

OPTIMIZING SD-WAN Performance

Tunnel-Free vs. Tunnel-Based Solutions

Problem with Tunnel-Based SD-WAN



Issues with Tunnel-Based SD-WAN



Inefficient Bandwidth Utilization

Overhead in tunnels can consume 40%-100% more bandwidth, particularly affecting applications like VoIP.



Fragmentation and Latency

Tunnels add to packet size, causing fragmentation, which leads to packet drops, increased latency, and degraded performance.



Security Risks

Increased vulnerability to attacks, issues with DPI and firewall performance.

G.729

VOIP IP Packet 60 bytes



GRE



40%

IPSEC with GRE



123%

VXLAN



83%

Evasion Problems

Challenges in detecting unauthorized access

Security Risks

Vulnerabilities due to data fragmentation

Static Connectivity

The inability to adapt to changing network conditions

Challenges in Network Tunneling

Bandwidth Tax

The additional cost of data transmission

Scalability Issues

Difficulty in expanding network capacity

Fragmentation Risk

The potential for data loss during transmission

Benefits of Tunnel-Free SD-WAN



Bandwidth Efficiency

Eliminates bandwidth tax from tunnel overhead.



Reduced Fragmentation

No additional packet size from tunnel overhead.



Improved Scalability

Easily supports thousands of sessions, avoiding limitations of tunnel-based scaling.

Secure Vector Routing (SVR)



Introduction to SVR

A session-based routing approach for SD-WAN without tunnels.



Advantages

Enhances network security and efficiency by enabling precise, policy-driven routing decisions while maintaining data integrity and confidentiality across complex environments.



Enhanced Security

Uses NAT and metadata for improved privacy, supporting AES-128/256 encryption without re-encryption.



Hyper-Segmentation

Granular, session-based segmentation enhancing MPLS link utilization and potential cost savings.

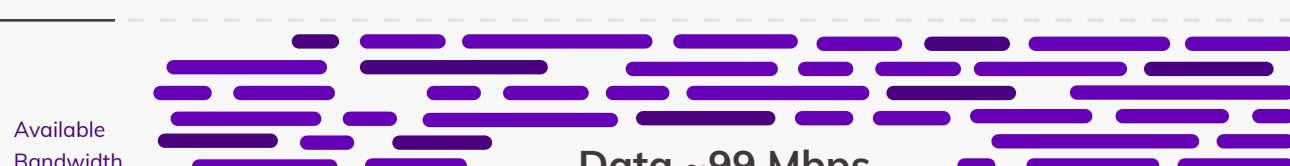
IPsec with GRE



Tunnel Overhead ~33Mbps

VS.

Secure Vector Routing



No Added Overhead

Transforming Network Efficiency

Stateless Network

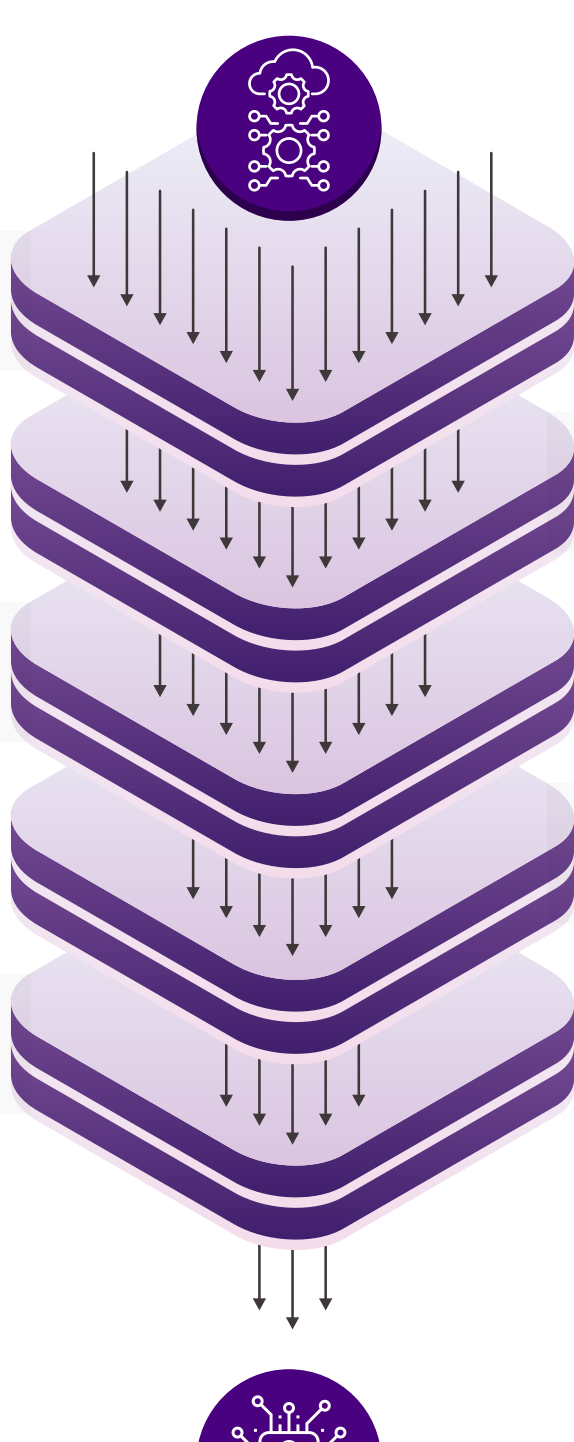
Session Awareness

Scalability Increase

Zero-Trust Security

Dynamic Routing

Cost Reduction



Efficient and Secure Network

40%

Packet Bandwidth Savings

100%

By removing the overhead burden and the need to process such overheads from CPE, the SD-WAN network becomes simple. SD-WAN CPE is more scalable yet less costly, resulting in potential capex savings.

Tunnel-free SD-WAN delivers scalable, dynamic connectivity, moving beyond the limitations of traditional tunnel-based approaches. With tunnel-free architecture, users gain efficient, any-to-any access without the performance and scalability constraints of tunnels. This service-centric approach empowers organizations to optimize SD-WAN performance and flexibility—redefining network efficiency for modern, distributed environments.