentiator)** - In a scenario where application-aware per packet steering is not possible (i.e. single link or multiple links experiencing issues at the same time), DMPO will perform remediation for high priority traffic such as FEC, jitter buffering for RT application and TCP NACK for applications such as file transfer.

Number Two: Segmentation

Segmentation separates different types of network traffic from each other and prioritizes certain traffic over others. With NSX SD-WAN, segmentation includes the isolation of the control, data, and management planes, and plays a major role in the expansive growth of IoT devices. Using segmentation, healthcare organizations are able to ensure critical devices such as infusion equipment, pumps, blood pressure, and temperature measuring devices receive prioritized access to the WAN over less critical devices.

Number Three: Security

As mentioned in Section 2: Primary Pain Points, security is a major pain point for healthcare organizations. Highly sensitive data must be protected at all costs and with the reliance on broadband links to connect non-primary offices, network solutions must account for this. With SD-WAN healthcare IT managers are able to apply network-wide business and security policies, insert local, third-party and cloud security services wherever and whenever they are needed, and extend the WAN perimeter. The Hosted Virtual Firewall on the NSX SD-WAN Edge for UTM and next-generation firewall capabilities can circumvent the need to send all Internet bound traffic and have either all or a sub-set of that traffic exit locally, made possible by NSX-SDWAN's granular application recognition and business policy.

The VNF capabilities supported on the NSX SD-WAN Edge allows security service insertion in the branch. Complexity of VPN tunnels and PKI infrastructure management in traditional WAN architectures is dramatically simplified by leveraging the secure and scalable cloud-based SD-WAN PKI infrastructure, which can be turned on with a single click in the NSX SD-WAN Orchestrator. VPN tunnels are built where and when needed, and cover branch-to-branch, branch-to-data-center and any-location-to-cloud traffic patterns.

Number Four: Quality of Service (QoS)

Patients and doctors have a high expectation that all voice and video transmissions will be uninterrupted, so that care can be provided over any device at any time. This is critically important to those providing telehealth services as the inability to connect reliably can impact adherence to HIPAA regulations. Protecting VOIP traffic against effects of latency, packet loss, jitter and remediating when needed is all part of the NSX SD-WAN offering.

SD-WAN delivers significant value to healthcare organizations seeking to optimize, scale, and protect their network. It has become a game changer for those that have chosen to adopt it.

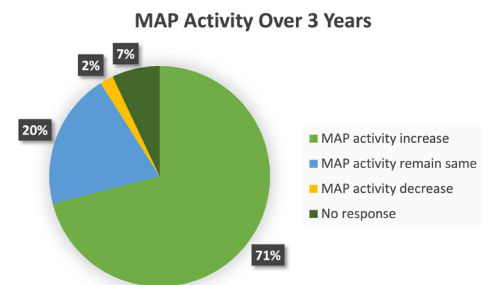
SD-WAN and the Growth of Mergers, Acquisitions, and Partnerships

Healthcare is constantly in a state of evolution, from advances in treatment, to state-of-the-art medical devices, to where services are offered and patients can be treated (hospitals vs. clinics). Evolution of the healthcare organization also occurs in the form of mergers, acquisitions, and partnerships (MAP), the success of which depend on the integration of each organization's respective networks.

How fast is MAP growing? Let's look at some facts:

- 2017: There were a total of 115 transactions that represented a 13% increase over 2016¹.
- 2018: In the first quarter of 2018, 30 MPAs were announced, a 11% increase from the same period in 2017.
- Large-sized deals: Of these 30, three had over \$1B in annual revenue and another four had revenue between \$500M and \$1B.
- PwC, who handles many M&A deals, reported at the end of 2017 that it had experienced 13 straight quarters of more than 200 MPAs in healthcare, totaling \$175.2B.

The trend of increasing MAP activities and the instance of high-revenue healthcare organizations participating in this trend shows no sign of slowing down. According to a study, the *2018 HealthLeaders Media Mergers, Acquisitions, and Partnerships Survey*², the majority of respondents expect their MAP activity to increase over the next three years (see Figure 1, right).



Why Is the Network Important to MAP?

As is the case in any vertical, when two companies merge or one purchases another, integrating the two can be very complicated, especially for very large organizations. In healthcare, the complexity exists in ensuring that patient records belonging to each company remain secure and accurate, but now must be accessible by both organizations. Companies are not successfully integrated until its data is fully integrated. And their respective data integration is dependent on a smooth network integration.

According to [Health Catalyst](#), "top-performing MAPs across all industries focus first on data integration and have a plan to do so within six months post-merger. Additionally, 40% of the MPA value in healthcare can be tied directly to IT strategy. Without a focus on IT integration, that 40% is at high risk."

1. Kaufman Hall; 2017 in Review: The Year M&A Shook the Healthcare Landscape

2. HealthLeaders;

<https://www.healthleadersmedia.com/strategy/71-healthcare-orgs-say-mergers-and-acquisitions-will-increase>

Turning to SD-WAN

The challenge in the healthcare industry is how quickly and securely these organizations can bring new MPA sites into the parent network. Initially, the acquiring company will provide the MPA sites limited access to resources from the parent company and once fully on-boarded, they are converted into a production standard and provided full access to production and existing corporate sites.

Complexity is introduced because MPA sites already have their own connectivity in place. In a standard networking environment, the parent company would have to rip and replace existing circuits and infrastructure in the MPA sites to be integrated into the parent company. This process can often take longer than this six-month process, typically taking a year or two to fully move over all sites.

However, parent companies that have adopted SD-WAN do not have this issue. With SD-WAN, healthcare organizations are able to extend the SD-WAN network architecture into the newly acquired sites by deploying edges, and with zero touch provisioning, adding them into the centralized management and orchestration portal. From this orchestrator, IT managers can easily monitor, manage, and control network activity across the entire environment.

Further simplifying the process is the ability to control how new sites and organizations are brought into the parent network through the use of customized profile creation. Without SD-WAN, entirely new equipment must be deployed to each site and highly-trained technicians must spend much time installing the new equipment, manually configuring it, testing it, and ensuring each that each is connected and accessing the appropriate information. SD-WAN eliminates this time-intensive process as its edges do not require a highly-skilled technician to install (it's often as simple as plugging in two to three cords), and with pre-established profiles deployed instantaneously across all edges, human error is eliminated. This process not only eliminates potential mistakes but shortens the window to full data and network integration.

Conclusion

SD-WAN continues to change the networking landscape in bigger and more widespread ways. With Healthcare's reliance on its network, SD-WAN is uniquely positioned to provide it with a future-proof infrastructure that can handle its increasingly stringent regulatory and medical requirements.



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