



WHITE PAPER

Next Generation Black Core

Unifying Federal Enterprise and
Mission Transport Networks

Executive Summary

Next Generation Black Core offers a transformative solution for unifying transport networks and Software-defined Wide Area Network (SD-WAN) overlays.

This approach eliminates the problem of disjointed wide area networks (WANs) in larger enterprise environments, which often results from scaling proprietary solutions across complex WAN architectures. It is an issue that frequently affects larger federal agencies as they modernize to address an expanding set of mission use cases. Next-Gen Black Core enables a unified WAN architecture by leveraging the best modern technologies and solutions in the right places across a diverse and complex WAN landscape. This white paper discusses how Next-Gen Black Core simplifies WAN integration, management, and routing policies, ensuring optimal business and mission outcomes.

Background

The WAN is a central component of any organization's network and IT architecture. It serves as the main conduit for connecting an expanding range of critical elements, including the network edge, multi-cloud environments, applications, customers, and mission. Network architects are tasked with providing both intelligent and secure connectivity in this increasingly complex landscape, where reliable network connectivity is essential. This often necessitates building bespoke networks between various resources, data centers, clouds, edge networks, customers, and partners.

As organizations strive to modernize their WAN architectures to find more cost-effective and agile solutions for growing connectivity needs, legacy MPLS networks are being replaced with SD-WAN. SD-WAN leverages Software-Defined Networking (SDN) principles and the availability of cheaper public bandwidth to automate operations, reduce WAN transport costs, and create a more flexible architecture. Despite these benefits, SD-WAN has limitations and has not fully replaced all the capabilities of legacy MPLS networks.

Challenges with Current SD-Wan Technologies

Here's a quick snapshot of the challenges with SD-WAN technologies:

01 | Underlay Network Requirement

Underlay networks are still required to transport SD-WAN enabled networks. SD-WAN is an overlay that does not directly address customers with large private infrastructure investments.

02 | Lack of Control over Outsourced WAN Underlays

With outsourced WAN underlays, customers do not control the underlay network carrying SD-WAN implementations, which can impact reliability needed for mission critical traffic. SD-WAN overlays are only as good as the underlay they traverse. Even worse, the organization has neither visibility nor control over those underlays.

03 | Operational Complexity of Tunneling

SD-WAN requires tunneling between each edge to achieve secure connections. Creating and maintaining this tunneling overlay results in significant operational complexity and load that can impact performance.

04 | Service Limitations

Unlike MPLS networks, SD-WAN implementations are limited to the types of network services that can be transported over them (e.g., L3VPN services only).

05 | Proprietary Control Planes

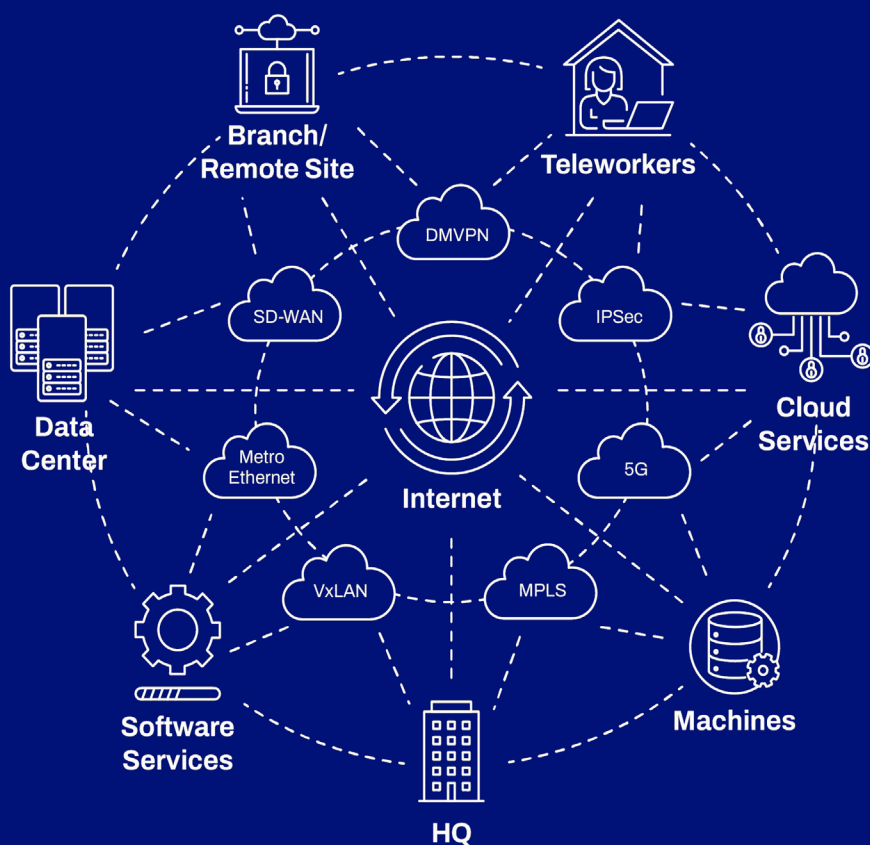
Due to the proprietary nature of most SD-WAN Original Equipment Manufacturer (OEM) control planes, it is difficult to integrate SD-WAN fabrics between different OEM solutions. This limits flexibility in building a unified WAN architecture when disparate WAN technologies may be needed.

Even with its shortcomings, SD-WAN remains a viable and useful solution for many organizations and use cases. However, for larger global enterprises or federal agencies, the belief that SD-WAN can fully modernize and replace their current WAN requirements may not be realistic. Vendors and OEMs have contributed to confusion in the marketplace by over-marketing SD-WAN capabilities as a one-size-fits all solution for all customer types and use cases.

The use of both legacy and SD-WAN technologies often results in a hodgepodge of disparate WAN technologies that large enterprises and federal agencies must navigate to meet diverse WAN requirements and use cases. As modern networks expand and become more elastic,

Below are several pain points resulting from disparate WAN technologies:

- No unified routing policy spanning both underlay and overlay
- networks. Multiple management systems (i.e., no single pane of glass).
- Manual integration and stitching between WAN technologies.
- Multiple WAN technology protocol stacks to maintain and operate.
- Complex and disparate WAN architecture.

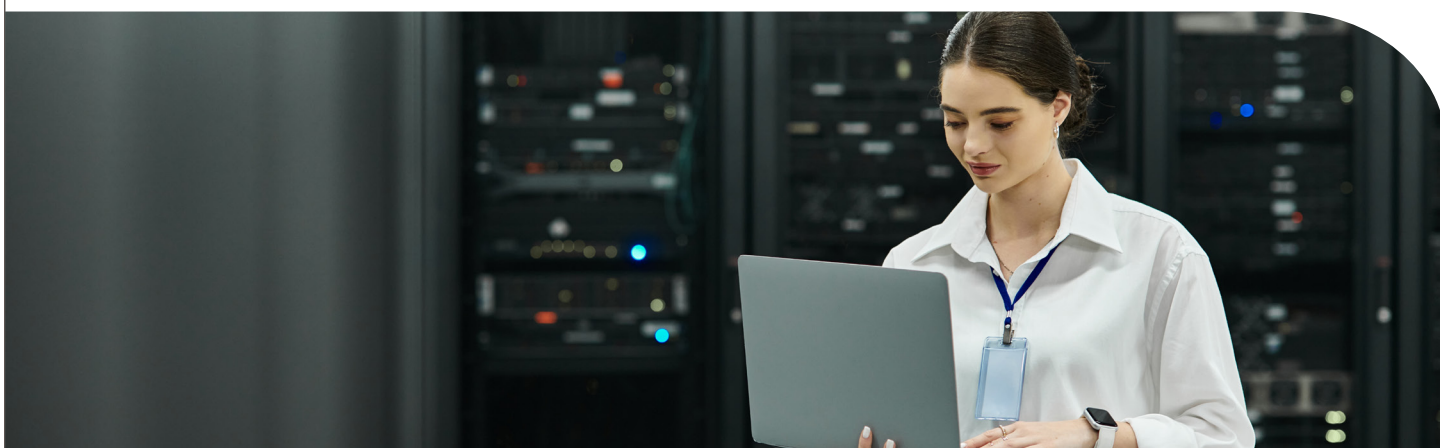


Next-Gen Black Core

In recent years, WAN technologies traditionally used by Service Providers (SP) have become more accessible to enterprise customers. This shift has been driven by advancements in network automation, orchestration tools, and newer Software Defined SP technologies like Segment Routing over IPv6 (SRv6), which have greatly simplified protocol stacks over legacy MPLS environments. These advancements have made SRv6 viable for larger enterprise customers and a crucial component of the Next Gen Black Core solution.

The key concept of Next-Gen Black Core is the integration of SD-WAN overlays (typically positioned at the WAN edge) with Software-Defined SRv6, unifying both underlay and overlay networks (typically positioned as an agnostic middle-mile transport). This integration and orchestration of various software-defined networks eliminate complex manual stitching and provide end-to-end inter-service and inter-domain capabilities. By integrating and orchestrating various software defined networks (i.e., SD-WAN & SRv6), large enterprises and federal agencies can streamline operations, unify their WAN architecture across disparate networks, and reduce operational complexity while maintaining the flexibility to introduce multiple vendors and technologies based on business and mission needs.

The modular concept of using the right software-defined WAN technology in the right place within the WAN architecture provides true unified business and mission capabilities within a single platform. Automation and global orchestration seamlessly integrate SD-WAN edge and SRv6 middle-mile technologies, enhancing end-to-end SLAs and service chaining capabilities. This ensures security is delivered in an agile and dynamic manner to protect data and users quickly and efficiently. Additionally, it provides greater visibility, reliability, and control as SRv6 unifies overlay and underlay networks, offering all the capabilities of legacy MPLS within an SDN architecture.



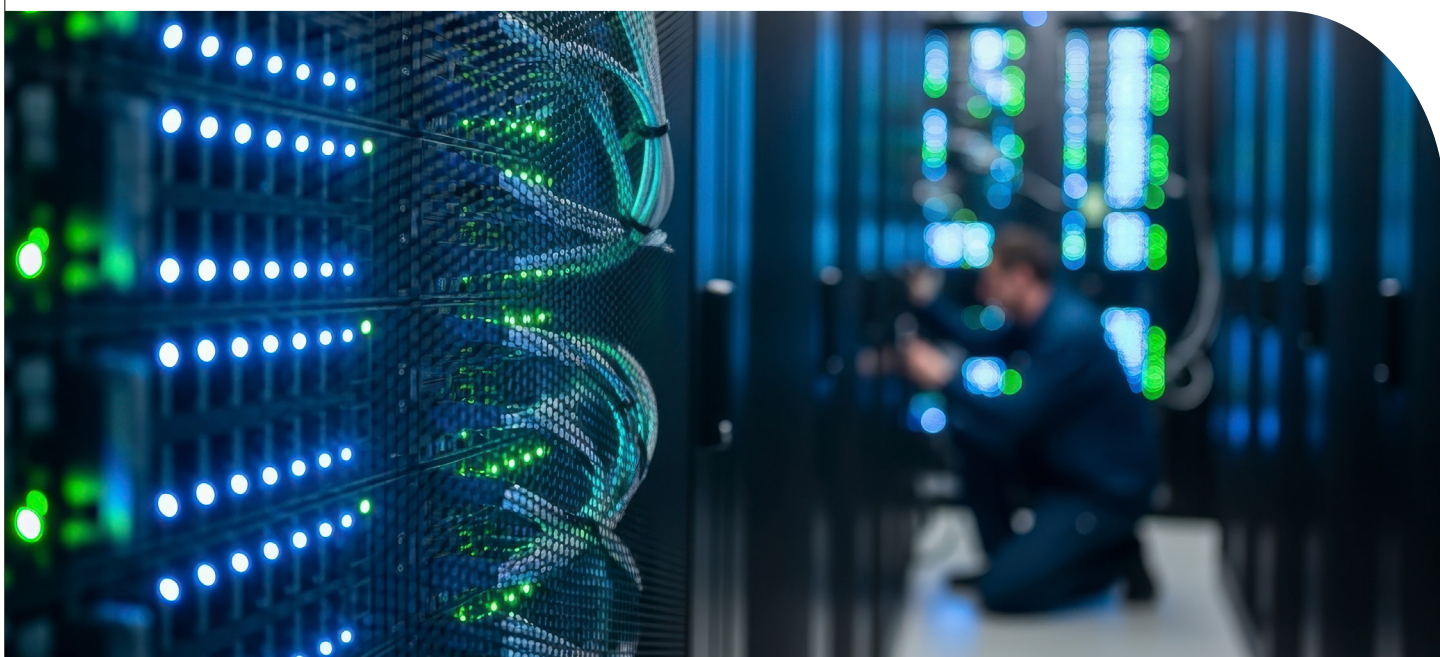
SD-WAN Edge

Designed as an edge WAN solution that unifies diverse underlay transports (e.g., public Internet, MPLS, 5G, SATCOM) that customers will not manage or control. This is typically ideal for connecting smaller fixed edge locations as well as episodic connections.

SRv6 Middle Mile

as a middle-mile transport to interconnect all regional SD-WAN fabrics. SRv6 uses traditional IPv6 forwarding principles as an open, agnostic transport for stitching together regional proprietary SD-WAN fabrics and legacy MPLS networks into a unified, standards-based intelligent networking fabric. SRv6 unifies both underlay and overlay networks, which is highly desirable for a middle-mile transport supporting critical mission traffic with granular control. In addition to providing an agnostic transport for regional SD-WAN fabrics, it offers mass scale, increased performance, and global interoperability for larger enterprises and federal agencies.

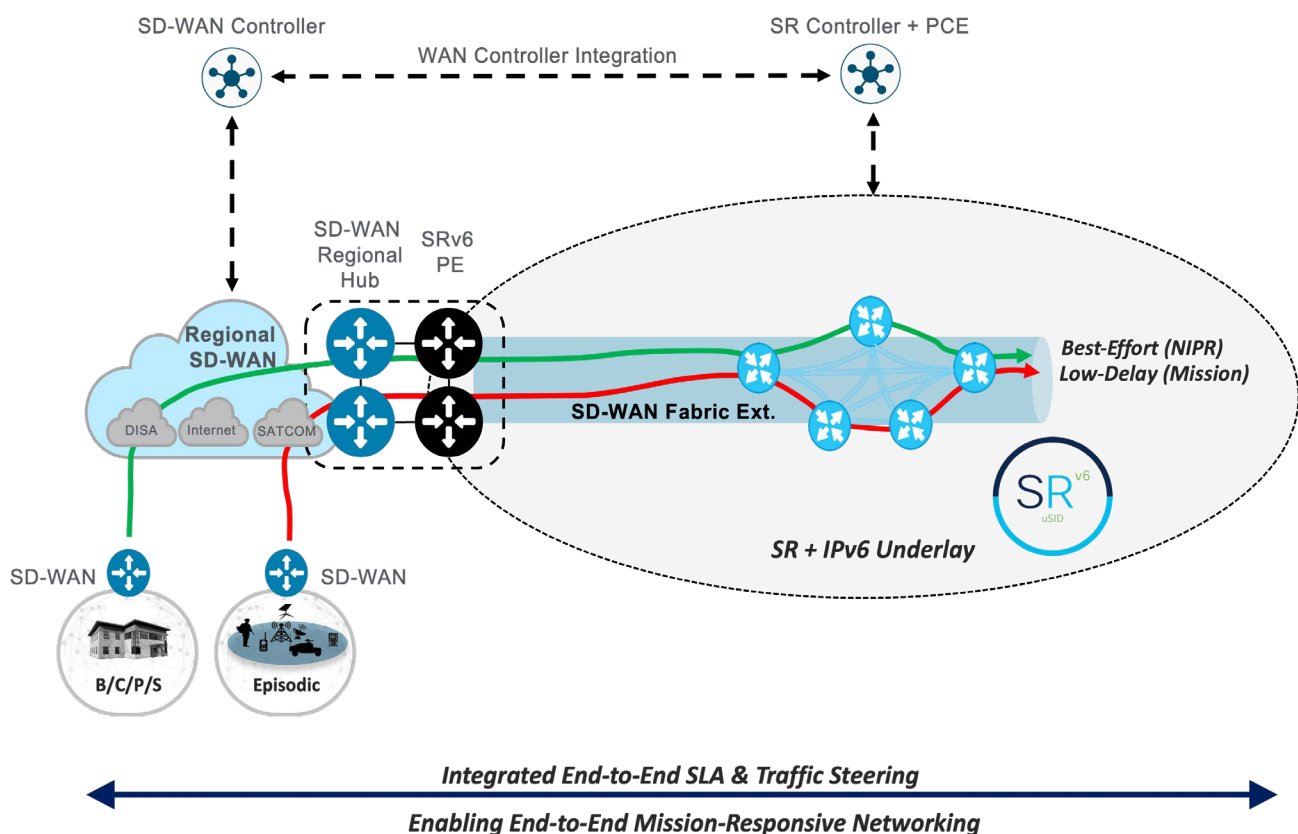
To support the development of Next-Gen Black Core, many vendors and OEMs are creating integrations and automated workflows to extend SD-WAN fabrics over SRv6. Additionally, they are developing SD-WAN to SRv6 gateway functionality, similar to the existing SRv6 and MPLS gateway functions currently implemented by several vendors and OEMs.



SD-WAN Over SRv6 Middle-Mile

Traditional SD-WAN solutions cannot perceive the underlying network resources. SD-WAN over SRv6 enables unified scheduling of “overlay” and “underlay” resources via programmable instructions. Through automated integrations, SD-WAN policies are mapped into transport SLAs (Segment Routing Traffic Engineering – SR-TE) to provide end-to-end SLAs and automated traffic steering. The combination of SD-WAN over SRv6 optimizes the use of high-performance underlays, as SD-WAN application performance is tied to end-to-end SLAs, which SRv6 can deliver based on per-hop behavior.

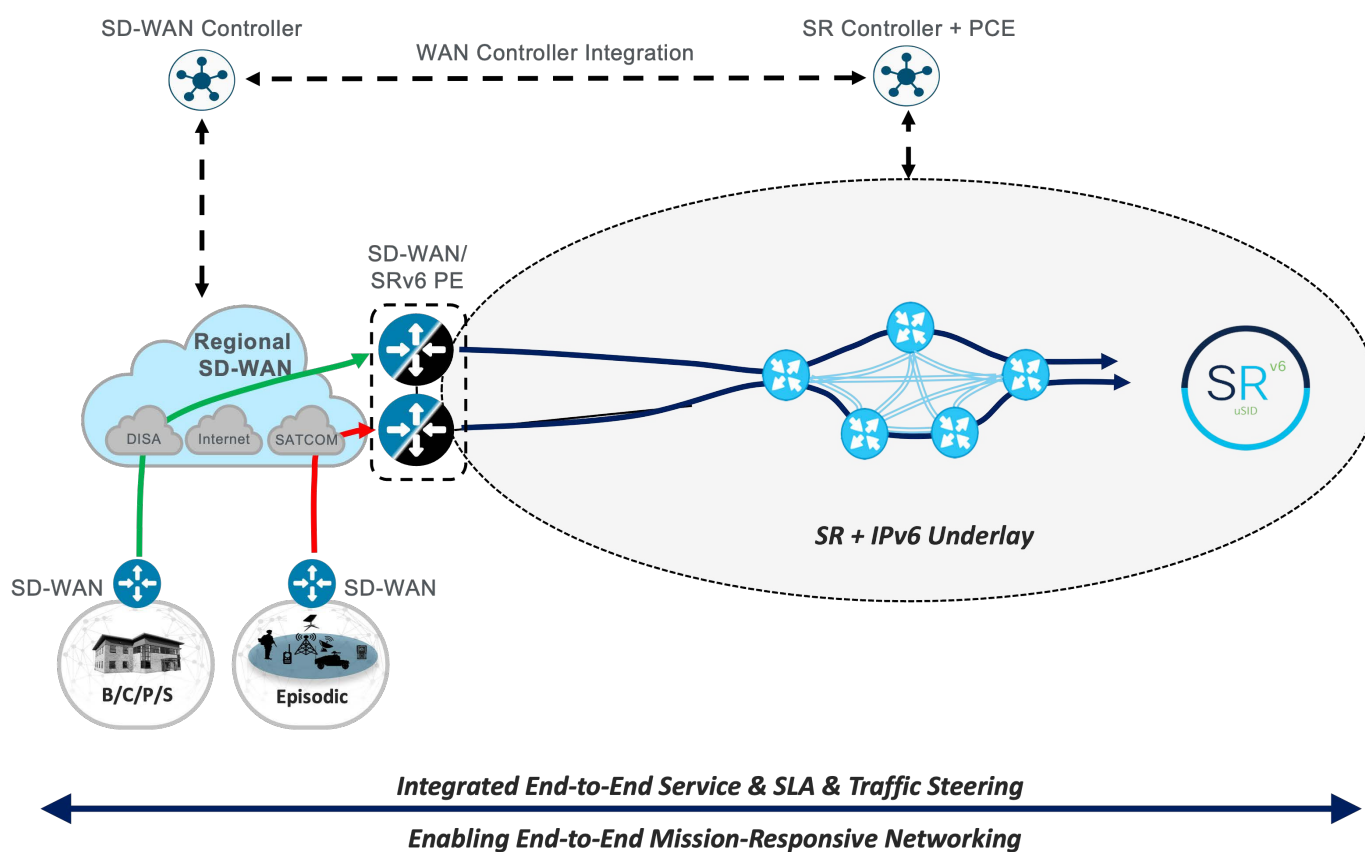
This solution equips federal agencies with a robust and integrated network architecture, ensuring optimal performance and reliability for mission-critical applications through automated and unified resource management.



SD-WAN & SRv6 Gateway

WAN & SRv6 GW can translate SD-WAN data plane protocols (e.g., GRE or IPSec) to the SRv6 data plane (IPv6). It supports automated workflows to map SD-WAN VPNs/VRFs and applications into SRv6 L3VPN services, enabling end-to-end internetworking between the two solutions. This capability is comparable to the IETF draft for the SRv6-to-MPLS GW feature (draft-agrawal-spring-srv6-mpls-interworking-11).

This integration allows federal agencies to maintain secure, high-performance communications across diverse network environments, ensuring seamless interoperability and agnostic mission capability.



Advantages of Next-Gen Black Core



Unified Transport

Unify enterprise and mission transports without the need for complex protocol and technology stitching.



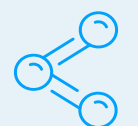
Optimized Technology Use

Leverage the right WAN technologies based on your organization's size and use cases, meeting the complex requirements of modern WAN environments.



Enhanced Scale and Performance

Improve the scale and performance of SD-WAN through regionalized fabrics interconnected via SRv6 middle-mile transport.



Seamless Integration

Achieve better integration across different SD-WAN fabrics, hybrid clouds, and legacy MPLS networks, with support for any service or application.



Programmable WAN

Utilize a fully programmable WAN protocol stack that allows for a high degree of automation and orchestration (i.e., Network as an API).



Agnostic Middle-Mile Core

Provide an agnostic middle-mile core for global interoperability within your enterprise and extranets.



Compliance

Build a network underlay based on traditional IPv6 with SRv6, aligning with the OMB mandate for federal agencies and addressing the challenges of diminishing IPv4 availability.



Future Proofing

Enable emerging agentic AI architectures by supporting continuous data exchange, low-latency decision loops, and dynamic service placement across edge, core, and cloud environments.

Conclusion

In summary, Next-Gen Black Core is a unified SDN transport approach that enables scalable programmatic control of WAN networks. BlueAlly stands ready to help federal customers understand how Next-Gen Black Core can transform and modernize their WAN architecture. As a thought leader in this field, we specialize in consulting, advising, and preparing customers for their WAN transformations.



[Contact us](#) today to learn how BlueAlly can help you streamline your compliance efforts and achieve your business goals now and in the future.