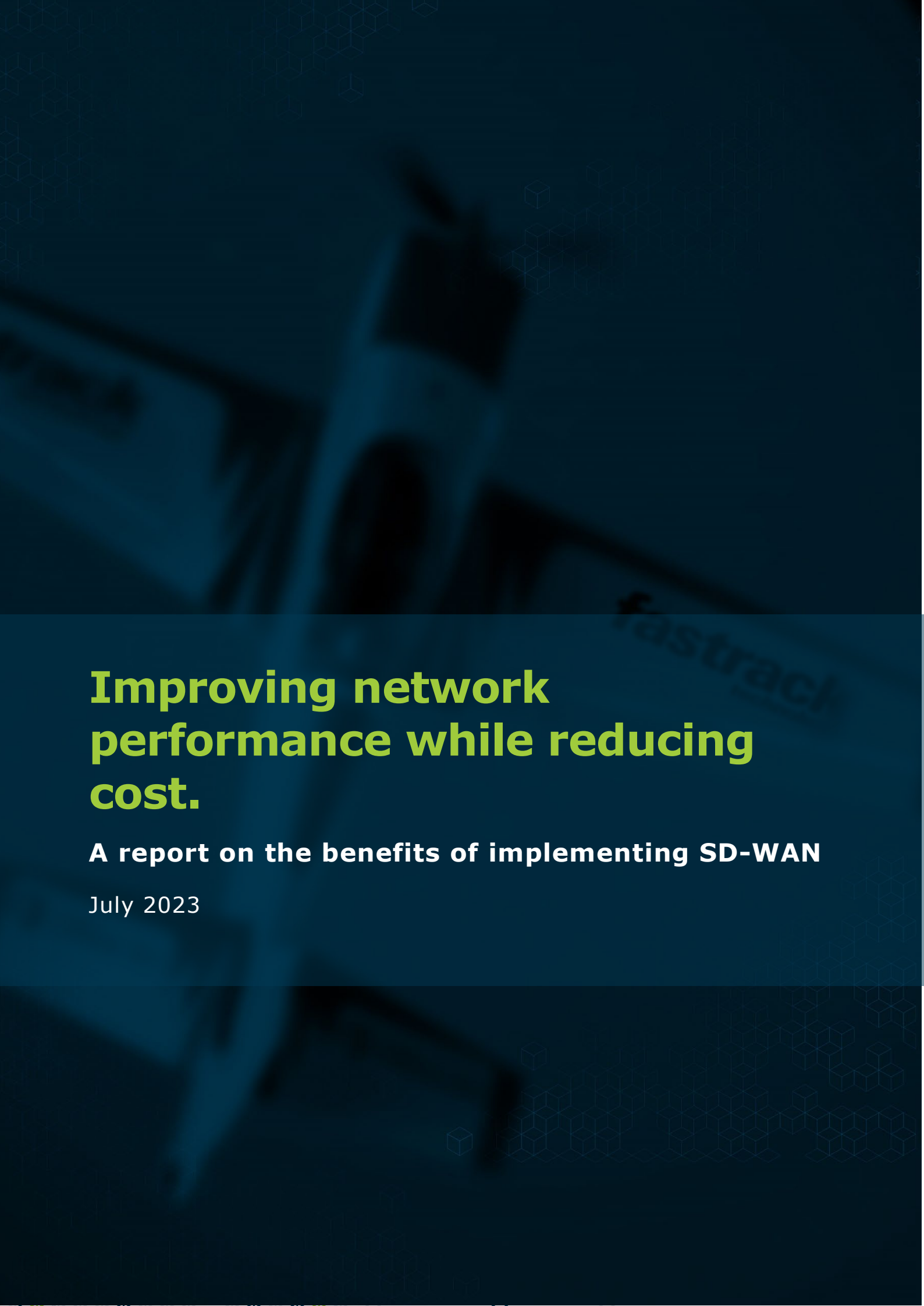

Improving network performance while reducing cost.

A report on the benefits of implementing SD-WAN

July 2023

Contents

Abstract 3

What is SD-WAN Architecture? 3

Additional Benefits of SD-WAN Architecture 4

SD-WAN and Performance Improvement 4

Improved network performance by optimizing traffic flow. 4

Leveraging multiple WAN connections. 4

SD-WAN and Cost-Reduction 5

Deployment models 6

Hub-and-Spoke Deployment Model: 6

Full-Mesh Deployment Model: 6

Hybrid Deployment Model: 6

Cloud-Centric Deployment Model: 6

On-Premises and Cloud Integration: 7

Best practices for implementing an SD-WAN solution. 7

Comprehensive Network Assessment: 7

Prioritize Security Considerations: 7

Bandwidth Management and Traffic Prioritization: 7

Redundancy and Failover Mechanisms: 7

Continuous Monitoring and Analytics: 8

User Training and Change Management: 8

Vendor and Service Provider Evaluation: 8

Conclusion 8

Abstract

SD-WAN (Software-Defined Wide Area Network) architecture is a transformative technology that has disrupted the traditional networking model. It allows organizations to easily and dynamically manage their WAN (Wide Area Network) by leveraging software-defined networking (SDN) principles. This allows businesses to improve network performance, reduce costs, and increase flexibility and agility.

In this whitepaper, we will delve into the details of SD-WAN architecture, discussing its key components, benefits, and challenges. We will also explore various deployment models and best practices for implementing an SD-WAN solution.

What is SD-WAN Architecture?

At its core, SD-WAN is a virtualization technology that decouples the network hardware from its control and management. This allows network administrators to manage and control the network through a centralized software controller, rather than through individual hardware devices.

The SD-WAN architecture consists of several key components, including the SD-WAN controller, the network edge, and the network core.

SD-WAN controller

The SD-WAN controller is the central point of management for the SD-WAN network. It is responsible for orchestrating the various components of the network and providing visibility into network performance and usage.

The SD-WAN controller typically resides in the cloud and is accessed via a web-based interface. This allows organizations to easily manage their network resources from a central location, without the need for on-premises hardware.

Network edge

The network edge refers to the devices located at the network perimeter, such as routers and switches. In an SD-WAN network, these devices are typically managed by the SD-WAN controller, allowing organizations to easily deploy and configure them without the need for specialized training or expertise.

The network edge devices are responsible for connecting the local LANs at each location to the WAN, and for routing traffic between the LANs and the WAN. They also provide security and performance optimization features, such as firewalling and Quality of Service (QoS) policies.

Network core

The network core refers to the underlying network infrastructure that connects the various locations in the WAN. In an SD-WAN network, this typically includes broadband, 4G/LTE, and MPLS links.

The network core is responsible for providing the necessary bandwidth and connectivity to support the various applications and services running on the WAN. It also provides routing and traffic management capabilities, allowing the SD-WAN controller to intelligently route traffic across the available links.

Additional Benefits of SD-WAN Architecture

1. Increased flexibility and agility:
    a. With an SD-WAN architecture, organizations can easily and quickly add, modify, or remove network connectivity without the need for complex configuration changes. This allows for greater flexibility and agility in responding to changing business needs.
2. Improved security:
    a. The centralized control and management of the network controller allows for enhanced security capabilities, such as dynamic segmentation and the ability to monitor and control network traffic.
3. Reduced costs: SD-WAN allows organizations to leverage a mix of connectivity options, such as MPLS and broadband internet, to create a cost-effective WAN solution. Additionally, the virtualization of edge devices reduces the need for expensive hardware, leading to further cost savings.

SD-WAN and Performance Improvement

By leveraging the centralized control and management of the network controller, SD-WAN can also help improve your network performance by optimizing traffic flow and ensuring that critical applications receive the necessary bandwidth and priority. This can lead to better user experience and productivity, and fewer network outages with dynamic and intelligent routing of traffic across the network.

Improved network performance by optimizing traffic flow.

With SD-WAN, traffic is automatically routed over the most optimal path based on network conditions, such as bandwidth, latency, and packet loss. This can help reduce network congestion and improve application performance. In addition, SD-WAN can prioritize mission-critical applications over less important traffic, ensuring that important data is delivered first.

Better visibility into the network.

With SD-WAN, IT teams can monitor network traffic in real-time, allowing them to identify bottlenecks and performance issues quickly. This can help reduce downtime and ensure that the network is performing at its best. In addition, SD-WAN can provide insights into application usage and bandwidth consumption, allowing IT teams to make informed decisions about network capacity and performance.

Leveraging multiple WAN connections.

With SD-WAN, organizations can use multiple internet connections, such as DSL, cable, and cellular, to create a more resilient and high-performing network. SD-WAN can automatically route traffic over the most optimal path, based on network conditions, ensuring that data is delivered quickly and reliably.

Reducing the reliance on backhauling traffic through a central data center.

With SD-WAN, traffic can be directed directly to the internet, or to the nearest cloud service, reducing the latency associated with backhauling traffic to a central location. This can improve application performance and reduce the strain on the network.

Providing a more agile and flexible network infrastructure.

SD-WAN can quickly adapt to changing network conditions, such as adding new locations or integrating with cloud services, without the need for costly and time-consuming network upgrades. This can help organizations to respond more quickly to changing business needs and provide a more responsive network environment.

Overall, SD-WAN can improve network performance by optimizing traffic flow, providing better visibility into the network, leveraging multiple WAN connections, reducing backhauling traffic, and providing a more agile and flexible network infrastructure. These benefits can help organizations to ensure that their network is performing at its best, reducing downtime, improving application performance, and providing a better user experience.

SD-WAN and Cost-Reduction

SD-WAN can help your organization save money by reducing the cost of expensive private networks and proprietary hardware. It does this by using the internet to connect your branch offices, data centers, and cloud environments, which is typically much cheaper than using private networks.

- Traditional private networks typically require dedicated leased lines or MPLS (Multiprotocol Label Switching) circuits to connect different locations, which can be expensive to set up and maintain. In addition, private networks often require proprietary hardware, which can be costly to purchase and deploy.
- SD-WAN, on the other hand, leverages the public internet to connect different locations, which is often less expensive than dedicated leased lines or MPLS circuits. In addition, SD-WAN can use low-cost, commodity hardware instead of expensive proprietary devices, which can further reduce costs
- By using SD-WAN, organizations can also reduce their dependency on expensive network services providers, such as telecom companies, and instead use the internet to connect their locations. This can lead to significant cost savings over time, especially as organizations continue to expand and add new locations.
- Moreover, SD-WAN can also help reduce costs related to network management and operations. Since SD-WAN solutions often come with a centralized management platform, IT teams can manage and monitor the network more efficiently, without the need for dedicated personnel at each location. This can help reduce staffing costs and streamline network management.

Overall, SD-WAN can help organizations **save money** by reducing the cost of expensive private networks and proprietary hardware, while also providing better network performance and agility. This is why many organizations are increasingly turning to SD-WAN to modernize their network infrastructure and drive cost savings.

Deployment models

1. Hub-and-Spoke Deployment Model
2. Full-Mesh Deployment Model
3. Hybrid Deployment Model
4. Cloud-Centric Deployment Model
5. On-Premises and Cloud Integration

Hub-and-Spoke Deployment Model:

The hub-and-spoke SD-WAN deployment model is a centralized architecture where the main hub serves as the central point for network management and control. Spoke locations, such as branch offices or remote sites, connect to the hub for access to applications and data. This model offers simplified management, as network administrators can make configuration changes and apply security policies from the central hub, ensuring consistency across all spokes. Additionally, it optimizes traffic flow, enabling efficient use of network resources by routing data through the hub to its intended destination.

Full-Mesh Deployment Model:

The full-mesh SD-WAN deployment model is a decentralized approach where each site directly connects to every other site within the network. This creates multiple direct paths between locations, enhancing redundancy and fault tolerance. Full-mesh is particularly beneficial for organizations with heavy data exchange between sites, as it minimizes latency and offers high availability. However, this model may require more complex configurations and could be costlier to implement due to increased hardware and bandwidth requirements.

Hybrid Deployment Model:

The hybrid SD-WAN deployment model combines the advantages of both hub-and-spoke and full-mesh models. In a hybrid approach, critical locations with high data exchange requirements use a full-mesh configuration to ensure optimal connectivity. Meanwhile, less critical sites can connect through a hub-and-spoke setup, offering cost-effectiveness and simplified management. This model is ideal for enterprises with diverse site requirements, allowing them to tailor their SD-WAN architecture based on individual location needs.

Cloud-Centric Deployment Model:

As cloud adoption continues to soar, the cloud-centric SD-WAN deployment model gains popularity. This model optimizes traffic flow by routing data directly to the cloud service providers, bypassing the traditional backhauling approach. By connecting users directly to cloud resources, organizations can reduce latency, enhance application performance, and improve the overall user experience. This deployment model is well-suited for businesses heavily reliant on cloud-based applications and services.

On-Premises and Cloud Integration:

Some organizations may opt for a deployment model that integrates on-premises and cloud-based SD-WAN solutions. This hybrid approach allows seamless connectivity between in-house applications and cloud resources. It offers the flexibility to adapt to evolving business requirements and ensures secure and efficient data flow across the entire network.

Selecting the most suitable SD-WAN deployment model depends on factors such as the organization's size, network complexity, data exchange patterns, and budgetary constraints. A thorough assessment of the existing infrastructure and future growth projections will guide businesses in making informed decisions for successful SD-WAN implementation.

Best practices for implementing an SD-WAN solution.

1. Comprehensive Network Assessment
2. Prioritize Security Considerations
3. Bandwidth Management and Traffic Prioritization
4. Redundancy and Failover Mechanisms
5. Continuous Monitoring and Analytics
6. User Training and Change Management
7. Vendor and Service Provider Evaluation

Comprehensive Network Assessment:

Before embarking on an SD-WAN implementation, conduct a detailed network assessment to understand the existing infrastructure, traffic patterns, and application requirements. This evaluation will help identify potential bottlenecks, security vulnerabilities, and areas for optimization. Armed with this insight, organizations can design a tailored SD-WAN solution that maximizes performance and efficiency.

Prioritize Security Considerations:

Security should be a paramount concern in any SD-WAN implementation. While SD-WAN provides inherent security benefits, such as centralized management and dynamic segmentation, additional measures are essential. Implement strong encryption protocols, next-generation firewalls, and intrusion detection systems to safeguard data against cyber threats. Regular security audits and updates are vital to stay ahead of evolving security risks.

Bandwidth Management and Traffic Prioritization:

One of the primary advantages of SD-WAN is efficient bandwidth utilization. Configure the SD-WAN controller to prioritize critical applications and real-time services, ensuring they receive the necessary bandwidth and low latency. By intelligently managing traffic, organizations can prevent network congestion and maintain consistent application performance.

Redundancy and Failover Mechanisms:

SD-WAN's resilience lies in its ability to support multiple WAN links. Implement redundancy and failover mechanisms to ensure uninterrupted connectivity even if one link experiences an outage. Redundancy enhances network reliability, minimizes downtime, and provides a seamless user experience.

Continuous Monitoring and Analytics:

Incorporate robust monitoring and analytics tools into the SD-WAN solution. Real-time insights into network performance, traffic patterns, and application usage empower IT teams to proactively detect issues and optimize network resources. These analytics aid in making data-driven decisions to enhance overall network efficiency.

User Training and Change Management:

Proper user training and change management are critical for a smooth SD-WAN adoption. Educate employees about the benefits of SD-WAN and how to leverage its features effectively. Address any concerns or questions they may have during the transition. Well-informed users contribute to increased productivity and successful SD-WAN implementation.

Vendor and Service Provider Evaluation:

When selecting an SD-WAN vendor or service provider, conduct a thorough evaluation of their capabilities, track record, and support services. Choose a vendor that aligns with the organization's specific requirements and offers reliable customer support.

By following these best practices, organizations can harness the full potential of SD-WAN, achieving enhanced network performance, cost savings, and agility while ensuring a secure and seamless user experience.

Conclusion

In this whitepaper, we have explored the transformative technology of SD-WAN (Software-Defined Wide Area Network) architecture and its profound impact on modern networking. By leveraging software-defined networking (SDN) principles, SD-WAN offers organizations the ability to revolutionize their Wide Area Network (WAN) management, leading to enhanced performance, reduced costs, and increased agility.

The core of SD-WAN lies in its virtualization technology, decoupling network hardware from its control and management. This centralizes network administration through the SD-WAN controller, streamlining configuration and providing unparalleled visibility into network performance and usage.

Throughout, we delved into the key components of SD-WAN architecture, including the SD-WAN controller, network edge, and network core. We explored the benefits of SD-WAN, such as increased flexibility, improved security, and significant cost reduction. Additionally, we discussed how SD-WAN optimizes network performance through intelligent traffic routing and better visibility.

Deployment models were another essential inclusion, presenting various approaches for implementing SD-WAN. The hub-and-spoke model offers centralized control and easy management, while the full-mesh model enhances redundancy and fault tolerance. The hybrid model combines the strengths of both, and the cloud-centric model caters to cloud-centric businesses. Additionally, we explored the integration of on-premises and cloud-based solutions to adapt to diverse location requirements.

To ensure successful SD-WAN implementation, we provided a set of best practices. Conducting a comprehensive network assessment allows businesses to tailor the SD-WAN solution to their specific needs. Prioritizing security considerations safeguards critical data from cyber threats. Effective bandwidth management and traffic prioritization optimize application performance, and redundancy mechanisms ensure uninterrupted connectivity.

Continuous monitoring and analytics empower IT teams to detect issues proactively, and user training facilitates a smooth transition. A meticulous evaluation of vendors and service providers ensures the right fit for the organization's requirements.

In conclusion, SD-WAN architecture has ushered in a new era of networking, revolutionizing how organizations manage their WAN infrastructure. By adopting SD-WAN, businesses can unleash the true potential of their networks, driving growth, enhancing user experience, and achieving cost efficiencies. As technology continues to evolve, embracing SD-WAN becomes more than just an advantage; it becomes a strategic imperative for businesses seeking to thrive in an increasingly interconnected world.

The implementation of SD-WAN should be approached with a clear understanding of the organization's goals and requirements. With careful planning, adherence to best practices, and continuous adaptation, businesses can harness the full power of SD-WAN and propel themselves into a more agile, secure, and efficient future.

Thank you for reading.

If you would like to chat further with one of our team about SD-WAN and how it could be of benefit to you – contact us.