



VyOS
Networks



/ SOLUTION BRIEF

VYOS - EVPN-VXLAN DISTRIBUTED ANYCAST GATEWAY

Introduction

Modern data center and campus networks demand a fabric that can deliver workload mobility, high availability, and simplified operations without sacrificing performance. Traditional Layer 2 extension techniques – VLANs stretched across spanning-tree domains or proprietary tunneling protocols – struggle to scale in multi-rack, multi-site environments and often introduce single points of failure at the network edge.

EVPN-VXLAN with Distributed Anycast Gateway addresses these challenges by combining the control-plane intelligence of Ethernet VPN (EVPN) with the overlay flexibility of VXLAN. Rather than relying on a single, centralized gateway for inter-VLAN routing, every leaf switch in the fabric is configured with the same gateway IP and MAC address for a given subnet. This allows a host to reach its default gateway through the nearest local switch, regardless of where it is physically connected or where it migrates to within the fabric.

The result is a network architecture that eliminates the need for First Hop Redundancy Protocols (such as VRRP or HSRP), reduces east-west traffic hair-pinning, and enables truly seamless workload mobility across racks, pods, or data centers. Combined with EVPN's standards-based control plane for MAC and IP address distribution, this design provides a resilient, scalable, and vendor-interoperable foundation for next-generation network fabrics.

This solution brief outlines how VyOS enables EVPN-VXLAN with Distributed Anycast Gateway, the architecture and configuration principles involved, and the operational benefits it delivers.

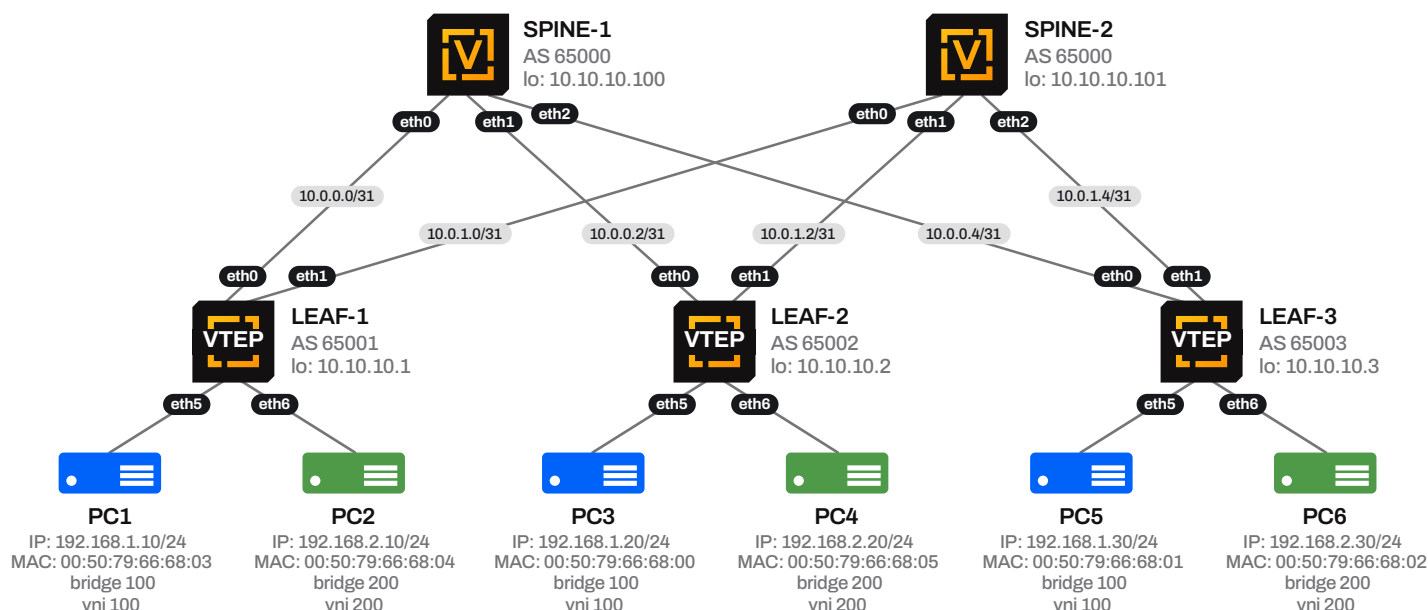
Deployment Details

The following scenario illustrates a typical EVPN-VXLAN deployment in a Leaf–Spine topology. In this For example, PC1 needs to communicate with PC6. Because the two hosts belong to different Layer 2 segments, VLAN 100 for PC1 and VLAN 200 for PC6, the traffic must be routed through the default gateway. Therefore, PC1 first needs to learn the MAC address associated with its gateway IP address (192.168.1.1).

One of the key advantages of EVPN is seamless host mobility. If PC1 moves from a location connected to LEAF-1 to a location connected to LEAF-2, it can retain the same IP address and default gateway configuration. Additionally, PC1 does not need to relearn a new default gateway MAC address, as the gateway is presented consistently across the fabric.

In this topology, PC1 and PC3 are connected to LEAF-1 and LEAF-2, respectively, while remaining in the same VLAN. They are used to represent the movement of PC1 between leaf switches. PC6 is connected to LEAF-3 and resides in VLAN 200.

IPv4 fabric eBGP underlay, EVPN VXLAN overlay, Anycast Gateway



This topology illustrates a typical EVPN-VXLAN deployment on a leaf-spine fabric. The underlay is built with eBGP: both spines share AS 65000, while each leaf runs its own AS (65001, 65002, and 65003), and every device is identified by a loopback address used for VTEP peering. On top of this IP underlay, the leaves act as VTEPs and use EVPN as the control plane to build a VXLAN overlay, extending Layer 2 segments across the fabric. VLAN 100 (VNI 100) and VLAN 200 (VNI 200) are each present on every leaf, so hosts in the same VLAN can communicate regardless of which leaf they're attached to, and each leaf presents the same default gateway IP and MAC for a given VLAN – this is the anycast gateway.

To see how this works in practice, consider PC1 (192.168.1.10/24, VLAN 100, on LEAF-1) communicating with PC6 (192.168.2.30/24, VLAN 200, on LEAF-3). Because the two hosts sit in different Layer 2 segments, traffic between them can't be switched directly – it must be routed through the default gateway. Before it can send the packet, PC1 first resolves the MAC address of its gateway (192.168.1.1) via ARP. LEAF-1 responds with the gateway's MAC, and since that gateway is anycast, the same MAC and IP are active on every leaf in the fabric – the routing happens locally at whichever leaf the host is attached to, rather than requiring traffic to hairpin through a central router.

This anycast behavior is what enables one of EVPN's key strengths: seamless host mobility. If PC1 moves from LEAF-1 to LEAF-2, it keeps the same IP address and default gateway configuration, and – critically – it never needs to relearn the gateway's MAC address, since that MAC is presented identically on LEAF-2 as it was on LEAF-1. EVPN's control plane simply updates the fabric with PC1's new location, and traffic is redirected accordingly, with no disruption to the host's own configuration or ARP cache.

In this diagram, PC1 (on LEAF-1) and PC3 (on LEAF-2) sit in the same VLAN (100) and are used to represent this exact scenario – PC1 moving from LEAF-1 to LEAF-2 without any reconfiguration. PC6, connected to LEAF-3 in VLAN 200, represents the remote host that PC1 needs to reach across the routed boundary.

Benefits of Implementing EVPN-VXLAN Anycast Gateway with VyOS

- Consistent gateway identity: hosts always resolve the same gateway IP and MAC, regardless of which leaf switch they attach to.
- Uninterrupted host mobility: workloads can move between leaf switches without re-triggering ARP resolution or losing inter-subnet connectivity.
- Flexible workload placement: any leaf switch in the fabric can locally route traffic for directly connected hosts, avoiding traffic tromboning to a fixed gateway pair.
- Resilient forwarding: eliminates the unknown-unicast flooding and dropped-traffic conditions that arise from stale ARP-to-MAC mappings after a host moves.

Conclusion

The anycast gateway is a cornerstone of modern EVPN-based datacenter architectures, enabling seamless virtual machine mobility across racks, pods, or even geographically distributed datacenters without requiring any reconfiguration on the host VM.

This walkthrough demonstrated how to deploy and validate an anycast gateway on VyOS using the symmetric IRB model, which distributes routing responsibilities evenly across leaf nodes and ensures both high availability and low-latency forwarding. Beyond the initial configuration, it also covered how to verify proper operation through VyOS's built-in show commands and how to identify common misconfigurations before they impact production traffic.

Together, these building blocks form a solid foundation for any scalable, resilient EVPN fabric built on VyOS.