



VyOS
Networks

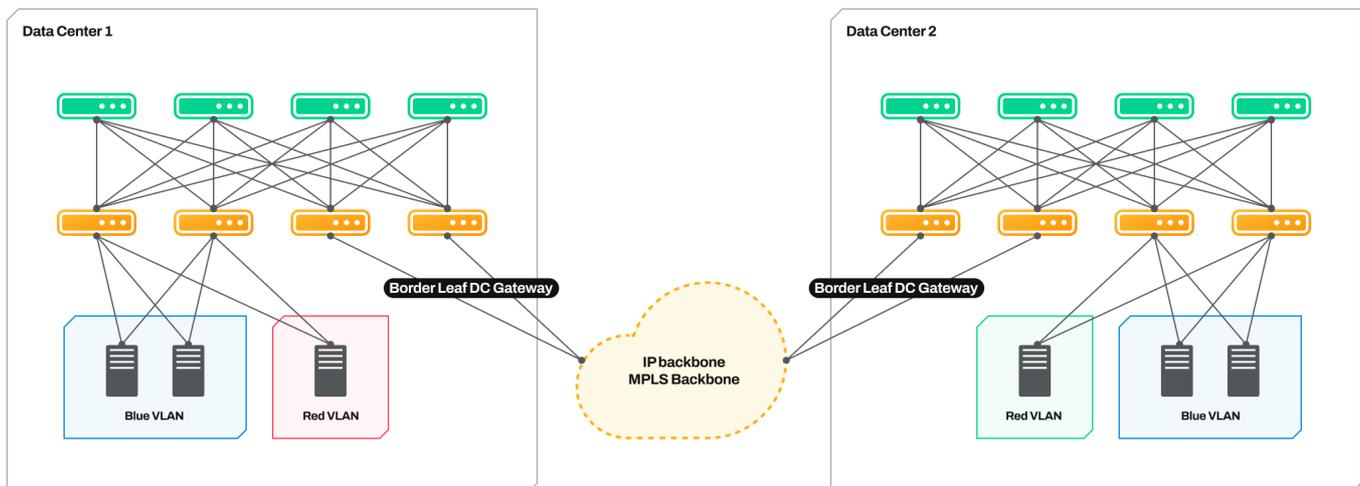


/ SOLUTION BRIEF

EVPN-VXLAN FOR MULTI-SITE DATA CENTER CONNECTIVITY

Introduction

Modern data centers are increasingly distributed across multiple geographic locations to improve redundancy, scalability, and disaster recovery capabilities. However, extending Layer 2 and Layer 3 networks seamlessly across these sites presents significant challenges, including complexity in managing VLANs, broadcast domains, and routing.



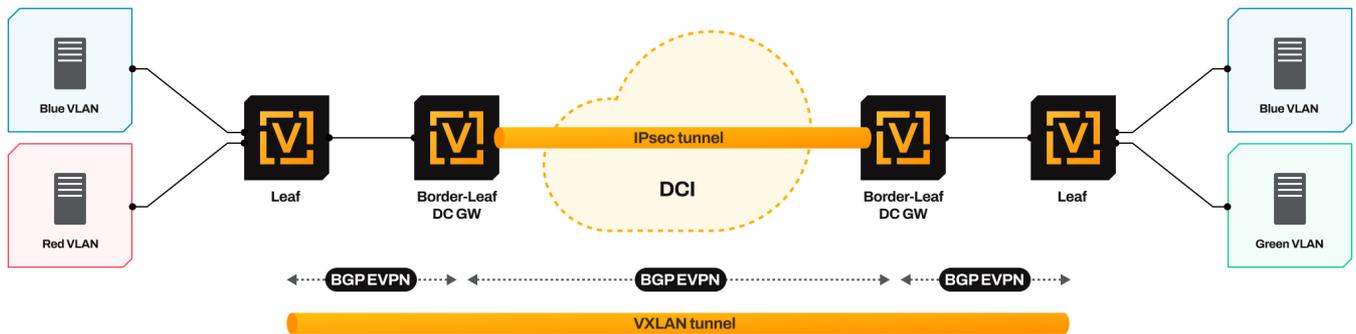
EVPN (Ethernet VPN) combined with VXLAN (Virtual Extensible LAN) emerges as the leading solution to overcome these challenges. This technology allows scalable Layer 2 extension over an IP network while providing advanced Layer 3 routing capabilities. With EVPN-VXLAN, enterprises can build flexible, multi-tenant networks that support workload mobility and efficient traffic forwarding between data centers.

EVPN-VXLAN Technology

EVPN is a control plane technology that uses BGP to distribute MAC and IP address information across the network, enabling scalable Layer 2 VPN services. VXLAN encapsulates Ethernet frames within UDP packets, allowing Layer 2 segments to extend over IP networks.

Together, EVPN and VXLAN offer numerous benefits:

- **Scalability:** EVPN's BGP-based control plane scales better than traditional flooding mechanisms.
- **Multi-tenancy:** Supports multiple isolated tenant networks with overlapping IP spaces.
- **Optimized Traffic Forwarding:** EVPN enables efficient unicast and multicast forwarding, reducing unnecessary broadcast traffic.
- **Active-Active Redundancy:** Provides load balancing and fast failover between data center sites.



In the border-leaf/DC gateway interconnect model, traffic is seamlessly handed off at the data center edge. This architecture delivers enhanced control and scalability over inter-site data exchange, while providing a strategic point for implementing QoS and advanced security measures. For added protection, a VPN tunnel can be established to safeguard the connection across the DCI network.

In a Layer 3 DCI architecture, VLANs and subnets remain local to their respective data centers, avoiding Layer 2 stretching. Inter-DC routing in an EVPN-VXLAN environment is enabled through the use of EVPN Type-5 routes, providing efficient and scalable connectivity.

Alternatively, MPLS can be leveraged to deliver DCI capabilities by establishing an IP VPN across the WAN, ensuring predictable performance and network segmentation.

As with any critical infrastructure, securing the DCI is paramount. For Internet-based connections, IPsec offers robust encryption and authentication, while MACsec is ideal for protecting private Layer 2 or dark fiber links.

DCI Architecture Highlights

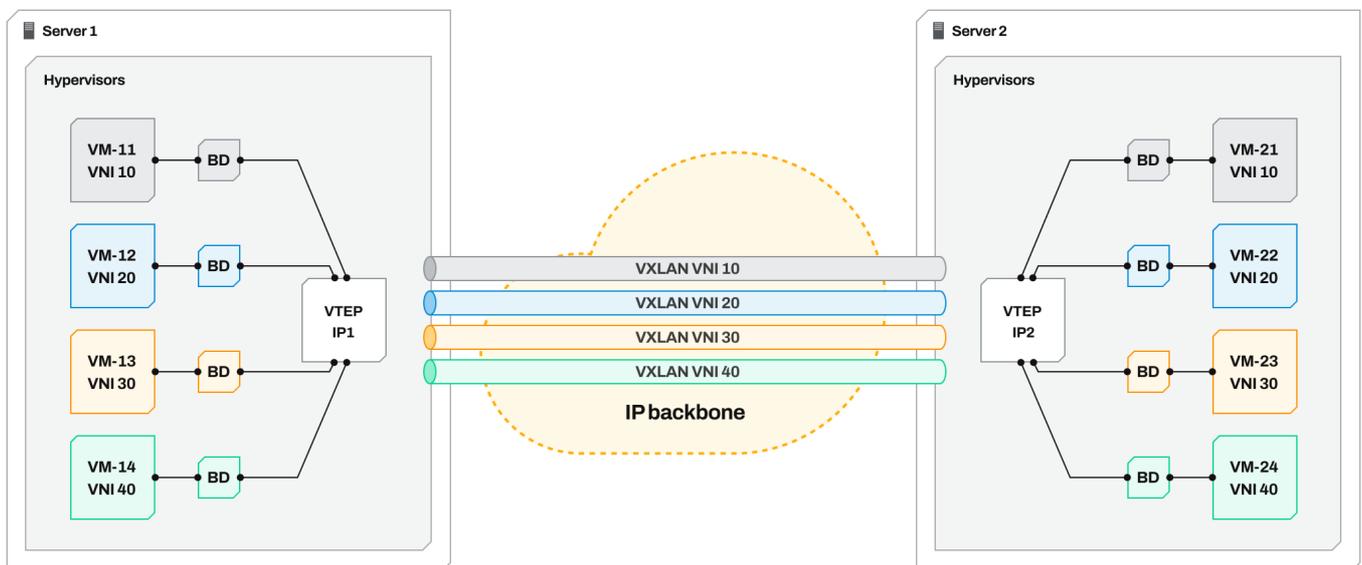
- **Border-Leaf / DC Gateway Model** – Hands off traffic at the data center edge, enabling greater control and scalability over inter-site data sharing.
- **QoS & Security Insertion Point** – Centralized control for applying advanced QoS and security policies; optional VPN tunnels secure traffic across the DCI network.
- **Layer 3 DCI Design** – VLANs and subnets remain local to each DC, with EVPN Type-5 routes delivering efficient inter-DC routing over VXLAN.
- **MPLS Option** – Enable DCI via MPLS-based IP VPNs for predictable performance and segmentation over the WAN.
- **Security Best Practices** – Use IPsec for Internet-based DCI, MACsec for private Layer 2 or dark fiber connections.

Implementing EVPN-VXLAN with VyOS

VyOS provides full support for BGP EVPN and VXLAN encapsulation, making it ideal for multi-site data center overlays. Typical deployment involves:

- **Configuring VXLAN interfaces to encapsulate tenant VLAN traffic.**
- **Using BGP EVPN to advertise MAC/IP routes across sites.**
- **Integrating with underlay IP networks for transport.**
- **Applying security and QoS policies on VyOS to maintain traffic integrity and performance.**

VyOS configurations can be scripted and deployed at scale, allowing network teams to automate multi-site overlay provisioning and monitoring.



Use Cases and Benefits

- **Workload Mobility:** Seamlessly migrate virtual machines or containers between data centers without IP changes.
- **High Availability:** Achieve site-level redundancy and fast failover to minimize downtime.
- **Simplified Segmentation:** Isolate tenants or applications with scalable Layer 2 and Layer 3 overlays.
- **Cost Efficiency:** Reduce reliance on expensive proprietary hardware by using VyOS on standard servers.
- **Cloud-Native Ready:** Support modern application architectures requiring flexible, programmable networks.

Conclusion

EVPN-VXLAN is the future-proof technology for extending Layer 2/Layer 3 networks across multiple data center sites. VyOS empowers organizations to implement this advanced networking paradigm on a flexible, open-source platform, delivering scalability, reliability, and cost savings. Deploying EVPN-VXLAN with VyOS simplifies network operations and prepares your infrastructure for dynamic workloads and cloud-native environments.

Additional Resources

VyOS official documentation: <https://docs.vyos.io>

VyOS community forums and support: <https://forum.vyos.io>

EVPN-VXLAN technology overview by IETF: <https://tools.ietf.org/html/rfc8365>