LAB GUIDE

VXLAN EVPN

IMPORTANT! THIS GUIDE ASSUMES THAT THE AOS-CX OVA HAS BEEN INSTALLED AND WORKS IN GNS3 OR EVE-NG. PLEASE REFER TO GNS3/EVE-NG INITIAL SETUP LABS IF REQUIRED.

https://www.eve-ng.net/index.php/documentation/howtos/howto-add-aruba-cx-switch/

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Lab Objective

This lab will enable the reader to gain hands on experience with L2 Virtual Extensible LAN (VXLAN) Ethernet VPN (EVPN).

Lab Overview

This lab as shown in Figure 1 will allow you to provide end hosts (Virtual PC Simulator - VPCS) on the same subnet with L2 overlay network connectivity across the VXLAN data plane tunnel created by EVPN control plane.

OSPF is used as the IP underlay Interior Gateway Protocol (IGP) to provide loopback connectivity for IBGP peering (AS#65001). IBGP EVPN with Route Reflectors (RRs) are used in this example to prevent the need for full mesh IBGP peers.

VXLAN EVPN scales better compared to flood and learn static VXLAN and allows use cases such as distributed L3 anycast gateways. Take note that L3 VXLAN does not currently work with AOS-CX VMs.

Spine1/Spine2 will function as IBGP EVPN RRs, while Leaf1/Leaf2 will function as IBGP EVPN RR clients.

VLAN 110 will be mapped to VXLAN Network Identifier (VNI) 110 to provide L2 overlay connectivity across the leaf switches.
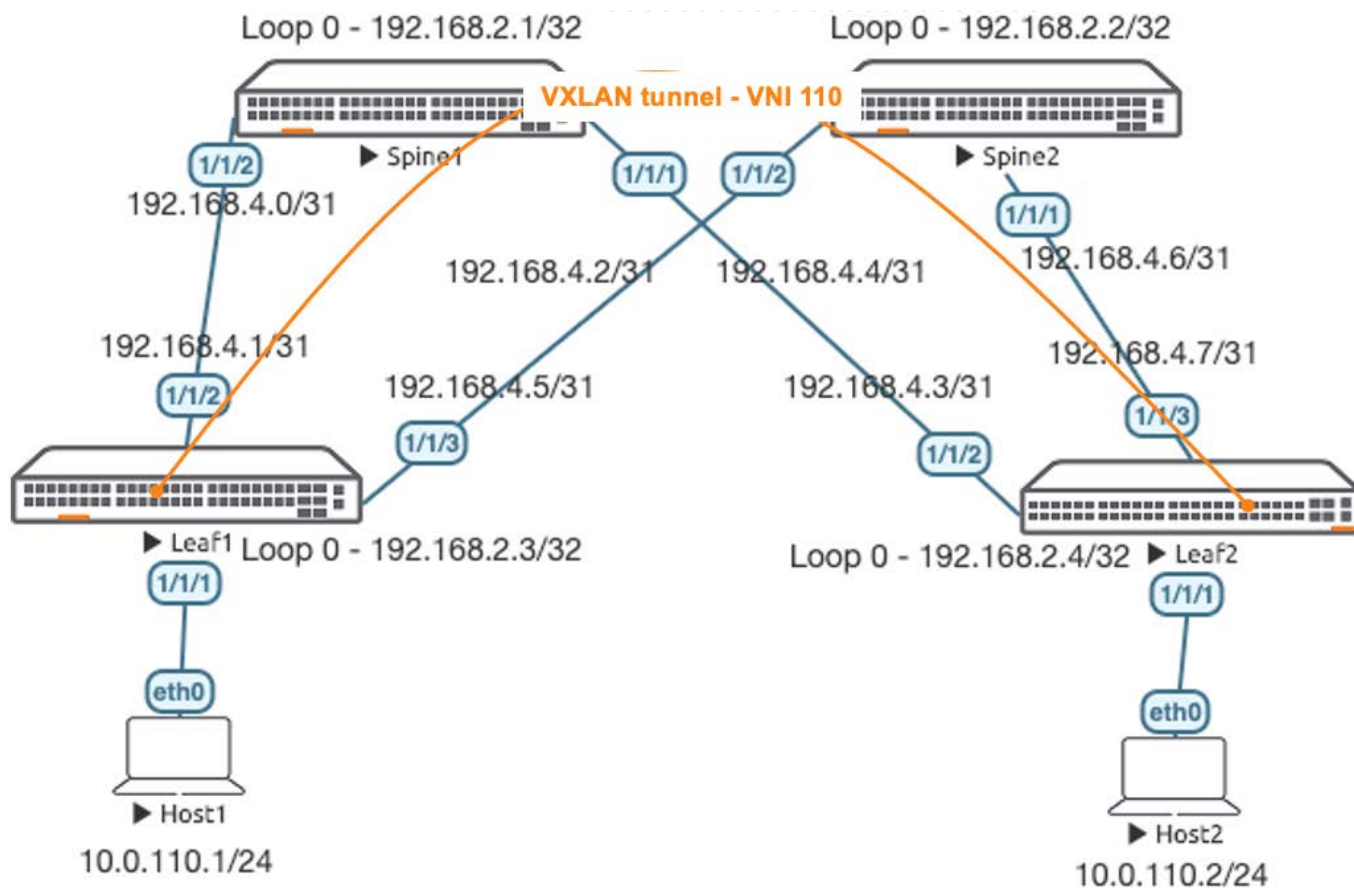
Lab Network Layout

Figure 1. Lab topology and addresses

Lab Tasks

Task 1 – Lab setup

For this lab refer to Figure 1 for topology and IP address details.

- Start all the devices, including VPCS hosts
- Open each switch console and log in with user "admin" and hit enter, so that no password is applied
- Change all hostnames as shown in the topology:
```
configure
hostname …
```
- On all devices, bring up required ports:
```
int 1/1/1-1/1/6
  no shutdown
use "exit" to go back a level
```

- Validate LLDP neighbors appear as expected on each switch
```
show lldp neighbor
```

Leaf1
```
Leaf1(config)# sh lld neighbor-info

LLDP Neighbor Information
=========================

Total Neighbor Entries          : 2
Total Neighbor Entries Deleted  : 0
Total Neighbor Entries Dropped  : 0
Total Neighbor Entries Aged-Out : 0

LOCAL-PORT  CHASSIS-ID          PORT-ID        PORT-DESC                                          TTL       SYS-NAME
---------------------------------------------------------------------------------------------------------------
1/1/2       08:00:09:8a:14:fa   1/1/2          1/1/2                                              120       Spine1
1/1/3       08:00:09:12:8e:9e   1/1/2          1/1/2                                              120       Spine2
```

Task 2 – Configure IP Underlay Interfaces

- Configure interfaces, IPs and required VLANs on the 4 switches

Leaf1
```
Leaf1(config)# int lo 0
Leaf1(config-loopback-if)# ip add 192.168.2.3/32
Leaf1(config-loopback-if)# ip ospf 1 area 0
OSPF process does not exist.
Do you want to create (y/n)? y
OSPF Area is not configured.
Do you want to create (y/n)? y

Leaf1(config-loopback-if)# router ospf 1
Leaf1(config-ospf-1)# router-id 192.168.2.3
Leaf1(config-ospf-1)# int 1/1/2
Leaf1(config-if)# ip add 192.168.4.1/31
Leaf1(config-if)# ip ospf 1 area 0
Leaf1(config-if)# ip ospf network point-to-point
Leaf1(config-if)# int 1/1/3
Leaf1(config-if)# ip add 192.168.4.5/31
Leaf1(config-if)# ip ospf 1 area 0
Leaf1(config-if)# ip ospf network point-to-point
```

Leaf2
```
Leaf2(config)# int lo 0
Leaf2(config-loopback-if)# ip add 192.168.2.4/32
Leaf2(config-loopback-if)# ip ospf 1 area 0
OSPF process does not exist.
Do you want to create (y/n)? y
OSPF Area is not configured.
Do you want to create (y/n)? y

Leaf2(config-loopback-if)# router ospf 1
Leaf2(config-ospf-1)# router-id 192.168.2.4
Leaf2(config-ospf-1)# int 1/1/2
Leaf2(config-if)# ip add 192.168.4.3/31
Leaf2(config-if)# ip ospf 1 area 0
Leaf2(config-if)# ip ospf network point-to-point
Leaf2(config-if)# int 1/1/3
Leaf2(config-if)# ip add 192.168.4.7/31
```

```
Leaf2(config-if)# ip ospf 1 area 0
Leaf2(config-if)# ip ospf network point-to-point
```

Spine1

```
Spine1(config)# int lo 0
Spine1(config-loopback-if)# ip add 192.168.2.1/32
Spine1(config-loopback-if)# ip ospf 1 area 0
OSPF process does not exist.
Do you want to create (y/n)? y
OSPF Area is not configured.
Do you want to create (y/n)? y

Spine1(config-loopback-if)# router ospf 1
Spine1(config-ospf-1)# router-id 192.168.2.1
Spine1(config-ospf-1)# int 1/1/2
Spine1(config-if)# ip add 192.168.4.0/31
Spine1(config-if)# ip ospf 1 area 0
Spine1(config-if)# ip ospf network point-to-point
Spine1(config-if)# int 1/1/1
Spine1(config-if)# ip add 192.168.4.2/31
Spine1(config-if)# ip ospf 1 area 0
Spine1(config-if)# ip ospf network point-to-point
```

Spine2

```
Spine2(config)# int lo 0
Spine2(config-loopback-if)# ip add 192.168.2.2/32
Spine2(config-loopback-if)# ip ospf 1 area 0
OSPF process does not exist.
Do you want to create (y/n)? y
OSPF Area is not configured.
Do you want to create (y/n)? y

Spine2(config-loopback-if)# router ospf 1
Spine2(config-ospf-1)# router-id 192.168.2.2
Spine2(config-ospf-1)# int 1/1/2
Spine2(config-if)# ip add 192.168.4.4/31
Spine2(config-if)# ip ospf 1 area 0
Spine2(config-if)# ip ospf network point-to-point
Spine2(config-if)# int 1/1/1
Spine2(config-if)# ip add 192.168.4.6/31
Spine2(config-if)# ip ospf 1 area 0
Spine2(config-if)# ip ospf network point-to-point
```

- Verify OSPF neighbors appear as expected between the switches

```
Leaf1(config)# sh ip os neighbors
OSPF Process ID 1 VRF default
==============================

Total Number of Neighbors: 2

Neighbor ID     Priority  State            Nbr Address       Interface
----------------------------------------------------------------------
192.168.2.1     n/a       FULL             192.168.4.0       1/1/2

192.168.2.2     n/a       FULL             192.168.4.4       1/1/3
```

- Verify OSPF routes are learnt as expected, you should see ECMP routes towards Lo0 of the other leaf, this is supposed to allow VXLAN traffic to be load shared across the ECMP routes (this works with real hardware, however AOS-CX VMs do not currently support ECMP)

```
Leaf1(config)# sh ip ro ospf

Displaying ipv4 routes selected for forwarding

'[x/y]' denotes [distance/metric]

192.168.2.1/32, vrf default
      via  192.168.4.0,  [110/100],  ospf
192.168.2.2/32, vrf default
      via  192.168.4.4,  [110/100],  ospf
192.168.2.4/32, vrf default                      ←ECMP to Leaf2 Lo0
      via  192.168.4.4,  [110/200],  ospf
      via  192.168.4.0,  [110/200],  ospf
192.168.4.2/31, vrf default
      via  192.168.4.0,  [110/200],  ospf
192.168.4.6/31, vrf default
      via  192.168.4.4,  [110/200],  ospf
```

Task 3 – Configure IP Underlay with EVPN

- On spine switches, configure EVPN Route Reflectors (RR) towards the leaf switches (RR clients) using leaf loopback IPs as neighbors

Spine1

```
Spine1(config)# router bgp 65001
Spine1(config-bgp)#  bgp router-id 192.168.2.1
Spine1(config-bgp)#  neighbor 192.168.2.3 remote-as 65001
Spine1(config-bgp)#  neighbor 192.168.2.3 update-source loopback 0
Spine1(config-bgp)#  neighbor 192.168.2.4 remote-as 65001
Spine1(config-bgp)#  neighbor 192.168.2.4 update-source loopback 0
Spine1(config-bgp)#  address-family l2vpn evpn
Spine1(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.3 activate
Spine1(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.3 route-reflector-client
BGP Session with this peer will be restarted
Spine1(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.3 send-community extended
Spine1(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.4 activate
Spine1(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.4 route-reflector-client
BGP Session with this peer will be restarted
Spine1(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.4 send-community extended
```

Spine2

```
Spine2(config-if)# router bgp 65001
Spine2(config-bgp)#  bgp router-id 192.168.2.2
Spine2(config-bgp)#  neighbor 192.168.2.3 remote-as 65001
Spine2(config-bgp)#  neighbor 192.168.2.3 update-source loopback 0
Spine2(config-bgp)#  neighbor 192.168.2.4 remote-as 65001
Spine2(config-bgp)#  neighbor 192.168.2.4 update-source loopback 0
Spine2(config-bgp)#  address-family l2vpn evpn
Spine2(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.3 activate
Spine2(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.3 route-reflector-client
BGP Session with this peer will be restarted
Spine2(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.3 send-community extended
Spine2(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.4 activate
```

```
Spine2(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.4 route-reflector-client
BGP Session with this peer will be restarted
Spine2(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.4 send-community extended
```

Leaf1

```
Leaf1(config)# router bgp 65001
Leaf1(config-bgp)#  bgp router-id 192.168.2.3
Leaf1(config-bgp)#  neighbor 192.168.2.1 remote-as 65001
Leaf1(config-bgp)#  neighbor 192.168.2.1 update-source loopback 0
Leaf1(config-bgp)#  neighbor 192.168.2.2 remote-as 65001
Leaf1(config-bgp)#  neighbor 192.168.2.2 update-source loopback 0
Leaf1(config-bgp)#  address-family l2vpn evpn
Leaf1(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.1 activate
Leaf1(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.1 send-community extended
Leaf1(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.2 activate
Leaf1(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.2 send-community extended
```

Leaf2

```
Leaf2(config-if)# router bgp 65001
Leaf2(config-bgp)#  bgp router-id 192.168.2.4
Leaf2(config-bgp)#  neighbor 192.168.2.1 remote-as 65001
Leaf2(config-bgp)#  neighbor 192.168.2.1 update-source loopback 0
Leaf2(config-bgp)#  neighbor 192.168.2.2 remote-as 65001
Leaf2(config-bgp)#  neighbor 192.168.2.2 update-source loopback 0
Leaf2(config-bgp)#  address-family l2vpn evpn
Leaf2(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.1 activate
Leaf2(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.1 send-community extended
Leaf2(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.2 activate
Leaf2(config-bgp-l2vpn-evpn)#   neighbor 192.168.2.2 send-community extended
```

- Validate EVPN neighbors are up on the leaf switches

```
Leaf1(config)# show bgp l2vpn evpn summary
VRF : default
BGP Summary
-----------
 Local AS                : 65001        BGP Router Identifier  : 192.168.2.3
 Peers                   : 2            Log Neighbor Changes   : No
 Cfg. Hold Time          : 180          Cfg. Keep Alive        : 60

 Neighbor        Remote-AS MsgRcvd MsgSent   Up/Down Time State        AdminStatus
 192.168.2.1     65001         5       5     00h:01m:59s  Established   Up
 192.168.2.2     65001         5       5     00h:01m:59s  Established   Up
```

- On leaf switches, configure the desired VLAN to be VXLAN encapsulated, this VLAN will be enabled towards Host1, Host2. Specify the same vlan under evpn.

- RD and route-target can be left as auto for IBGP EVPN, these are advertised to other devices via "send-community extended" configured previously

Leaf1

```
Leaf1(config)# vlan 110
Leaf1(config-vlan-110)#
Leaf1(config-vlan-110)# evpn
Leaf1(config-evpn)#  vlan 110
Leaf1(config-evpn-vlan-110)#   rd auto
```

```
Leaf1(config-evpn-vlan-110)#   route-target export auto
Leaf1(config-evpn-vlan-110)#   route-target import auto
```

Leaf2

```
Leaf2(config)# vlan 110
Leaf2(config-vlan-110)#
Leaf2(config-vlan-110)# evpn
Leaf2(config-evpn)#   vlan 110
Leaf2(config-evpn-vlan-110)#   rd auto
Leaf2(config-evpn-vlan-110)#   route-target export auto
Leaf2(config-evpn-vlan-110)#   route-target import auto
```

Task 4 – Configure Leaf Switches with VXLAN

- On both leaf switches, configure the desired VLAN to be VXLAN encapsulated on the ports towards Host1, Host2

Leaf1

```
Leaf1(config)# int 1/1/1
Leaf1(config-if)#  no routing
Leaf1(config-if)#  vlan access 110
```

Leaf2

```
Leaf2(config)# int 1/1/1
Leaf2(config-if)#  no routing
Leaf2(config-if)#  vlan access 110
```

- Configure the VXLAN interface, the source IP based on Lo0 and the desired VLAN to VXLAN Network Identifier (VNI) mapping

Leaf1

```
Leaf1(config)# interface vxlan 1
Leaf1(config-vxlan-if)#  source ip 192.168.2.3
Leaf1(config-vxlan-if)#  no shutdown
Leaf1(config-vxlan-if)#  vni 110
Leaf1(config-vni-110)#   vlan 110
```

Leaf2

```
Leaf2(config)# interface vxlan 1
Leaf2(config-vxlan-if)#  source ip 192.168.2.4
Leaf2(config-vxlan-if)#  no shutdown
Leaf2(config-vxlan-if)#  vni 110
Leaf2(config-vni-110)#   vlan 110
```

- Validate the VXLAN interface is up with correct source, destination VTEP peer IPs via EVPN and VNI/VLAN mapping.

```
Leaf1(config)# sh int vxlan
Interface vxlan1 is up
Admin state is up
Description:
Underlay VRF: default
Destination UDP port: 4789
VTEP source IPv4 address: 192.168.2.3

VNI         VLAN   VTEP Peers        Origin
---------- ------ ---------------- --------
```

```
110         110     192.168.2.4         evpn
```

- The leafs automatically create a VXLAN tunnel between them as they are both interested in the same VNI

- If wireshark is available https://www.eve-ng.net/index.php/features-compare/

- Setup and start wireshark packet captures

    ○ right click on a leaf switch -> Capture -> 1/1/2 -> Ethernet

    ○ also right click on the same switch, other uplink -> Capture -> 1/1/3 -> Ethernet

- Only 1 link might show the desired packet captures as ECMP is not supported on the AOS-CX VMs

Task 5 – Configure Hosts (VPCS)

- Configure Host1, Host2 with the desired IP and default gateway (the default gateway doesn't exist on the network as L2 VXLAN is used but is a required config in VPCS, so we assume a .254 as the default gateway)

Host1
```
ip 10.0.110.1/24 10.0.110.254
```

Host2
```
ip 10.0.110.2/24 10.0.110.254
```

Task 6 – Final Validation

- Ensure L2 connectivity works between hosts
```
VPCS> ping 10.0.110.2

84 bytes from 10.0.110.2 icmp_seq=1 ttl=64 time=1.787 ms
84 bytes from 10.0.110.2 icmp_seq=2 ttl=64 time=3.202 ms
84 bytes from 10.0.110.2 icmp_seq=3 ttl=64 time=3.999 ms
84 bytes from 10.0.110.2 icmp_seq=4 ttl=64 time=3.055 ms
84 bytes from 10.0.110.2 icmp_seq=5 ttl=64 time=3.375 ms
```

- Validate local and remote MACs are seen on the leaf switches as expected
```
Leaf1# sh mac-address-table
MAC age-time          : 300 seconds
Number of MAC addresses : 2

MAC Address         VLAN    Type                    Port
-------------------------------------------------------------
00:50:79:66:68:05   110     dynamic                 1/1/1
00:50:79:66:68:07   110     evpn                    vxlan1(192.168.2.4)
```

- Validate local and remote MACs are also seen in the EVPN table

```
Leaf1# sh bgp l2vpn evpn
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, e external S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete

EVPN Route-Type 2 prefix: [2]:[ESI]:[EthTag]:[MAC]:[OrigIP]
EVPN Route-Type 3 prefix: [3]:[EthTag]:[OrigIP]
VRF : default
Local Router-ID 192.168.2.3

     Network                                            Nexthop         Metric    LocPrf    Weight
Path
----------------------------------------------------------------------------------------------------
-
Route Distinguisher: 192.168.2.3:110      (L2VNI 110)
*>  [2]:[0]:[0]:[00:50:79:66:68:05]:[]                 192.168.2.3      0         100       0      ?
*>  [3]:[0]:[192.168.2.3]                              192.168.2.3      0         100       0      ?

Route Distinguisher: 192.168.2.4:110      (L2VNI 110)
*>i [2]:[0]:[0]:[00:50:79:66:68:07]:[]                 192.168.2.4      0         100       0      ?
* i [2]:[0]:[0]:[00:50:79:66:68:07]:[]                 192.168.2.4      0         100       0      ?
*>i [3]:[0]:[192.168.2.4]                              192.168.2.4      0         100       0      ?
* i [3]:[0]:[192.168.2.4]                              192.168.2.4      0         100       0      ?
Total number of entries 6
```

- Validate VXLAN traffic is seen in the wireshark capture


```
     222 467.568626857 10.0.110.2           10.0.110.1          ICMP    148 Echo (ping) reply    id=0x17bd, seq=2/512, ttl=64
     223 468.573783975 10.0.110.2           10.0.110.1          ICMP    148 Echo (ping) reply    id=0x18bd, seq=3/768, ttl=64
     224 469.577206681 10.0.110.2           10.0.110.1          ICMP    148 Echo (ping) reply    id=0x19bd, seq=4/1024, ttl=64
▶ Frame 222: 148 bytes on wire (1184 bits), 148 bytes captured (1184 bits) on interface 0
▶ Ethernet II, Src: HewlettP_8a:14:fa (08:00:09:8a:14:fa), Dst: HewlettP_16:7b:7e (08:00:09:16:7b:7e)
▶ Internet Protocol Version 4, Src: 192.168.2.4, Dst: 192.168.2.3
▶ User Datagram Protocol, Src Port: 25721, Dst Port: 4789
▼ Virtual eXtensible Local Area Network
  ▶ Flags: 0x0800, VXLAN Network ID (VNI)
    Group Policy ID: 0
    VXLAN Network Identifier (VNI): 110
    Reserved: 0
▶ Ethernet II, Src: Private_66:68:07 (00:50:79:66:68:07), Dst: Private_66:68:05 (00:50:79:66:68:05)
▶ Internet Protocol Version 4, Src: 10.0.110.2, Dst: 10.0.110.1
▶ Internet Control Message Protocol
```

- Validate EVPN mac address advertisements

```
  194 429.671778871 192.168.2.3           192.168.2.1        BGP       170 UPDATE Message
▶ Frame 194: 170 bytes on wire (1360 bits), 170 bytes captured (1360 bits) on interface 0
▶ Ethernet II, Src: HewlettP_16:7b:7e (08:00:09:16:7b:7e), Dst: HewlettP_8a:14:fa (08:00:09:8a:14:fa)
▶ Internet Protocol Version 4, Src: 192.168.2.3, Dst: 192.168.2.1
▶ Transmission Control Protocol, Src Port: 41637, Dst Port: 179, Seq: 172, Ack: 153, Len: 104
▼ Border Gateway Protocol - UPDATE Message
    Marker: ffffffffffffffffffffffffffffffff
    Length: 104
    Type: UPDATE Message (2)
    Withdrawn Routes Length: 0
    Total Path Attribute Length: 81
  ▼ Path attributes
    ▶ Path Attribute - ORIGIN: INCOMPLETE
    ▶ Path Attribute - AS_PATH: empty
    ▶ Path Attribute - LOCAL_PREF: 100
    ▶ Path Attribute - EXTENDED_COMMUNITIES
    ▼ Path Attribute - MP_REACH_NLRI
      ▶ Flags: 0x90, Optional, Extended-Length, Non-transitive, Complete
        Type Code: MP_REACH_NLRI (14)
        Length: 44
        Address family identifier (AFI): Layer-2 VPN (25)
        Subsequent address family identifier (SAFI): EVPN (70)
        Next hop network address (4 bytes)
        Number of Subnetwork points of attachment (SNPA): 0
      ▼ Network layer reachability information (35 bytes)
        ▼ EVPN NLRI: MAC Advertisement Route
            Route Type: MAC Advertisement Route (2)
            Length: 33
            Route Distinguisher: 0001c0a80203006e (192.168.2.3:110)
          ▶ ESI: 00:00:00:00:00:00:00:00:00:00
            Ethernet Tag ID: 0
            MAC Address Length: 48
            MAC Address: Private 66:68:05 (00:50:79:66:68:05)
            IP Address Length: 0
          ▶ IP Address: NOT INCLUDED
            0000 0000 0000 0000 0110 .... = MPLS Label 1: 6
```

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Appendix – Complete Configurations

- If you face issues during your lab, you can verify your configs with the configs listed in this section

- If configs are the same, try powering off/powering on the switches to reboot them

Host1
```
VPCS> show ip

NAME         : VPCS[1]
IP/MASK      : 10.0.110.1/24
GATEWAY      : 10.0.110.254
DNS          :
MAC          : 00:50:79:66:68:05
LPORT        : 20000
RHOST:PORT   : 127.0.0.1:30000
MTU          : 1500
```

Host2
```
VPCS> show ip

NAME         : VPCS[1]
IP/MASK      : 10.0.110.2/24
GATEWAY      : 10.0.110.254
DNS          :
MAC          : 00:50:79:66:68:07
LPORT        : 20000
RHOST:PORT   : 127.0.0.1:30000
MTU          : 1500
```

Leaf1
```
Leaf1# sh run
Current configuration:
!
!Version ArubaOS-CX Virtual.10.05.0001
!export-password: default
hostname Leaf1
user admin group administrators password ciphertext
AQBapVMU52p/ytCYietVZGUk6tIqYw4Q6Akwu3365UgNKfHpYgAAADiRDONY/h2CBMH3N7BMvRRQl+cqX6RfeBJpVlnE4Fy
hoWrLRp7YL1hG4UUpF4eJxnNbkt00CM/6ZyxB
ZEC61b3HA1m04o3wLSbsWFvH9r83X+Tgd1xX3lsD0tOEKwfSPD6X
led locator on
!
!
!
!
ssh server vrf mgmt
vlan 1,110
evpn
    vlan 110
        rd auto
        route-target export auto
        route-target import auto
interface mgmt
    no shutdown
    ip dhcp
```

```
interface 1/1/1
    no shutdown
    no routing
    vlan access 110
interface 1/1/2
    no shutdown
    ip address 192.168.4.1/31
    ip ospf 1 area 0.0.0.0
    ip ospf network point-to-point
interface 1/1/3
    no shutdown
    ip address 192.168.4.5/31
    ip ospf 1 area 0.0.0.0
    ip ospf network point-to-point
interface 1/1/4
    no shutdown
interface 1/1/5
    no shutdown
interface 1/1/6
    no shutdown
interface loopback 0
    ip address 192.168.2.3/32
    ip ospf 1 area 0.0.0.0
interface vxlan 1
    source ip 192.168.2.3
    no shutdown
    vni 110
        vlan 110
!
!
!
!
!
router ospf 1
    router-id 192.168.2.3
    area 0.0.0.0
router bgp 65001
    bgp router-id 192.168.2.3
    neighbor 192.168.2.1 remote-as 65001
    neighbor 192.168.2.1 update-source loopback 0
    neighbor 192.168.2.2 remote-as 65001
    neighbor 192.168.2.2 update-source loopback 0
    address-family l2vpn evpn
        neighbor 192.168.2.1 activate
        neighbor 192.168.2.1 send-community extended
        neighbor 192.168.2.2 activate
        neighbor 192.168.2.2 send-community extended
    exit-address-family
!
https-server vrf mgmt
```

Leaf2
```
Leaf2# sh run
Current configuration:
!
!Version ArubaOS-CX Virtual.10.05.0001
!export-password: default
hostname Leaf2
user admin group administrators password ciphertext
AQBapatyqH0CftWF1n1MVl85TAbO9WDzCOquKut5MUry1/WkYgAAAFzxzdzLlkrDdw4XJpYgRjJEdVBzF3kg1JX6pqIm3dY
pLNRx2UaegUlKCLtL+eqqYKdmJizE/p0B1YkL
1PhYYLfX9riBS72YQdgzy/TWyK4KsoMBo0KOyA8HAwwl60LydmEK
```

```
led locator on
!
!
!
!
ssh server vrf mgmt
vlan 1,110
evpn
    vlan 110
        rd auto
        route-target export auto
        route-target import auto
interface mgmt
    no shutdown
    ip dhcp
interface 1/1/1
    no shutdown
    no routing
    vlan access 110
interface 1/1/2
    no shutdown
    ip address 192.168.4.3/31
    ip ospf 1 area 0.0.0.0
    ip ospf network point-to-point
interface 1/1/3
    no shutdown
    ip address 192.168.4.7/31
    ip ospf 1 area 0.0.0.0
    ip ospf network point-to-point
interface 1/1/4
    no shutdown
interface 1/1/5
    no shutdown
interface 1/1/6
    no shutdown
interface loopback 0
    ip address 192.168.2.4/32
    ip ospf 1 area 0.0.0.0
interface vxlan 1
    source ip 192.168.2.4
    no shutdown
    vni 110
        vlan 110
!
!
!
!
router ospf 1
    router-id 192.168.2.4
    area 0.0.0.0
router bgp 65001
    bgp router-id 192.168.2.4
    neighbor 192.168.2.1 remote-as 65001
    neighbor 192.168.2.1 update-source loopback 0
    neighbor 192.168.2.2 remote-as 65001
    neighbor 192.168.2.2 update-source loopback 0
    address-family l2vpn evpn
        neighbor 192.168.2.1 activate
        neighbor 192.168.2.1 send-community extended
        neighbor 192.168.2.2 activate
        neighbor 192.168.2.2 send-community extended
    exit-address-family
!
https-server vrf mgmt
```

Spine1
```
Spine1# sh run
Current configuration:
!
!Version ArubaOS-CX Virtual.10.05.0001
!export-password: default
hostname Spine1
user admin group administrators password ciphertext
AQBapQmyufe7KU4F+7y0XkwIsvuwwy+1zBXxDKhnrN99muFCYgAAAMBAMUs8+7DMHMpSf5hWbuXPGW6AsSiV8gCMUVUvo0m
waV1h6lv8JKB784F5JpeRDhRZawQQwww8qWEb
75GleLUzv0KKWxfO68ZH/vyH4kS+mOlqBanG2FfUwLK3hlGp0WYX
led locator on
!
!
!
!
ssh server vrf mgmt
vlan 1
interface mgmt
    no shutdown
    ip dhcp
interface 1/1/1
    no shutdown
    ip address 192.168.4.2/31
    ip ospf 1 area 0.0.0.0
    ip ospf network point-to-point
interface 1/1/2
    no shutdown
    ip address 192.168.4.0/31
    ip ospf 1 area 0.0.0.0
    ip ospf network point-to-point
interface 1/1/3
    no shutdown
interface 1/1/4
    no shutdown
interface 1/1/5
    no shutdown
interface 1/1/6
    no shutdown
interface loopback 0
    ip address 192.168.2.1/32
    ip ospf 1 area 0.0.0.0
!
!
!
!
!
router ospf 1
    router-id 192.168.2.1
    area 0.0.0.0
router bgp 65001
    bgp router-id 192.168.2.1
    neighbor 192.168.2.3 remote-as 65001
    neighbor 192.168.2.3 update-source loopback 0
    neighbor 192.168.2.4 remote-as 65001
    neighbor 192.168.2.4 update-source loopback 0
    address-family l2vpn evpn
        neighbor 192.168.2.3 activate
        neighbor 192.168.2.3 route-reflector-client
        neighbor 192.168.2.3 send-community extended
        neighbor 192.168.2.4 activate
        neighbor 192.168.2.4 route-reflector-client
        neighbor 192.168.2.4 send-community extended
```

```
        exit-address-family
!
https-server vrf mgmt
```

Spine2

```
Spine2# sh run
Current configuration:
!
!Version ArubaOS-CX Virtual.10.05.0001
!export-password: default
hostname Spine2
user admin group administrators password ciphertext
AQBapQO37UTF26BBmzKTurSE0YYNBHnts3ccme3ZAtefD8lYYgAAAH904CccOVwhGS7zXBrJxrsC0EO5vND88i3JRpKdxDt
Eih6QtPpA23znBp11RH/J72YHm/iLDSHs0gWO
xadHnIwj3DnT/324kjPE2fQCN7Z8H7S1reE6Wbd1Hc808Iw5o6aM
led locator on
!
!
!
!
ssh server vrf mgmt
vlan 1
interface mgmt
    no shutdown
    ip dhcp
interface 1/1/1
    no shutdown
    ip address 192.168.4.6/31
    ip ospf 1 area 0.0.0.0
    ip ospf network point-to-point
interface 1/1/2
    no shutdown
    ip address 192.168.4.4/31
    ip ospf 1 area 0.0.0.0
    ip ospf network point-to-point
interface 1/1/3
    no shutdown
interface 1/1/4
    no shutdown
interface 1/1/5
    no shutdown
interface 1/1/6
    no shutdown
interface loopback 0
    ip address 192.168.2.2/32
    ip ospf 1 area 0.0.0.0
!
!
!
!
!
router ospf 1
    router-id 192.168.2.2
    area 0.0.0.0
router bgp 65001
    bgp router-id 192.168.2.2
   area 0.0.0.0
router bgp 65001
    bgp router-id 192.168.2.2
    neighbor 192.168.2.3 remote-as 65001
    neighbor 192.168.2.3 update-source loopback 0
    neighbor 192.168.2.4 remote-as 65001
```

```
    neighbor 192.168.2.4 update-source loopback 0
    address-family l2vpn evpn
        neighbor 192.168.2.3 activate
        neighbor 192.168.2.3 route-reflector-client
        neighbor 192.168.2.3 send-community extended
        neighbor 192.168.2.4 activate
        neighbor 192.168.2.4 route-reflector-client
        neighbor 192.168.2.4 send-community extended
    exit-address-family
!
https-server vrf mgmt
```