

# OPTIMIZING SD-WAN Performance

## Tunnel-Free vs. Tunnel-Based Solutions

### Problem with Tunnel-Based SD-WAN



#### Issues with Tunnel-Based SD-WAN



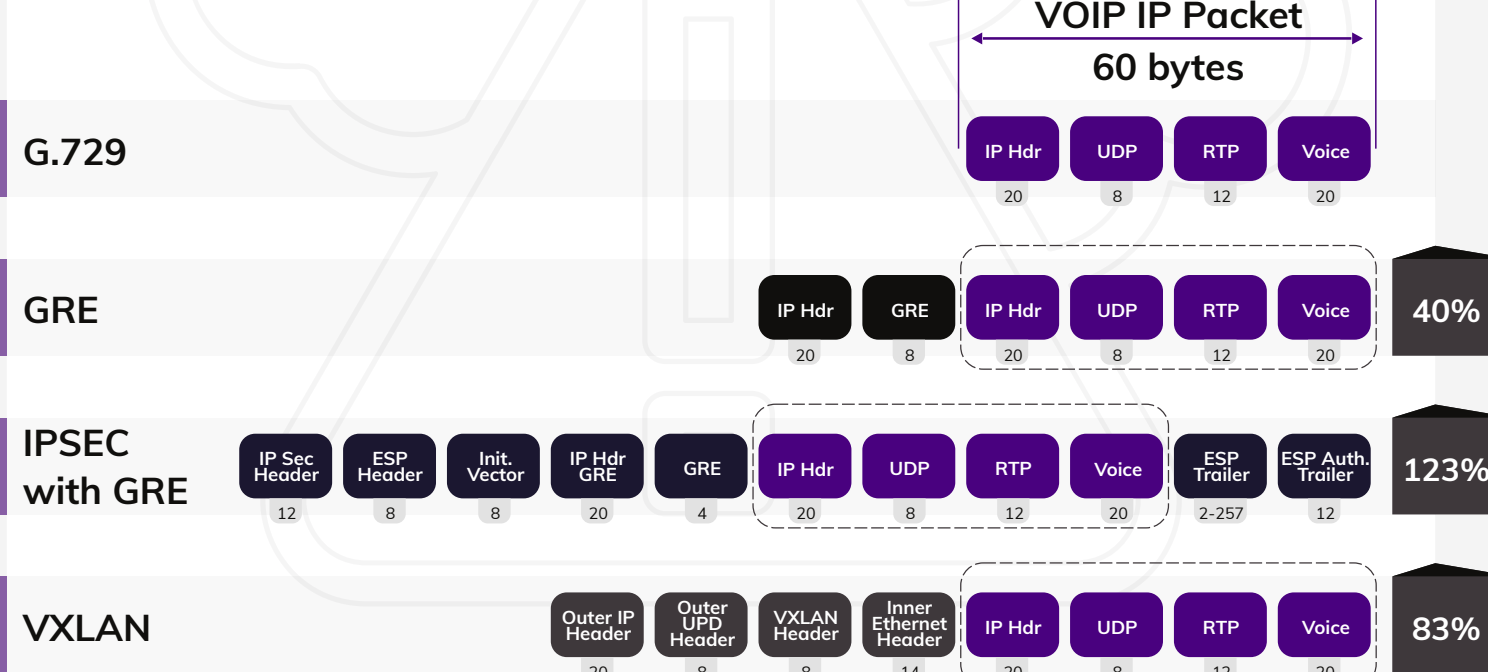
**Inefficient Bandwidth Utilization**  
Overhead in tunnels can consume 40%-100% more bandwidth, particularly affecting applications like VoIP.



**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.

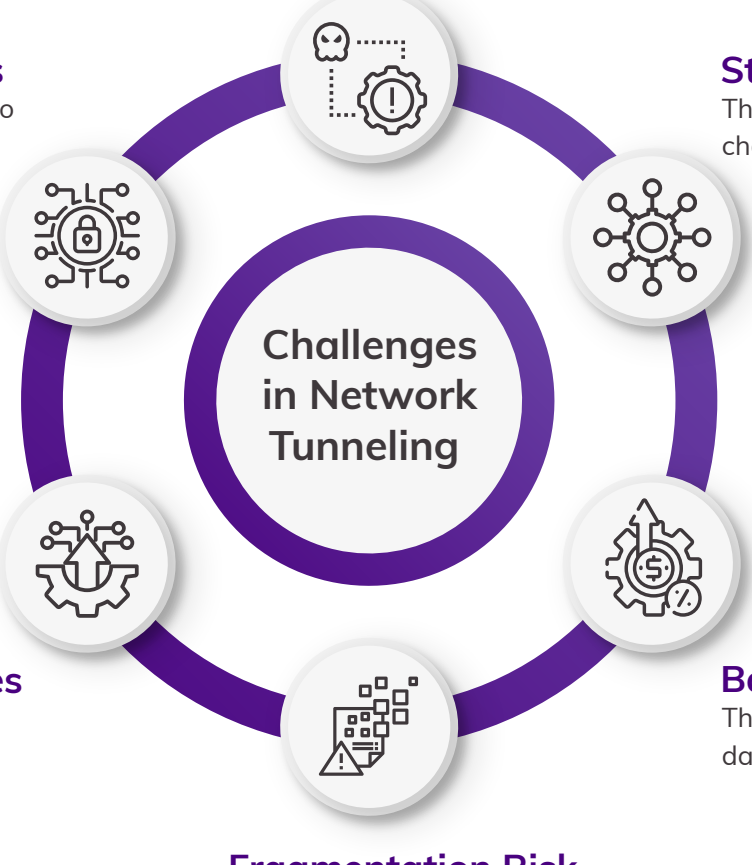


### Evasion Problems

Challenges in detecting unauthorized access

**Security Risks**  
Vulnerabilities due to data fragmentation

**Static Connectivity**  
The inability to adapt to changing network conditions



**Scalability Issues**  
Difficulty in expanding network capacity

**Bandwidth Tax**  
The additional cost of data transmission

**Fragmentation Risk**  
The potential for data loss during transmission

### Benefits of Tunnel-Free SD-WAN



**Bandwidth Efficiency**  
Eliminates bandwidth tax from tunnel overhead.

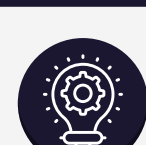


**Reduced Fragmentation**  
No additional packet size from tunnel overhead.



**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.

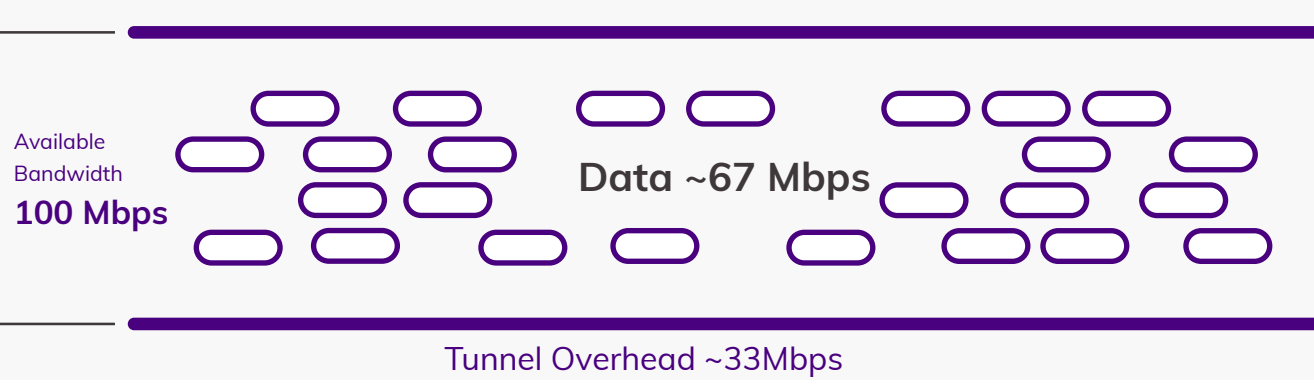


**Enhanced Security**  
Uses NAT and metadata for improved privacy, supporting AES-128/256 encryption without re-encryption.



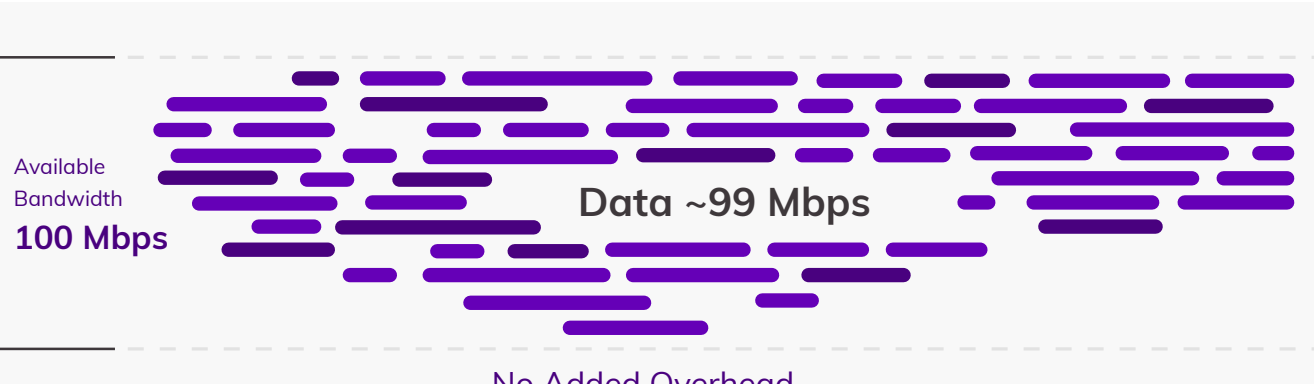
**Hyper-Segmentation**  
Granular, session-based segmentation enhancing MPLS link utilization and potential cost savings.

### IPsec with GRE



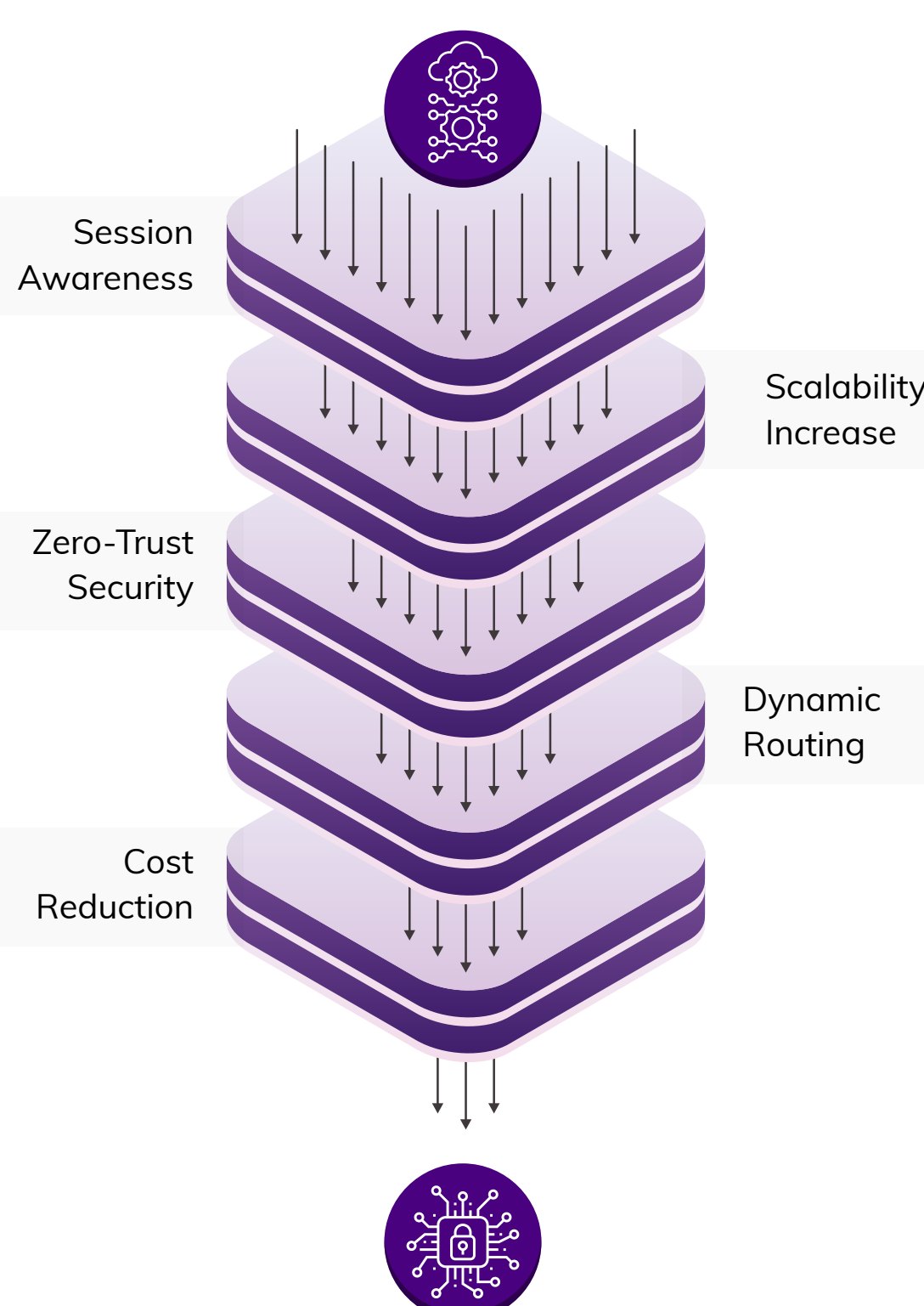
VS.

### Secure Vector Routing



### Transforming Network Efficiency

#### Stateless Network



40%

Packet Bandwidth Savings

100%

By removing the overhead burden from transport 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.