ArcOS®: Build Flexible and Scalable Data Center Networks While Reducing Operational Complexity

Key Benefits

· Operational simplicity and deployment flexibility with centralized peering and LSVR

· Scale-out performance with symmetric IRB and distributed anycast gateway

· Seamless workload mobility with fabric-wide per-tenant visibility

· Maximum system uptime with superior fabric resiliency and fast failure detection

Solution Overview

The Arrcus **BGP Ethernet Virtual Private Network (BGP-EVPN)** solution is a fully programmable, multi-tenant spine-leaf routing fabric based on the high-performance ArcOS® BGP-EVPN control plane and the high-density VXLAN data plane. Built from first principles, the Arrcus solution enables service providers and enterprises to use open and microservices-based networking software to build massively scalable, multi-tenant Clos fabrics. Furthermore, the innovative BGP Link State Vector Routing (LSVR) technology, along with the available standards-based OpenConfig model, significantly reduces operational complexity and costs while enriching the operator's design choice.
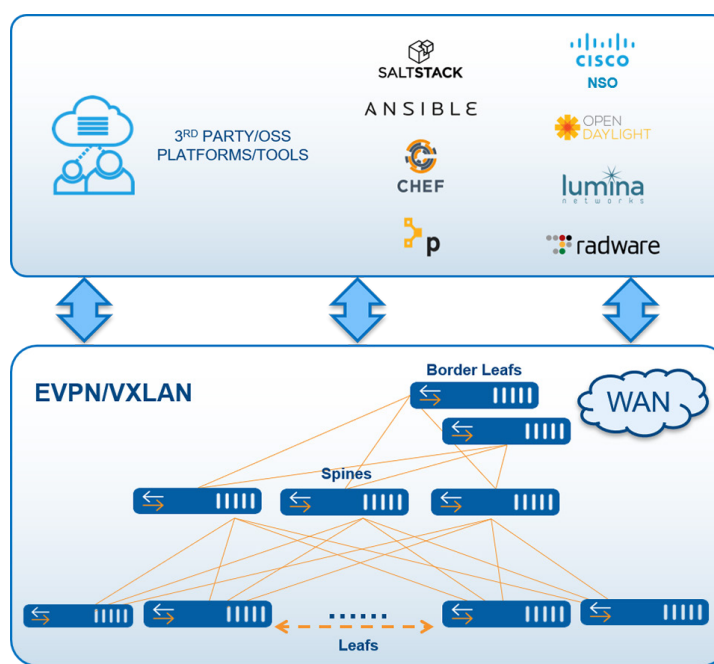

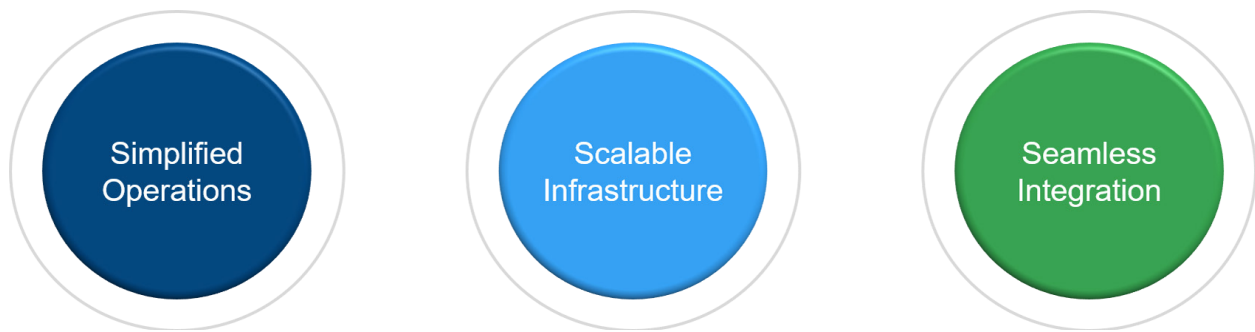Figure 1: The programmable multi-tenant data center fabric

Figure 2: Key attributes of the Arrcus BGP-EVPN solution

The Arrcus BGP-EVPN Solution Benefits

Operational Simplicity and Deployment Flexibility with Centralized Peering and LSVR

The ArcOS BGP-EVPN solution significantly simplifies fabric provisioning and management. With a centralized route reflector peering design, it scales massively unlike the complex full-mesh solution. ArcOS also supports LSVR, a standards-based hybrid routing protocol utilizing a combination of link-state and path-vector routing mechanisms, to significantly improve the network underlay. Based on BGP, LSVR leverages the common BGP routing infrastructure, including its configuration mechanism. The consolidation of underlay, overlay, and internet routing into a single protocol (BGP) dramatically simplifies network operations with reduced configuration and tooling requirements.

ArcOS also offers both IS-IS and OSPF as alternative underlay routing options in brownfield deployments if the legacy link- state routing is required. Besides, ArcOS supports the hop-by-hop EBGP option between leaves and spines.

Scale-out Performance with Symmetric IRB and Distributed Anycast Gateway

Arrcus enables enterprises and providers alike to build out massively scalable private cloud/hybrid cloud fabrics. In Figure 3, each POD is a three-stage Clos. As BGP-EVPN fabric grows, it can be a five-stage Clos for inter-POD or inter-site fabric underlay expansion.

Within each POD or site, with the elimination of data plane flood/learn, endpoints (workloads) are instead learned via the highly scalable BGP protocol. They can be placed further apart and can grow to a larger scale while remaining connected to the same virtual layer-2 network.
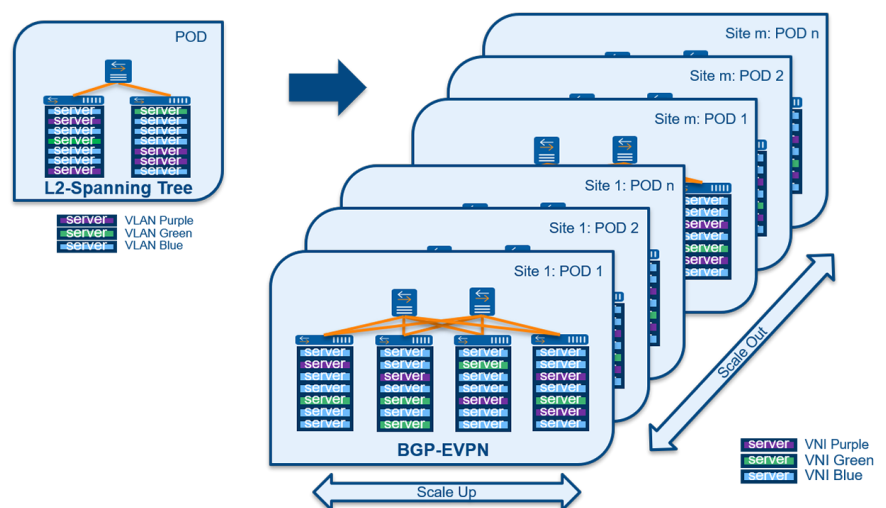

Figure 3: The Arrcus BGP-EVPN solution scales up and out

The distributed anycast gateway capability facilitates optimal east-west routing to support transparent workload mobility. Instead of dispatching traffic to a centralized gateway for routing, traffic is efficiently routed locally to the nearest default gateway available on all leaf switches. Also, the capability of allowing the same gateway IP and MAC address for each locally defined subnet significantly simplifies configuration.

ArcOS provides the optimal forwarding capability of IP routing for inter-subnet traffic and ethernet bridging for intra-subnet traffic per tenant by leveraging the symmetric IRB solution. Both ingress and egress VTEPs only need to maintain
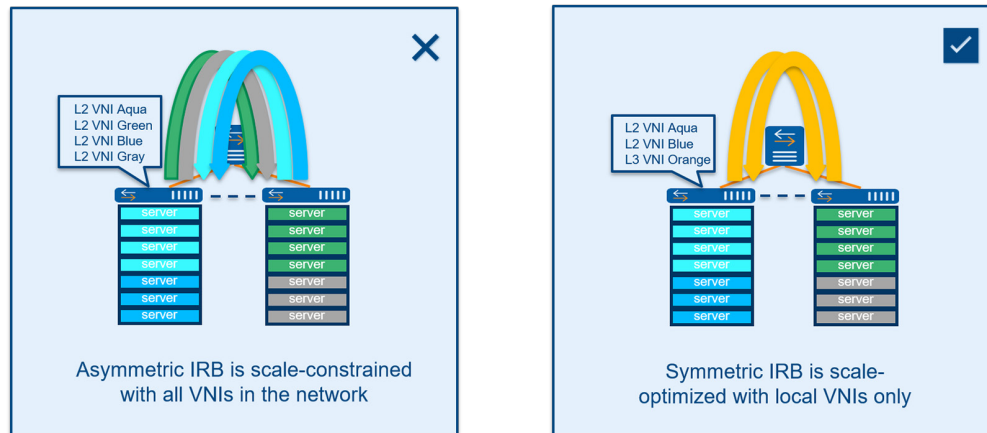

Figure 4: The Arrcus BGP-EVPN optimizes in scale with symmetric IRB

local VNIs and host entries for locally present MAC VRFs. This enhancement results in significantly improved scale and performance in control plane and data plane.

Seamless Workload Mobility with Fabric-wide Per-Tenant Visibility

ArcOS supports workload mobility both within and between BGP-EVPN fabrics. The BGP control plane promptly learns about the workload whereabouts and updates its reachability. It minimizes traffic hair-pinning due to the long latency associated with the traditional data plane flooding-based discovery mechanism.

ArcIQ, an AI-driven analytics platform, provides BGP-EVPN fabric-wide visibility to MAC address movement in real-time as the corresponding applications move from one location to another.

Maximum System Uptime with Superior Fabric Resiliency and Fast Failure Detection

With IP-based Clos, the leaf/spine layer switching capacity is the aggregation of individual switching capacities in the layer. The presence of a large number of leaf/spine switches minimizes the impact of losing a particular leaf/spine switch due to a failure. For example, in a Clos with eight spine switches, a single switch loss event translates to one-eighth spine fabric capacity reduction. This fabric resiliency is a drastic improvement against some legacy active-active aggregation switches with proprietary pairing, where losing one equates to 50% capacity loss.

Bidirectional Forwarding Detection (BFD) is an IP-based network protocol for link failure detection between adjacent switching devices. With the BFD-based sub-second failure detection, prompt redistribution of displaced traffic around the failure results in minimal traffic disruption.

With the ArcOS' built-in modularity and granular process restart capability, the Arrcus BGP-EVPN solution delivers high service availability if an individual process experiences a fault. The available routing graceful restart extension preserves the forwarding plane, which further minimizes any traffic loss due to any routing process restart event.

Key Capabilities

The table below details essential BGP-EVPN fabric capabilities.

FEATURE	DESCRIPTION
Integrated routing and bridging (IRB)	The solution provides optimal forwarding capability of IP routing for inter-subnet traffic and ethernet bridging for intra-subnet traffic per tenant. In addition, Symmetric IRB allows BGP-EVPN to further scale out without requiring all VNIs to be present on a leaf switch
BGP-EVPN type 2 route	BGP-EVPN type 2 route carries per-tenant host MAC addresses and their associated IP addresses
BGP-EVPN type 3 route	BGP-EVPN type 3 route carries per-tenant tunnel information for broadcast, unknown unicast, and multicast (BUM) traffic
BGP-EVPN type 5 route	BGP-EVPN type 5 route carries per-tenant IP subnet
Distributed anycast gateway	Distributed anycast gateway is a network architecture that allows the deployment of a group of gateways identified by a single IP address. As the number of gateways increases and their location moves closer to the edge, the distance traffic has to traverse to reach a gateway is reduced
Streaming telemetry	BGP-EVPN type 2, 3, and 5 routes
Underlay protocol	EBGP, IS-IS, BGP LSVR, and OSPF
Fabric-wide analytics	BGP-EVPN fabric-wide visibility of MAC address move
Route reflection	Route reflection for BGP-EVPN type 1, 2, 3, 4, and 5 routes
Leaf hardware platform	Currently, Broadcom Trident 3-based platforms are certified to run under ArcOS with additional platforms on the roadmap

Solution Requirements

REQUIREMENTS	DESCRIPTION
ArcOS	BGP-EVPN fabric node devices require ArcOS release 4.1.1 or later
ArcIQ	An AI-driven analytics platform (ArcIQ release 2.1.1 or later) that delivers real-time transformational insights and telemetry at scale. It is an optional solution component that can be deployed either in the cloud or on-premise
Platforms	**Leaf Switch:** • Celestica Questone 2 • Celestica Seastone 2 • QCT IX8 • QCT IX7 **Spine Switch:** • Any XGS (Tomahawk 3, Trident 3) or DNX (J2, J+)-based product series certified to run under ArcOS **Ports:** • Server-facing: 10G and 25G • Fabric-facing: 40G and 100G

Learn more

Visit www.arrcus.com to find out how Arrcus can enable your organization's IT transformation with the best-in-class ArcOS BGP-EVPN solution.

Network Different – with Arrcus

About Arrcus

Arrcus was founded to enrich human experiences by interconnecting people, machines, and data. Our mission is to democratize the networking industry by providing best-in-class software, the most flexible consumption model, and the lowest total cost of ownership (TCO). The Arrcus team consists of world-class technologists who have an unparalleled record in shipping industry-leading networking products, complemented by industry thought leaders, operating executives, and strategic company builders.

The company is headquartered in San Jose, California.

For more information, go to www.arrcus.com or follow @arrcusinc.

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