

# 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.

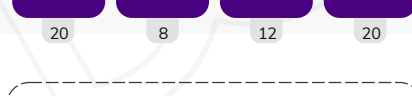


#### Security Risks

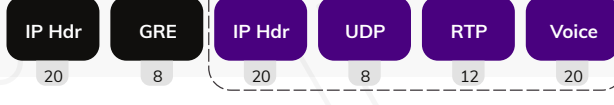
Increased vulnerability to attacks, issues with DPI and firewall performance.

G.729

VOIP IP Packet  
60 bytes

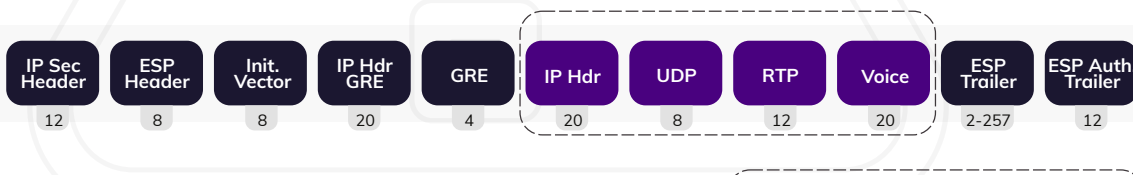


GRE



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

### Scalability Issues

Difficulty in expanding network capacity

### Bandwidth Tax

The additional cost of data transmission

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

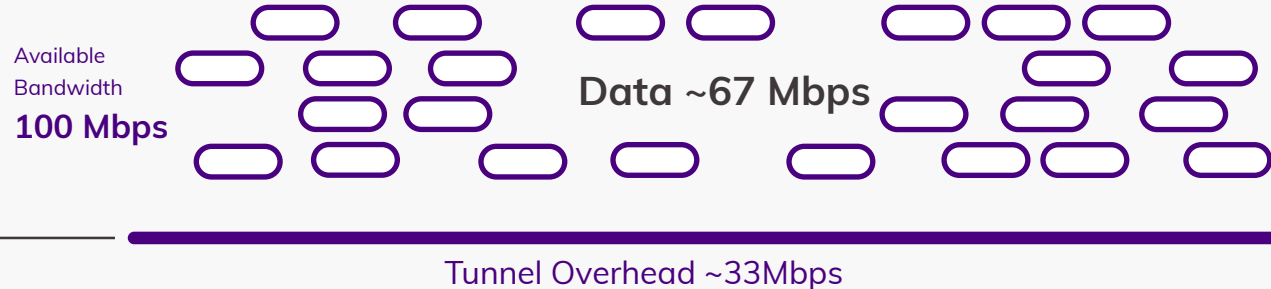
Uses NAT and metadata for improved privacy, supporting AES-128/256 encryption without re-encryption.



#### Hyper-Segmentation

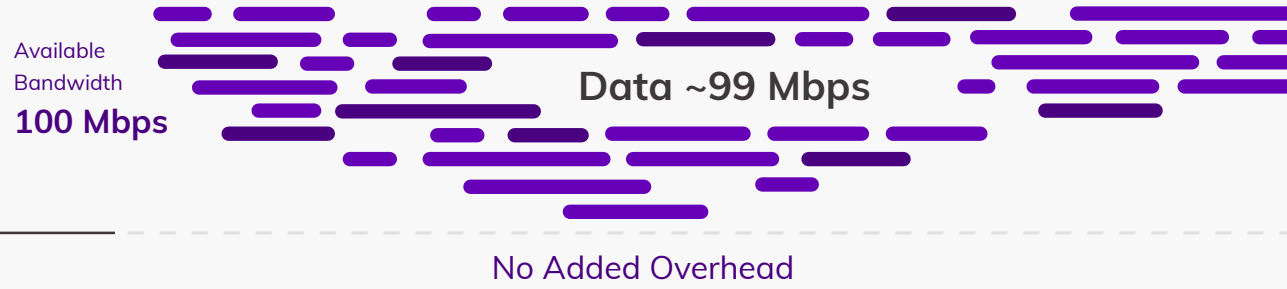
Granular, session-based segmentation enhancing MPLS link utilization and potential cost savings.

### IPsec with GRE



VS.

### Secure Vector Routing



## Transforming Network Efficiency

### Stateless Network

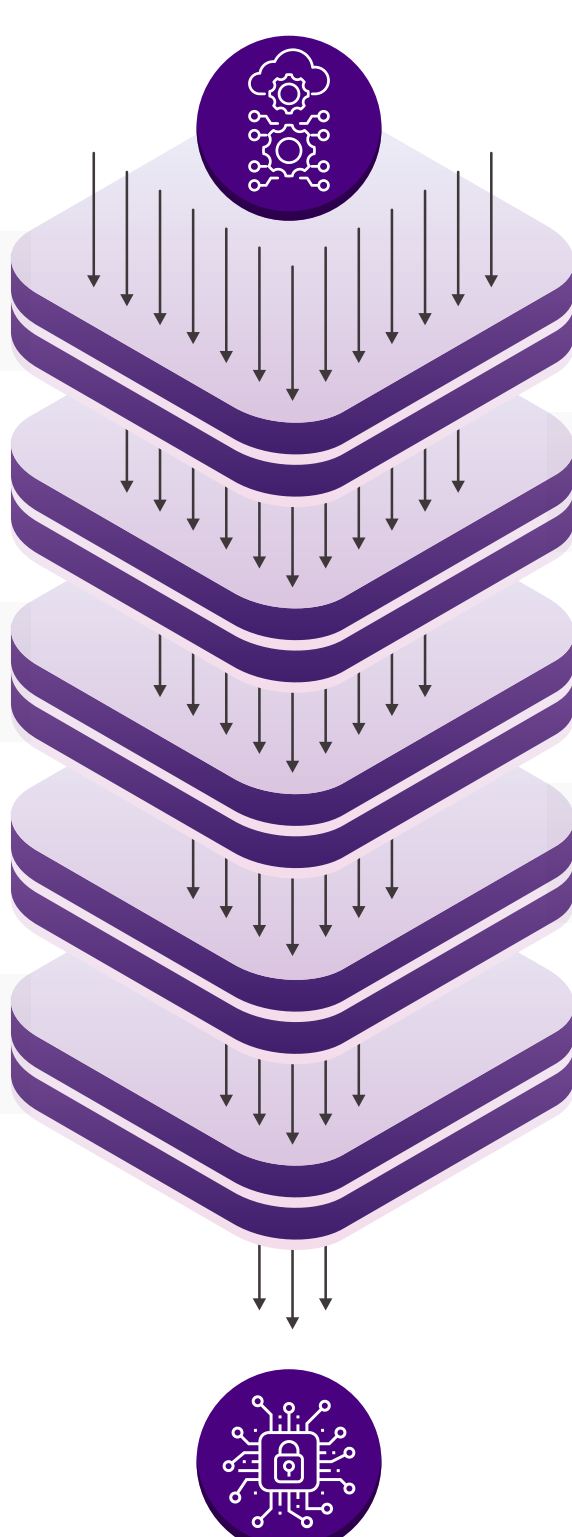
Session Awareness

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.