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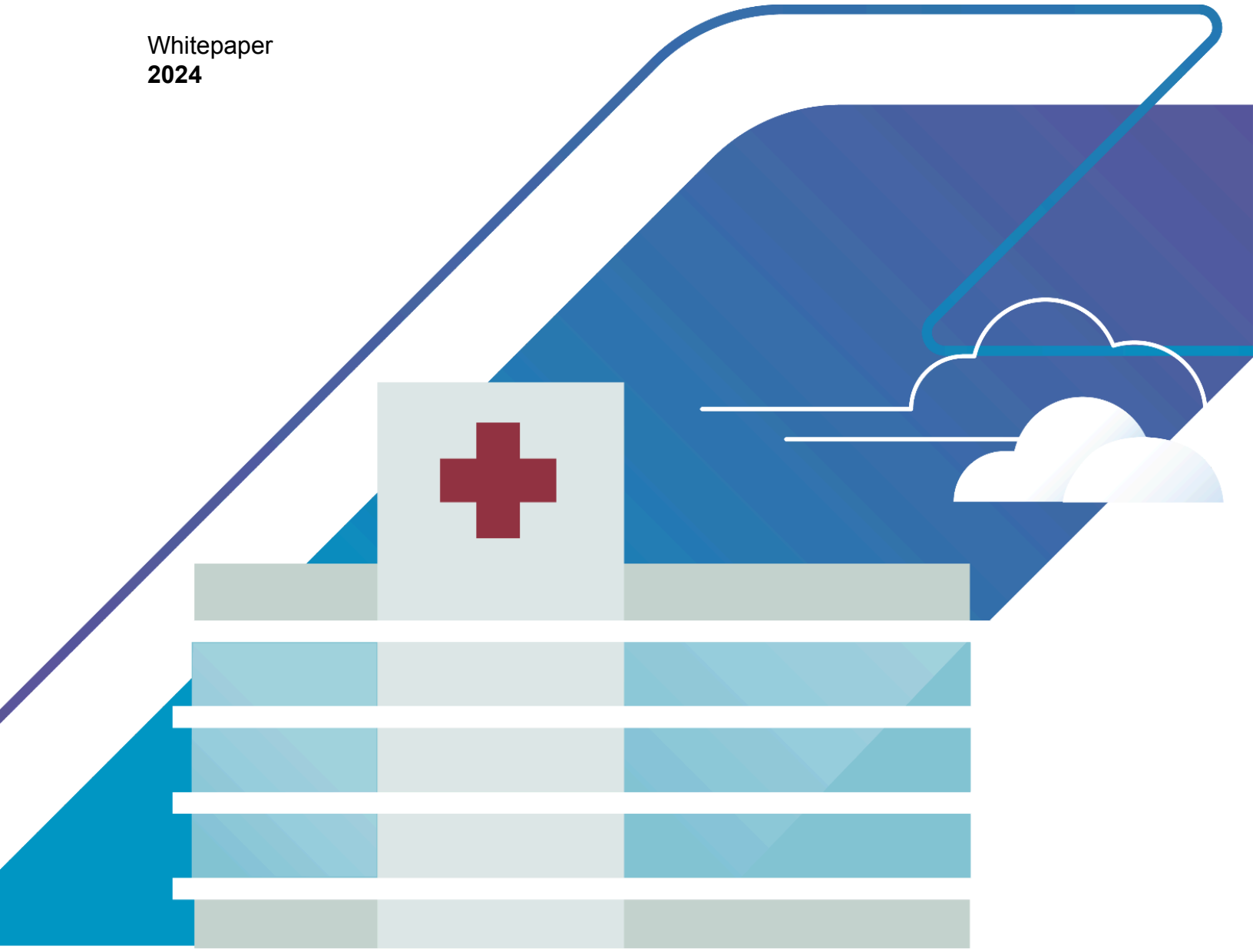

SD-WAN FOR HEALTHCARE

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.

Secure Access Service Edge 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 SASE, in particular VeloCloud SD-WAN/SASE, highlighting how it enables Healthcare organizations to accelerate digital transformation journey and provide superior patient care. We'll start by examining current trends and use cases that VeloCloud SASE is seeing in the industry..

Primary Pain Points

Healthcare, like other industries, relies heavily on its network to conduct business and serve clients. However, the traditional wide area network (WAN) that healthcare depends on is often complex, static, and slow to adapt to the rapidly changing demands of the industry.

The digital transformation and expansion into the cloud are causing significant disruption in healthcare. To fully embrace this transformation and capitalize on its benefits, healthcare organizations must scrutinize the WAN and eliminate its obstacles by adopting new technologies and platforms.

Under-performant and expensive MPLS network

A significant pain point in the healthcare industry is the ongoing challenge of providing reliable and secure access to critical information, such as patient medical records and medical imaging, to geographically diverse branch sites while maintaining compliance with industry regulations. Healthcare providers are often tied to legacy MPLS contracts that are expensive, inflexible, and

underperforming. Additionally, setting up new sites is slow, as provisioning MPLS circuits can take days or even months.

Distributed Security

Protected Health Information (PHI) is highly sensitive, making it a prime target for hackers who go to great lengths to obtain it. Constant threats necessitate increasingly sophisticated levels of security. This complexity is heightened by the varying WAN architectures across different access groups and branch sites within an organization. Managing this variability presents significant security and operational challenges.

Distributed Network Visibility

Most networks lack a comprehensive and centralized management and monitoring portal, hindering complete visibility of the WAN. To truly understand and optimize the WAN, IT managers need the ability to measure and assess application traffic, prioritize individual applications, and report on their performance. However, this capability is often absent in traditional networks, making it difficult to identify issues, determine solutions, and plan for future needs based on the current situation.

Access to Care in Remote Locations

Access to healthcare in remote locations where broadband or private circuits are unavailable poses significant challenges, requiring reliance on satellite or 4G/5G networks. Satellite and 4G/5G networks often have lower bandwidth compared to traditional broadband, leading to slower data transfer rates. This can hinder the timely access and transmission of large medical files such as imaging studies or electronic health records (EHRs). Satellite connections, in particular, suffer from high latency due to the long distances signals must travel. This can affect real-time communications and remote consultations, making video conferencing and telemedicine less effective.Both satellite and 4G/5G connections can be less stable than wired connections. Weather conditions can disrupt satellite signals, while 4G/5G coverage may be inconsistent, leading to dropped connections and unreliable service. These less reliable networks also pose compliance and data security risks.

The Emerging Profile

So now that we understand the pain points faced in healthcare, let's take a deeper look 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 are not significantly different from each other.

1. Most have (typically two) centralized data centers that host applications or services.
2. A set of 24*7*365 regional hospitals or campuses with several remote clinics or urgent care clinics or individual doctor's offices running 9 - 5.
3. Or, they do not have a main hospital or campus, but are made up of many remote clinics or doctor's offices or doctors working from home providing specialized services.

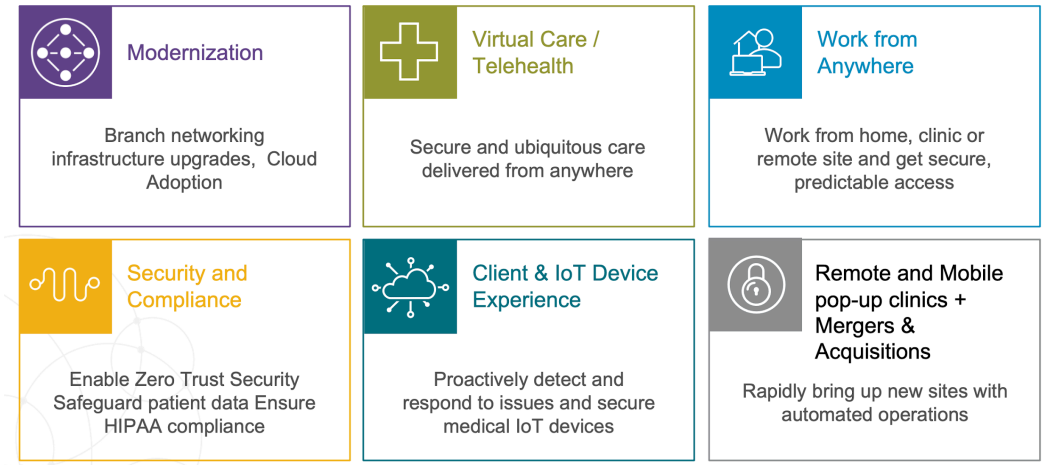
The remote clinics can be fixed (meaning they are brick-and-mortar) or mobile. In both scenarios, the remote sites rely on VPN connectivity back to the main data centers. All traffic flow is to and from the regional hospital campus and remote clinics to the data center. In some cases, remote sites require communication with each other or send information to each other.

Considering the predominantly N-S traffic flow described in this Healthcare profile, the WAN becomes the lifeblood for those organizations that host critical applications and services in the centralized data centers. Patient information must be available at all times 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 patient information is uploaded or downloaded to the data centers on a continuous basis. The WAN must be able to support large file transfers in a secure and efficient manner. The size of the files can be 100s of MB of data at a time due to the high resolution required by imaging data and medical records.Outages are detrimental to health care as the inability to access patient records by care providers can cause them to be in breach of Health Insurance Portability and Accountability Act (HIPAA) regulations and hinder their ability 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 provide continuous patient care and supporting care personnel with improved efficiency, access, speed, and security. Let's take a look at the use cases:

Healthcare Use Cases



Modernization and Cost reduction

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 remote clinics, due to its high cost. More and more, healthcare organizations are 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 or compliance (HIPAA, SOC2, etc.)

Virtual Care / Telehealth

Networking availability and uptime are paramount in healthcare, even at additional costs. Reliance on legacy networking systems often led to significant outages and downtime, impeding critical patient care and transactional capabilities. However, customers who have adopted SD-WAN technology no longer face connectivity issues. Proven data shows that SD-WAN has dramatically reduced healthcare downtime from 1 hour to just 6 minutes per year, thereby enhancing the service level agreements (SLAs) for patient care from 99.999% to 99.9999%.

Work From Anywhere

COVID-19 pandemic has permanently transformed our lives, compelling radiologists and other physicians to work from home or anywhere. IT departments must ensure that these professionals experience seamless connectivity, as if they were in the clinic,

avoiding issues like VPN logins, emails getting stuck in the outbox, and problems with telehealth application loading. SD-WAN is an invaluable tool for delivering optimal business performance for remote workers. It enables radiologists to diagnose their most critical patients more efficiently from remote locations. The return on investment (ROI) is quick, as optimized network traffic delivery allows them to increase the number of scans analyzed per day.

Security and Compliance

Providing healthcare today extends beyond making diagnoses or prescribing medications. Advancements in medicine, increased regulations to protect patients and doctors, and the digitization of healthcare processes demand a scalable, secure, uninterrupted, and bandwidth-flexible healthcare IT network. Compliance with the Health Insurance Portability and Accountability Act (HIPAA) is crucial for healthcare networks, ensuring patient data security by segmenting various types of traffic.

Healthcare networks typically handle three types of traffic:

- **Corporate traffic**
- **Guest traffic**
- **Payment card transaction traffic**

SD-WAN can segment this traffic, routing each type to its appropriate destination regardless of the point of origin. Corporate traffic is backhauled to the data center for Unified Threat Management (UTM) inspection, guest traffic is managed locally at each site, and payment traffic must comply with PCI standards, being routed through the appropriate payment channels.

By segmenting different kinds of traffic, SD-WAN helps customers maintain a HIPAA-compliant network, ensuring secure and efficient operation.

https://blogs.vmware.com/sase/2024/05/02/how-VMware VeloCloud-sd-wan-helps-organizations-attain-hipaa-compliance/

Client & IoT Device Experience

Healthcare IT teams now have comprehensive visibility into their entire network with SD-WAN. Utilizing a cloud-based centralized orchestrator, SD-WAN provides IT managers with single-pane-of-glass visibility into traffic flows, network issues, and enables network-wide configuration or rule changes with a single click.

Velocloud SD-WAN's Dynamic Multi-Path Optimization (DMPO) measures traffic flow across the network, ensuring that critical applications are prioritized over less-critical ones. This capability is particularly crucial during blackout or brownout situations, as

SD-WAN can predict and remedy these scenarios, often repairing connections to maintain consistent connectivity. The network dynamically adjusts to underlying conditions, steering or remediating access and transport to ensure the continuous performance of critical applications.

Remote and Mobile Pop-up clinics

With the onset of the pandemic in early 2020, healthcare providers quickly recognized the need to establish testing sites outside their campuses. Protecting non-COVID patients and managing the high volume of people needing tests and care became a priority. Traditionally, setting up pop-up sites was complex due to limited connectivity options. However, SD-WAN revolutionized this process, enabling rapid deployment of sites within minutes using 4G/LTE/FirstNet/Satellite links. This allowed hospital systems to test and treat tens of thousands of people in non-traditional locations.

Though the pandemic is waning, the innovative changes it introduced will endure. The need to provide healthcare facilities in remote locations, where large numbers of patients can be served, remains critical. SD-WAN continues to support these efforts, ensuring connectivity and efficient operation even in the most challenging environments.

Growth by Merger and Acquisition

Healthcare is continually evolving, with advancements in treatments, cutting-edge medical devices, and shifts in service delivery locations (such as hospitals versus clinics). This evolution also includes organizational changes like mergers, acquisitions, and partnerships (MAPs). The success of these MAP activities hinges on the seamless integration of each organization’s networks. As the trend of high-revenue healthcare organizations engaging in MAPs continues to grow, the importance of network integration becomes increasingly critical.

Why is Network Integration Vital for MAP?

In any sector, merging or acquiring companies can be complex, particularly for large organizations. In healthcare, this complexity is magnified by the need to ensure that patient records remain secure and accurate while being accessible to both organizations involved. Successful integration is achieved only when data from both entities is fully integrated, which relies on a smooth and effective network integration."

The number of mergers and acquisitions in the healthcare industry is increasing, with 53 transactions occurring in 2023 alone. After a merger or acquisition, the individual companies must integrate their systems, combining numerous disparate platforms—a

traditionally laborious and challenging task. Initially, the parent company grants the acquired sites limited access to resources, and once fully on-boarded, converts them to production standards, providing full access to Data centers and existing corporate sites. However, with SD-WAN, this process is streamlined. Each site can be integrated into the existing network quickly and efficiently, eliminating the usual complexities.

Orchestration and Automation

One of SD-WAN's key features is its ability to centrally manage and control all sites in the network. If policies or configurations need to be implemented or modified, the centralized management plane can remotely deploy these changes, eliminating the need to send a trained technician to each location. This process allows new sites or acquired locations to be deployed using standard templates or profiles, reducing human error and speeding up go-live time. Additionally, it helps reduce operational costs by streamlining the deployment and management processes.

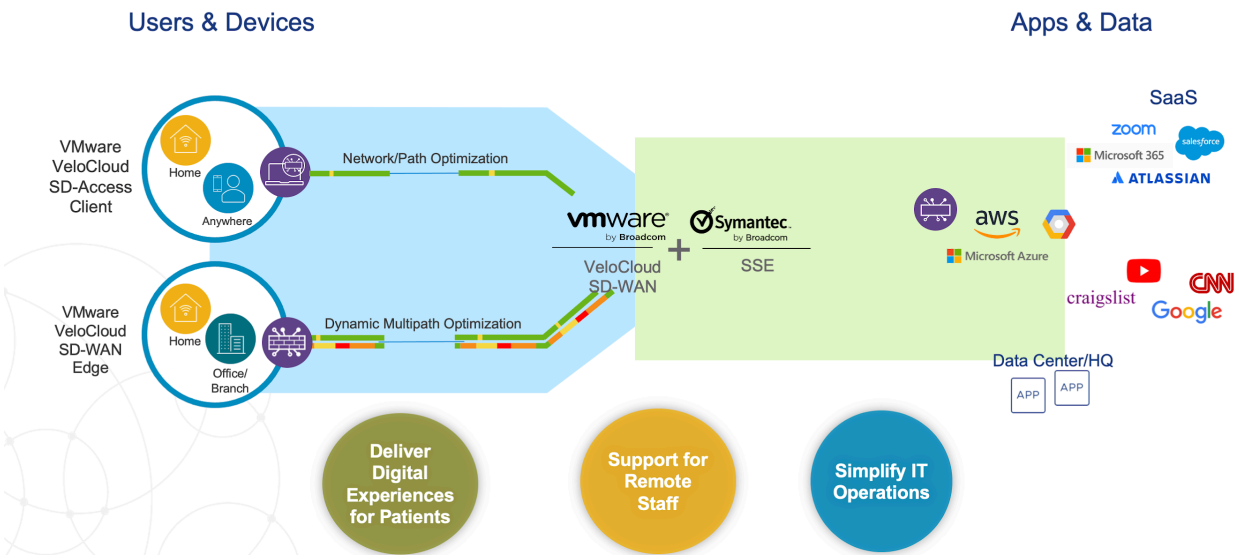
Why should you invest in VMware VMware VeloCloud SASE?

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 and SASE have emerged as the technology that is changing the networking status quo for healthcare. Its ability to deliver on the promise of faster, better, cheaper and more is causing healthcare providers and their IT staff to take notice.

VeloCloud's SASE solution which includes VeloCloud SD-WAN, Velocloud SD-Access Client and Velocloud SSE by Symantec has been successfully deployed across numerous healthcare organizations, demonstrating a strong alignment with their needs. While SASE offers a broad range of benefits and features tailored for healthcare, let's delve into the few key advantages that make healthcare IT professionals say, "I need VMware VeloCloud SASE!"

VMware VeloCloud SASE Enables New Enterprise Edge

Architected for distributed clouds, workers, and Edge applications



Dynamic path section using Dynamic Multi-Path Optimization (DMPO)

VeloCloud's DMPO aggregates all available links—broadband, LTE, MPLS, and FirstNet circuits—and employs application-aware per-packet link steering along with on-demand remediation. This ensures optimal performance in all conditions, including during brown-outs or black-outs. As a result, healthcare data remains consistently accessible and transmittable, enabling rapid transfer of radiological images (PACS, DICOM, etc.) and maintaining sub-second failover to ensure stable VDI sessions and uninterrupted real-time traffic for voice, video, and telehealth communications.

- **Automated Bandwidth Discovery**: During VMware VeloCloud SD-WAN deployment, the system automatically detects WAN links and measures both upload and download bandwidth to the nearest VMware VeloCloud SD-WAN Gateway or hub. Continuous link monitoring, performed every 100 milliseconds, assesses link characteristics—latency, packet loss, and jitter—for every packet on each tunnel between DMPO endpoints.

- **Dynamic Application-Aware Per-Packet Steering**: Leveraging real-time link measurements and business policy configurations, DMPO enables application-aware per-packet steering with sub-second adjustments, even during blackout or brownout conditions. As a packet-based solution, VMware VeloCloud SD-WAN can adjust packet routing mid-flow without disrupting overall traffic flow.

- **Bandwidth Aggregation**: DMPO performs per-packet load balancing across all available links, considering real-time WAN performance to optimize path selection. It ensures proper resequencing at the destination to maintain packet order and flow integrity.

- **On-Demand Remediation (Key Differentiator)**: When application-aware per-packet steering is not feasible—due to single or multiple problematic links—DMPO provides on-demand remediation. This includes high-priority traffic support through FEC, jitter buffering for real-time applications, and TCP NACK for file transfers.

Security

As mentioned in Section 1: Primary Pain Points, security is a major concern for healthcare organizations. Protecting highly sensitive data is paramount, especially with the reliance on broadband links to connect non-primary offices. SD-WAN addresses these concerns by allowing healthcare IT managers to apply network-wide business and security policies, integrate local, third-party, and cloud security services as needed, and extend the WAN perimeter. While more info can be found here on how VeloCloud SD-WAN Helps Organizations Attain HIPAA Compliance, let's highlight few major points here:

The **Enhanced Firewall** on the VMware VeloCloud SD-WAN Edge, equipped with IPS, IDS, URL filtering, and malicious IP reputation capabilities, can handle internet-bound traffic locally, eliminating the need to route all traffic through a central point. This flexibility allows customers to choose an integrated solution that combines VMware VeloCloud SD-WAN for networking needs with Velocloud SSE by Symantec or other SSE partners for security enforcement.

Segmentation separates different types of network traffic from each other and prioritizes certain traffic over others. With VeloCloud 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.

VeloCloud SD-WAN's granular application recognition and business policy features simplify the complexity of VPN tunnels and PKI infrastructure management found in traditional WAN architectures. The secure and scalable cloud-based SD-WAN PKI infrastructure can be activated with a single click in the VeloCloud SD-WAN Orchestrator, creating VPN tunnels as needed to cover branch-to-branch, branch-to-data-center, and any-location-to-cloud traffic patterns.

Velocloud SSE by Symantec helps safeguard sensitive patient data by integrating advanced security features like encryption, threat detection, data loss prevention into a network with single vendor SASE capability ensuring compliance with HIPAA regulation.

Quality of Service (QoS)

Patients and doctors expect seamless voice and video communication to ensure continuous care across any device, anytime. For telehealth providers, maintaining reliable connectivity is crucial to comply with HIPAA regulations. VMware VeloCloud SD-WAN addresses this need by safeguarding VOIP traffic from latency, packet loss, and jitter, and by providing effective remediation when issues arise. VMware VeloCloud SD-WAN offers substantial benefits to healthcare organizations aiming to optimize, scale, and secure their networks, making it a transformative solution for those who adopt it

Work from Anywhere

Velocloud SD-WAN empowers enterprise employees to work remotely—securely, easily, and productively, this customer case study provides info on how customer are not only able to extend the same level of user experience to radiologist's home as if they are working onsite but also increase number of scans per day allows to see more patients. **Velocloud SD-Access client** is a simple, secure, and high-performance remote access service to securely connect users "on the go", headless endpoints i.e Patient Check-in Kiosks etc. without hardware edges while providing visibility and insight into the user's application experience using integrated AIOps.

Interoperability with legacy network

VeloCloud SD-WAN can integrate with legacy networks using traditional routing protocols. Interoperating between SD-WAN and non-SD-WAN environments is a key differentiator during phased approaches for VeloCloud .Traffic from an SD-WAN site to Legacy / non-SD-WAN sites can be forwarded either directly to the Legacy site using the MPLS underlay network or backhauled via the SD-WAN Hub at the Datacenter using the SD-WAN overlay.

Simplified Mergers and Acquisitions

By leveraging Velocloud SD-WAN, healthcare organizations can manage complexities of M&A more effectively, ensuring smooth transition, enhanced operational efficiency and robust security across the newly unified network. It's built-in Segmentation feature

plays a crucial role in supporting healthcare M&A by allowing rapid integration of different networks. 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.

Native Multicast support

Healthcare applications, such as the Informacast mass notification system and Philips bedside monitors, rely on multicast traffic. VMware VeloCloud SD-WAN supports these applications by handling multicast both natively within its SD-WAN tunnel and through GRE tunnels encapsulated within the SD-WAN. This capability ensures seamless operation and integration of critical healthcare applications.

Zero Touch Provisioning

The challenge in the healthcare industry is how quickly and securely organizations can turn up new sites or integrate recently acquired sites. With VeloCloud SD-WAN, healthcare organizations are able to extend the SD-WAN network architecture to new sites via true Zero Touch Provisioning (ZTP) capability. With ZTP, SD-WAN sites can be turned up in a matter of minutes vs. weeks or months that it takes in bringing up traditional WAN routers. 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 that each site 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 templates/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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