

AOS 2.0 VXLAN Feature Brief



As a network engineer, you need to move to modern L3 fabric for agility and scale, but are held back by many L2 workloads (virtual or physical). You need to easily stretch your L2 segments across the fabric using VXLAN, but are stuck with three options to manage (design, implement, operate) L2 workloads on a physical IP fabric (underlay):

- 1. Manual, without using a SDN controller
- 2. OVSDB, using a SDN controller (e.g. Cisco ACI, VMware NSX or Juniper Contrail)
- 3. Ethernet VPN (EVPN), using vendor-specific control plane technology to allow hosts (bare-metal and VMs) to be placed anywhere in a network, and connected to the same logical L2 overlay network.

Manual:

- <u>Pros</u>: Multi-vendor standardards based technology. No controller lock-in. Ability and flexibility to invest or add a SDN controller later.
- <u>Cons</u>: There are a lot of manual, error-prone, vendor-specific, time-consuming steps involved.

SDN Controller::

- <u>Pros</u>: Ability to connect physical ports and bare metal servers using high speed underlay switch with 10/25/40/100G interfaces. Leverage the same interface used to configure virtual networking infrastructure.
- <u>Cons</u>: You need to invest in a SDN controller that has certified integration with the underlay switch. Assumes the majority of the workload is already virtualized.



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EVPN+VXLAN:

- Pros: Standards based technology
- <u>Cons</u>: Complex configurations with different vendor-specific deployment types. Interoperability challenges between vendors.

How AOS (Apstra® Operating System) makes the lifecycle operations of VXLAN easy

AOS provides turnkey, vendor-agnostic, autonomous lifecycle automation of VXLAN, spanning design, implementation, and operations — for any virtual, container-based, and bare-metal workloads.

For example, the networking team can automate the configurations and verifications of VXLAN on an IP fabric, without using a SDN controller, or EVPN. Without AOS, these are the manual VXLAN provisioning steps you will have to perform. With AOS, these steps are completely automated:

- Create VXLAN Network Identifier (VNI) resource pool
- Configure VTEP VNI interfaces for applying connectivity and isolation policy
- Configure VTEP source interfaces for VTEP-to-VTEP communication
- Attach hosts (virtual or bare-metal) that need to be on certain VLANs
- Bind different VLANs into a contiguous, stretched L2 domain over VXLAN tunnel
- Configure VXLAN routing between VXLAN and VXLAN or VLAN domains (coming soon)
- Verify all configurations
- Figure out what telemetry to gather, in order to validate the operating state of the VXLAN tunnels and underlay fabric meet your desired service expectations
- Gather the telemetry you need
- Continuously monitor telemetry you gather, in order to ensure the operating state of the VXLAN tunnels and underlay fabric meet your desired service expectations

The following screenshot shows an example of your VXLAN intent during the design phase. In this case, you want a select group of servers on different VLANs (in different racks) placed onto the same VXLAN



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segment (same L2 domain).

Endpoints						
/iews Topology Nodes 		Legend	VLAN Tagged 📒 Unta	agged		Manage Endpoint
	mclag_compute_02_leaf1 mclag_compute_02_leaf2	mclag_compute_04_leaf1 mclag_compute_04_leaf2 .4_server36 .4_server37 .4_server37 .4_server38	I2_hpc_03_leaf 3_server10 3_server10 3_server10 3_server04	12_hpc_01_leaf .1_server09 .1_server13 .1_server14 .1_server02 .1_server14	12,hpc,09_leaf .9_server07 .9_server07 .9_server02 .9_server06	
	.2.server15 .2.server10 .2.server03 .2.server11 .2.server03 .2.server11 .2.server32 .2.server32 .2.server32 .2.server32 .2.server33 .2.server33			.1_server10 .1_server10 .1_server11 .1_server10 .1_server13 .1_server01 .1_server05 .1_server12 .1_server06 .1_server06		
	.2_server33 .2_server12 .2_server02 .2_server07 .2_server35 .2_server10 .2_server10 .2_server10 .2_server10 .2_server17 .2_server10 .2_server17	4_server05 4_server06 4_server12 4_server24 4_server22 4_server40 4_server05 4_server09 4_server01 4_server09 4_server12 4_server09 4_server03 4_server09 4_server04 4_server09				
	.2.server08 .2.server09 .2.server05 .2.server09 .2.server14 .2.server121 .2.server127 .2.server122 .2.server126 .2.server126 .2.server126 .2.server128	.4_server16 .4_server20 .4_server19 .4_server08 .4_server32 .4_server32 .4_server29 .4_server32 .4_server29 .4_server11 .4_server27 .4_server27 .4_server27 .4_server27				
	2_server202_server182_server23	4_server024_server074_server034_server33				

Figure 1: Automated VXLAN Design

Additionally, in the figure above, some of the endpoints are provisioned to support "tagged" interfaces (aqua) while others are provisioned for "untagged" (purple). AOS also manages the automation and intent validation of these endpoints.

The following screenshot shows an example of closed-loop validation. In this case, all route expectations for the VTEPs on "racktype 2_1_leaf" have been validated.



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Physical	Properties	B Telemetry							
Anomalies Co	onfig Interface	MAC LLDP	BGP LAG	MLAG	Route Counters	ARP Tran	sceivers Utilia	zation	
							1-15	of 15 < >	Page Size: 25
	Expected			Actual					
Destination 🖨	State \$	Next hops \$		State \$	Next hops 🗢		Status 🖨	Last fetched \$	Last modified \$
0.0.0/0	up	172.16.0.25/	/32	up	172.16.0.	25/32	ok	7 days ago	7 days ago
172.16.0.0/32	up	172.16.0.10/		up	172.16.0.		ok	7 days ago	7 days ago
172.16.0.0/32	up	172.16.0.10/ 172.16.0.18/		up	172.16.0. 172.16.0.		ok	7 days ago	7 days ago
			/32			18/32			
	up	172.16.0.18/	/32 /32	up up	172.16.0.	18/32 10/32	ok	7 days ago 7 days ago	7 days ago 7 days ago
172.16.0.1/32		172.16.0.18/ 172.16.0.10/	/32 /32 /32		172.16.0. 172.16.0.	18/32 10/32 18/32			
172.16.0.0/32 172.16.0.1/32 172.16.0.12/31 172.16.0.14/31	up	172.16.0.18/ 172.16.0.10/ 172.16.0.18/	(32 (32 (32 (32	up	172.16.0. 172.16.0. 172.16.0.	18/32 10/32 18/32 10/32	ok	7 days ago	7 days ago

/ Blueprints / rack-based-blueprint-1a49e26d / racktype2_1_leaf

Figure 2: Example Of Closed-Loop Validations of VXLAN

The following screenshot shows an example of closed-loop validation for the entire integrated underlay and overlay (VXLAN), as a single logical system, across all individual devices.



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Dashboard	Staged	Uncommitted	Active			
Physical V Virtua	I 🕴 Anomalies					
		Links: All		S	Selection Anomalies	5
Nodes: All						
Nodes: All Views Topology Nod	les 🔿 Links 🛛	Show servers?	Layer: Anomalies:	All 🗘	Deploy Mode	
	les 🔿 Links 🛛 🗍	Show servers?	Layer: Anomalies:	All present		s: Discovery
Views 💿 Topology 🔵 Nod	des Links (ext.router.fet		Layer: Anomalies:	present	Deployment Status	
Views 💿 Topology 🔵 Nod			Layer: Anomalies:	present	Deployment Status	
Views Topology Nod		e19195b	Layer: Anomalies:	present 0	Deployment Status Deployment Status Anomalies: All	
Views Topology Nod		e19195b	Layer: Anomalies:	present 0	Deployment Status Deployment Status Anomalies: All Anomalies: BGP	s: Service

Figure 3: Example Of Closed-Loop Validations of Integrated Underlay and Overlay

Summary

AOS provides turnkey, vendor-agnostic, autonomous lifecycle operations of VXLAN, including design, implementation, and operations for any virtual, container-based and bare-metal workloads.

Soon for operations, AOS provides vendor-agnostic telemetry and correlation between overlay and underlay. For example, easy, instant, fabric wide visibility into VXLAN tunnel utilization for all VXLAN segments configured by AOS on switches. Additionally, AOS provides underlay to overlay correlation when endpoints/VTEPs are instantiated on hypervisors through integration with:

- Leading hypervisor and/or overlay controller, and/or
- Leading Cloud Management Platform (CMP)

About Apstra

Apstra® delivers the Apstra Operating System[™] (AOS), a new category of networking solution called Intent-Based Network Operating System. AOS enables an autonomous operational model for the network. AOS is intent-based, closed-loop, and fully autonomous, and enables the only "Vendor-Agnostic Self-Operating Network[™]".

For more information, visit <u>www.apstra.com</u> or follow <u>@ApstraInc</u>, or email us at <u>sales@apstra.com</u>.