PVLAN &
PVLAN over EVPN VXLAN

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Agenda

- **PVLAN**
  - **Definition**
  - **Trunk Mode**
  - **Arista Support**

- **PVLAN over EVPN VXLAN**
  - **Control Plane and Data Plane**
  - **Traffic Flow**
  - **Arista Support**

PVLAN

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Private VLAN

- **Private VLANs** are a collection of VLANs
  - There is a single primary VLAN, and one or more secondary VLANs

- **Primary VLAN**
  - Ports in the primary VLAN can send/receive traffic from ports in all the corresponding PVLANs
  - There will only be one primary VLAN in a private VLAN Domain

- **Secondary VLAN**

  - **Community VLAN**

    » Hosts in the same community VLAN can forward traffic to each other as well as ports in the primary VLAN

    » There can be multiple community VLANs in a private VLAN

  - **Isolated VLAN**

    » Hosts in an isolated VLAN can only forward traffic to ports in the primary VLAN

    » Hosts within an isolated VLAN are not allowed to communicate with each other via bridging

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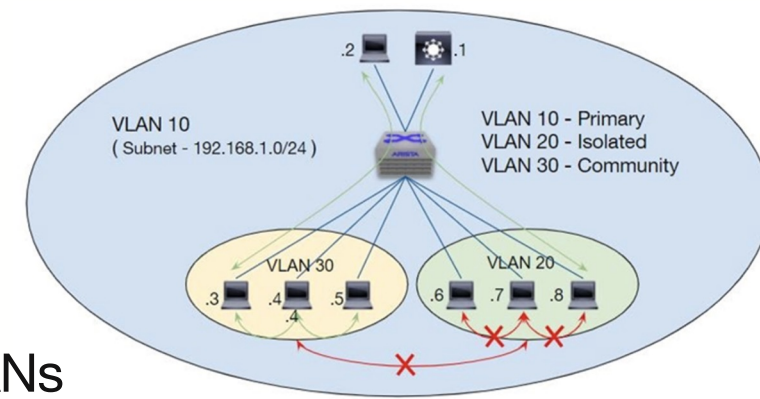
PVLAN Ports

- **Promiscuous port**
  - All ports in primary VLAN are called promiscuous ports
  - By default all promiscuous ports are mapped to all secondary VLANs
  - Communicates with anything else connected to the primary or any secondary VLAN
  - Connects to a router, firewall or other common gateway device

- **Host port**
  - **Community port**
    - Connects to the host that resides on community VLAN
    - Communicates with promiscuous ports and ports on the same community VLAN
  - **Isolated port**
    - Connects to the host that resides on isolated VLAN
    - Communicates only with promiscuous ports

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PVLAN Traffic Flow

Src Dest	Primary VLAN 10	Isolated VLAN 11	Community VLAN 12	Community VLAN 13
Primary VLAN 10	OK	OK	OK	OK
Isolated VLAN 11	OK	NOK	NOK	NOK
Community VLAN 12	OK	NOK	OK	NOK
Community VLAN 13	OK	NOK	NOK	OK

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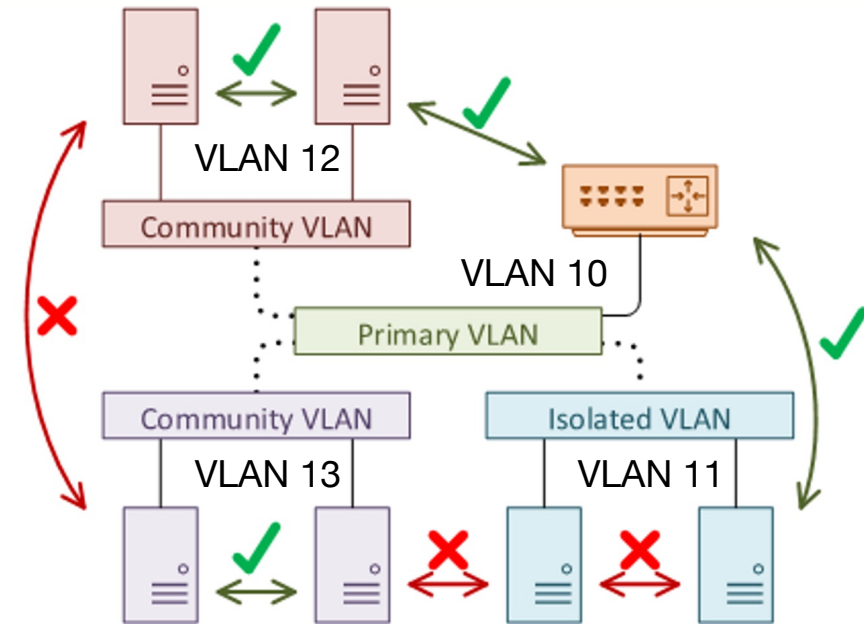
PVLAN Configuration

```
platform sand l2 forwarding-id sharing
!
!
vlan 10
 !
vlan 11
   private-vlan isolated primary vlan 10
 !
vlan 12-13
   private-vlan community primary vlan 10
 !
interface Ethernet 27/1
 switchport access vlan 11
 !
interface Ethernet 28/1
 switchport access vlan 12
 !
interface Ethernet 33/1
 switchport access vlan 10
```

On Sand Platforms

Primary VLAN

Secondary VLAN

Secondary VLAN

Host Port

Host Port

Promiscuous Port

```
show vlan private-vlan

Primary Secondary Type              Ports
------- --------- ---------- --------

10              12          community
        Et28/1, Et33
10              13          community
               Et33
10              11          isolated
        Et27/1, Et33


show vlan

VLAN  Name    Status   Ports
-----  ------  -------- ----------------------
1    default  active
10   VLAN0010 active    Et27/1+, Et28/1+, Et33
11   VLAN0011 active    Et27/1, Et33+
12   VLAN0012 active    Et28/1, Et33+
13   VLAN0013 active    Et33+
```

+ indicates a private VLAN promoted port

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MAC Learning in Primary VLAN

```
s70515#sh run int ethernet 27/1,28/1
interface Ethernet27/1
    switchport access vlan 11
interface Ethernet28/1
    switchport access vlan 12
!
!
!
!
s70515#sh mac address-table
VLAN    Mac Address       Type        Ports       Moves   Last Move
----    -----------       ----        -----       -----   ---------
  10    985d.82b4.ca61    DYNAMIC     Et27/1      1       0:00:43 ago
  10    985d.82b4.ccf5    DYNAMIC     Et28/1      1       0:03:58 ago
Total Mac Addresses for this criterion: 2
```

Secondary VLAN

Secondary VLAN

Primary VLAN

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Mapping on a Promiscuous Port

By default a promiscuous ports is mapped to all secondary VLANs

```
s70515#show running-config interfaces ethernet 33
interface Ethernet33
   switchport access vlan 10
```

Without explicit mapping

```
s70515#show vlan

VLAN  Name      Status    Ports
---   --------- --------  -------------------------------
1     default   active
10    VLAN0010  active    Et27/1+, Et28/1+, Et33
11    VLAN0011  active    Et27/1, Et33+
12    VLAN0012  active    Et28/1, Et33+
13    VLAN0013  active    Et33+


+ indicates a private VLAN promoted port
```

```
s70515#show running-config interfaces ethernet 33
interface Ethernet33
   switchport access vlan 10
   switchport pvlan mapping 1-11,13
```

With mapping

```
s70515#show vlan

VLAN  Name      Status    Ports
---   -------   --------- ------------------------
1     default   active
10    VLAN0010  active    Et27/1+, Et28/1+, Et33
11    VLAN0011  active    Et27/1, Et33+
12    VLAN0012  active    Et28/1
13    VLAN0013  active    Et33+


+ indicates a private VLAN promoted port
```
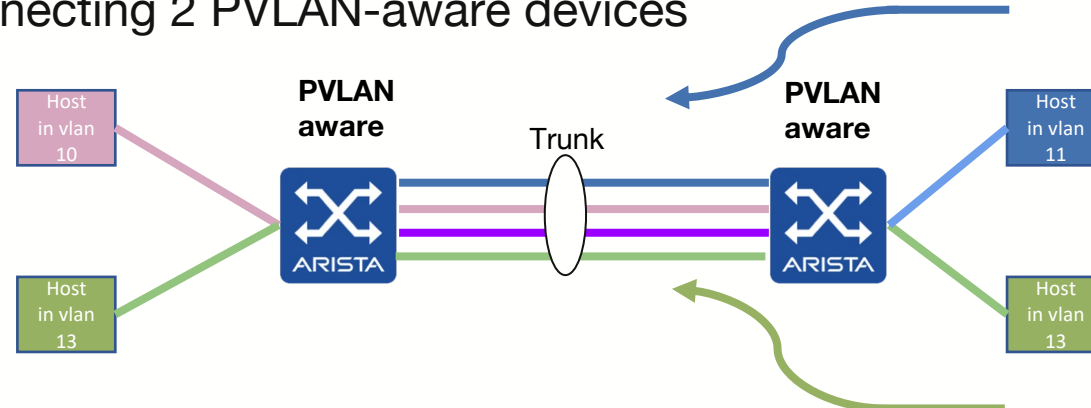
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PVLAN and Trunk Mode

- **Regular trunk mode**
  - PVLAN (primary and secondary VLANs) are supported on the trunk as long as they are allowed
  - No Private VLAN specific behaviour on this trunk
  - Frames are forwarded towards the trunk the way they have been received by the switch in terms on VLAN tag (for primary and secondary VLANs)
  - The device connected to the trunk must be PVLAN aware for the frame to be handled accordingly on the destination device
 - Use case:
    - » Interconnecting 2 PVLAN-aware devices

Primary VLAN: 10
Isolated VLAN: 11
Community VLAN: 12
Community VLAN: 13

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PVLAN and Trunk Mode

- **Promiscuous trunk mode**
  - Not supported by Arista
  - When traffic from a secondary VLAN needs to pass over the trunk, the secondary VLAN tag is rewritten with the primary VLAN tag
  - Use case:
    - >> Communication with PVLAN-unaware devices
    - >> An external router on a stick routes between several primary VLANs
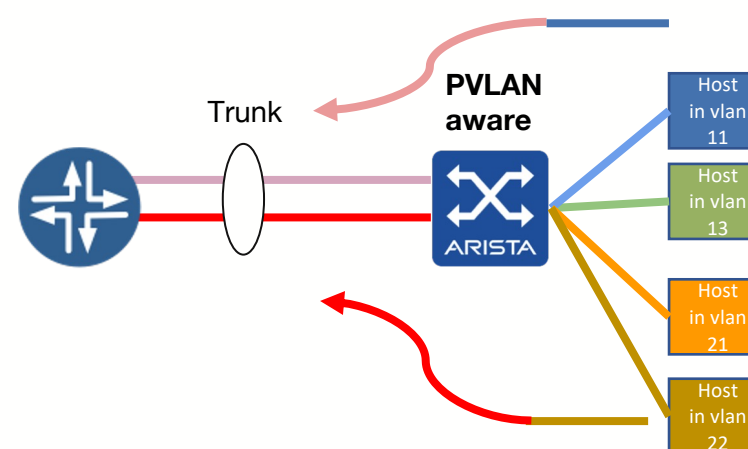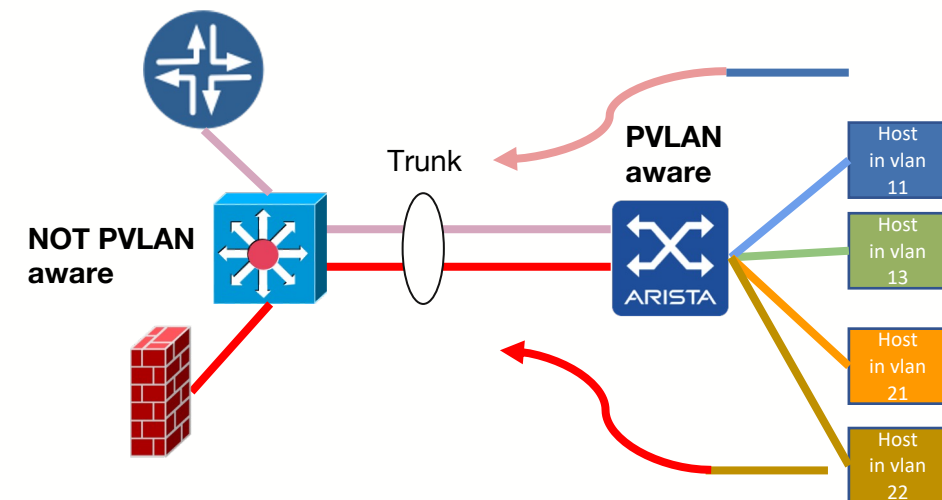
First Private VLAN Domain
Primary VLAN: 10
Isolated VLAN: 11
Community VLAN: 12
Community VLAN: 13

Second Private VLAN Domain
Primary VLAN: 20
Community VLAN: 21
Isolated VLAN: 22

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Workaround for Promiscuous Trunk

- VLAN translation on trunk interface

    - Egress VLAN translation on the trunk for all secondary VLANs to primary VLAN

- Configuration Example

```
interface Ethernet 1
    switchport mode trunk
    switchport vlan translation out 11-13 10
    switchport vlan translation out 21-23 20
```
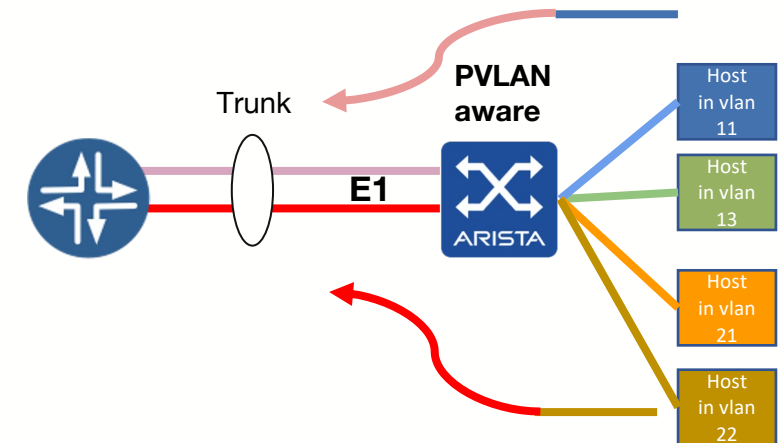
- Configuration on the access port in secondary VLAN unchanged

- Keep the configuration synchronized between trunk and PVLAN Domain when
  adding/removing secondary VLANs

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PVLAN and Trunk Mode

- **Secondary VLAN trunk mode**
  - Arista supported feature
  - This option rewrites the primary tag on the frame to use a secondary VLAN ID
  - Any frame coming in on a primary VLAN will go out on the trunk with the lowest values secondary VLAN in that private VLAN domain
  - Configuration: `switchport trunk private-vlan secondary`
  - Use case:
    - » Communication with PVLAN-unaware devices
      Gateways on PVLAN-aware device
      Devices on PVLAN-unaware devices

First Private VLAN Domain
Primary VLAN: 10
Isolated VLAN: 11
Community VLAN: 12
Community VLAN: 13

Second Private VLAN Domain
Primary VLAN:20
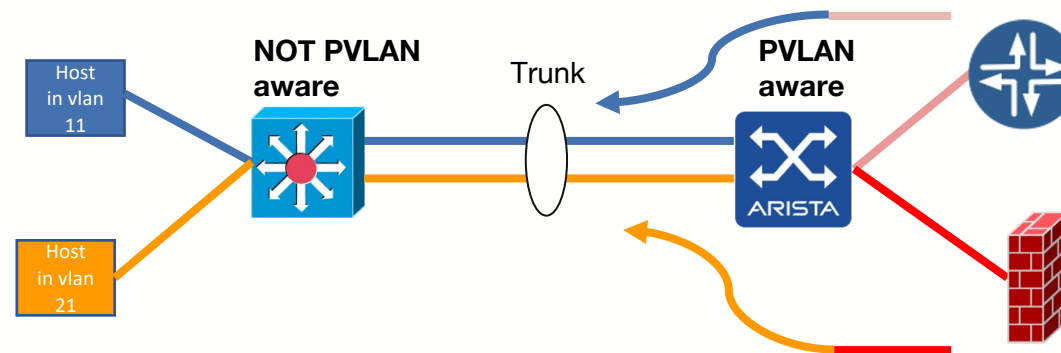Community VLAN: 21
Isolated VLAN: 22

Host in vlan 10
Host in vlan 11
Host in vlan 12
Host in vlan 13
Host in vlan 20
Host in vlan 21
Host in vlan 22

NOT PVLAN aware
Trunk
PVLAN aware
Host in vlan 11
Host in vlan 21

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PVLAN and Trunk Mode

- **Isolated VLAN trunk mode**
  - Terminology used by other vendors
  - This option rewrites the primary tag on the frame to use the isolated VLAN ID
  - Any frame coming in on a primary VLAN will go out on the trunk with the isolated VLAN values in that private VLAN domain
  - Use case:
    - » Communication with PVLAN-unaware devices

      Gateway on PVLAN-aware device

      Hosts on PVLAN-unaware devices

First Private VLAN Domain
Primary VLAN: 10
Isolated VLAN: 11
Community VLAN: 12
Community VLAN: 13

Second Private VLAN Domain
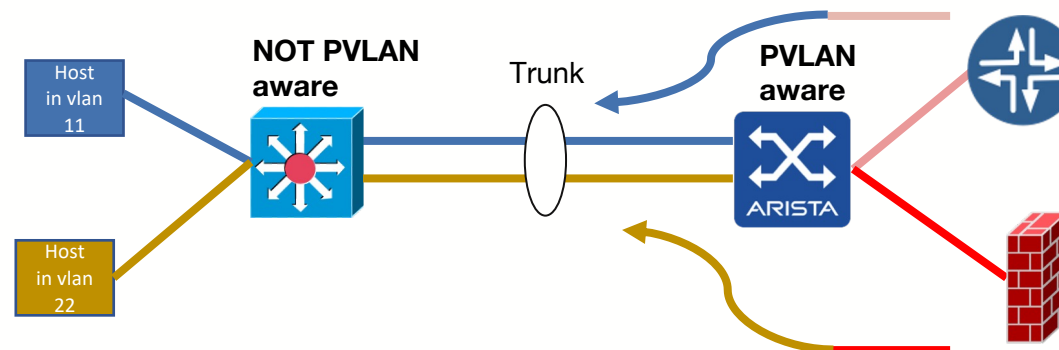Primary VLAN:20
Community VLAN: 21
Isolated VLAN: 22

Host in vlan 10
Host in vlan 11
Host in vlan 12
Host in vlan 13
Host in vlan 20
Host in vlan 21
Host in vlan 22

Host in vlan 11
Host in vlan 22
NOT PVLAN aware
Trunk
PVLAN aware

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Arista Support for Trunk Mode

- **Regular trunk mode**
  - Supported on Arista switches

- **Promiscuous trunk mode**
  - Not supported on Arista switches
  - VLAN translation as a workaround

- **Secondary VLAN trunk mode**
  - Supported on Arista switches

- **Isolated VLAN trunk mode**
  - Supported on Arista switches if adequate VLAN numbering

PVLAN over EVPN VXLAN

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PVLAN over EVPN VXLAN

PVLAN behaviour is maintained when stretched across an EVPN VXLAN Fabric

Spine Switches

Leaf Switches

EVPN VXLAN Fabric with PVLAN

Primary VLAN: 10
Isolated VLAN: 11
Community VLAN: 12
Community VLAN: 13

Host in vlan 10
Host in vlan 11
Host in vlan 12
Host in vlan 13

Host in vlan 11
Host in vlan 13
Host in vlan 12
Host in vlan 13
Host in vlan 11
Host in vlan 12
Host in vlan 11
Host in vlan 11

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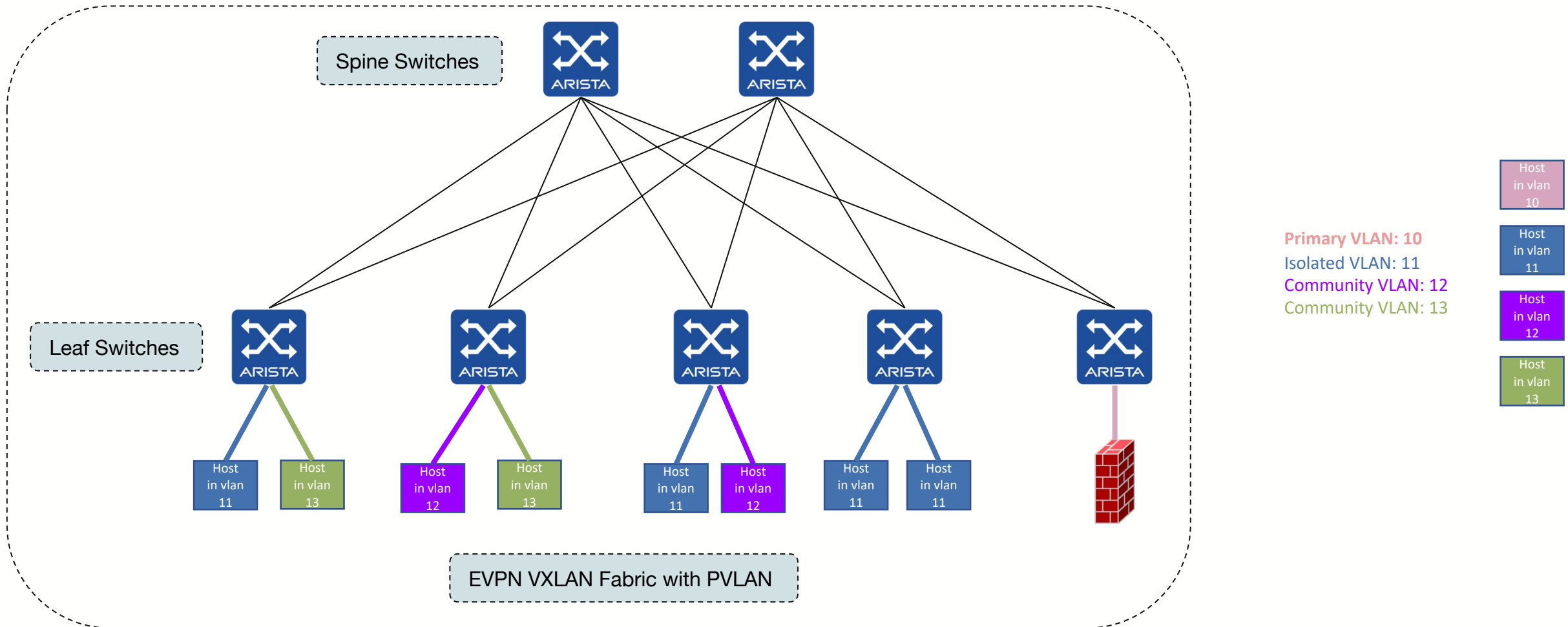
PVLAN with EVPN VXLAN

- MAC addresses from primary and secondary VLANs
  - Only in primary VLAN MAC address-table
  - Same behavior as PVLAN without EVPN VXLAN

- For route-type 2, MAC and MAC/IP from primary and secondary VLANs are advertised
  - With MAC VRF RD/RT of primary VLAN
  - With primary VLAN VNI

- Route-type 3 are advertised for primary and secondary VLANs
  - Hence, flood lists are created for primary and secondary VLANS

- VNI encapsulation depends on the source host

- Frame is dropped at the destination VTEP when traffic not allowed

Control Plane and Data Plane

Type 2 (MAC)
RD = 10.1.0.1:10
RT = 10:10
NH = VTEP 1
VNI = 10
MAC = 985d.82b4.ccf5

Type 2 (MAC)
RD = 10.1.0.1:10
RT = 10:10
NH = VTEP 1
VNI = 10
MAC = 985d.82b4.ca61

BGP Update → ← BGP Update

Type 2 (MAC)
RD = 10.2.0.2:10
RT = 10:10
NH = VTEP 2
VNI = 10
MAC = 444c.a88d.27c1

VNI 12

172.16.0.1
985d.82b4.ccf5

Host 1

Leaf 1 — — — Leaf 2 — Host 2

172.16.0.2
444c.a88d.27c1

172.16.0.3
985d.82b4.ca61

Host 3

VNI 11

VNI 10

Host in vlan 10
Host in vlan 11
Host in vlan 12
Host in vlan 13

Primary VLAN: 10
Isolated VLAN: 11
Community VLAN: 12
Community VLAN: 13

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Traffic Flow Examples

Src ＼ Dest	Primary VLAN 10	Isolated VLAN 11	Community VLAN 12	Community VLAN 13
Primary VLAN 10	OK - VNI 10	OK - VNI 10	OK - VNI 10	OK - VNI 10
Isolated VLAN 11	OK - VNI 11	NOK - VNI 11	NOK - VNI 11	NOK - VNI 11
Community VLAN 12	OK - VNI 12	NOK - VNI 12	OK - VNI 12	NOK - VNI 12
Community VLAN 13	OK - VNI 13	NOK - VNI 13	NOK - VNI 13	OK - VNI 13

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Traffic Flow Examples

ping H3 → H2 (OK)

16:30:17.181670 98:5d:82:b4:dd:f9 > 98:5d:82:c1:6b:03, ethertype 802.1Q (0x8100), length 168: vlan 1006, p 0, ethertype IPv4 (0x0800), **10.1.1.1.18655 > 10.2.1.2.4789: VXLAN**, flags [I] (0x08), **vni 12**

98:5d:82:b4:ca:61 > 44:4c:a8:8d:27:c1, ethertype IPv4 (0x0800), length 114: **172.16.0.3 > 172.16.0.2: ICMP echo request**, id 18917, seq 1, length 80

16:30:17.181814 98:5d:82:c1:6b:03 > 98:5d:82:b4:dd:f9, ethertype IPv4 (0x0800), length 164: **10.2.1.2.20406 > 10.1.1.1.4789: VXLAN**, flags [I] (0x08), **vni 12**

44:4c:a8:8d:27:c1 > 98:5d:82:b4:ca:61, ethertype IPv4 (0x0800), length 114: **172.16.0.2 > 172.16.0.3: ICMP echo reply**, id 18917, seq 1, length 80

ping H1 → H2 (NOK)
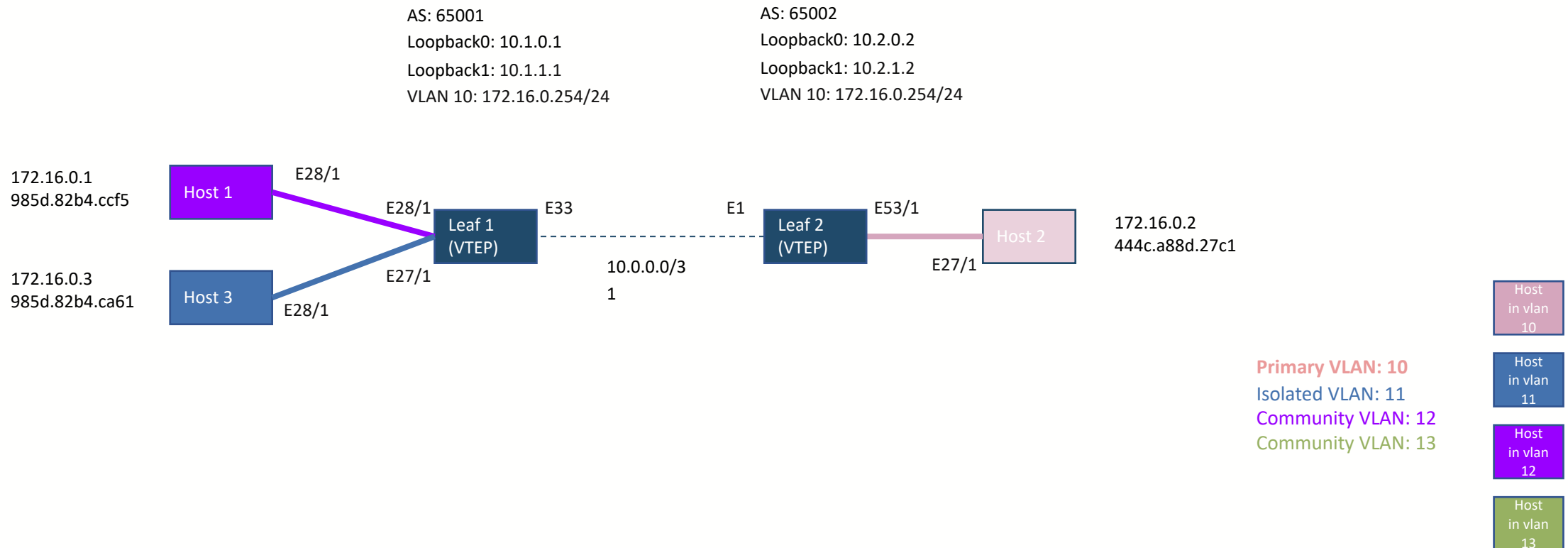
16:36:11.517270 98:5d:82:b4:dd:f9 > 98:5d:82:c1:6b:03, ethertype 802.1Q (0x8100), length 168: vlan 1006, p 0, ethertype IPv4 (0x0800), **10.1.1.1.54434 > 10.2.1.2.4789: VXLAN**, flags [I] (0x08), **vni 13**

98:5d:82:b4:cc:f5 > 44:4c:a8:8d:27:c1, ethertype IPv4 (0x0800), length 114: **172.16.0.1 > 172.16.0.2: ICMP echo request**, id 18969, seq 1, length 80

There is no echo reply.

Lab Details for the Next Slides

Devices configuration and show commands:
https://github.com/ksator/pvlan_evpn_vxlan/blob/master/inventories/pvlan_accross_evpn_vxlan/

AS: 65001
Loopback0: 10.1.0.1
Loopback1: 10.1.1.1
VLAN 10: 172.16.0.254/24

AS: 65002
Loopback0: 10.2.0.2
Loopback1: 10.2.1.2
VLAN 10: 172.16.0.254/24

172.16.0.1
985d.82b4.ccf5

Host 1

E28/1

E28/1

Leaf 1
(VTEP)

E33

E1

Leaf 2
(VTEP)

E53/1

Host 2

172.16.0.2
444c.a88d.27c1

172.16.0.3
985d.82b4.ca61

Host 3

E27/1

E28/1

10.0.0.0/3
1

E27/1

Primary VLAN: 10
Isolated VLAN: 11
Community VLAN: 12
Community VLAN: 13

Host
in vlan
10

Host
in vlan
11

Host
in vlan
12

Host
in vlan
13

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VLAN Table and VXLAN Address Table

```
leaf1#show vlan private-vlan
Primary Secondary Type        Ports
------- --------- ----------- -------------------------------
10      12        community   Cpu, Et28/1, Vx1
10      13        community   Cpu, Vx1
10      11        isolated    Cpu, Et27/1, Vx1
```

```
leaf1#show vlan
VLAN  Name                               Status    Ports
----- ---------------------------------- --------- -------------------------------
1     default                            active
10    VLAN0010                           active    Cpu, Et27/1+, Et28/1+, Vx1
11    VLAN0011                           active    Cpu, Et27/1, Vx1
12    VLAN0012                           active    Cpu, Et28/1, Vx1
13    VLAN0013                           active    Cpu, Vx1

+ indicates a private VLAN promoted port
leaf1#
```

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VLAN Table and VXLAN Address Table

```
Leaf2#show vlan private-vlan
Primary Secondary Type        Ports
------- --------- ----------- -------------------------------
10      12        community   Cpu, Et53/1, Vx1
10      13        community   Cpu, Et53/1, Vx1
10      11        isolated    Cpu, Et53/1, Vx1
```

```
Leaf2#show vlan
VLAN  Name                             Status    Ports
----- -------------------------------- --------- --------------------------------
1     default                          active
10    VLAN0010                         active    Cpu, Et53/1, Vx1
11    VLAN0011                         active    Cpu, Et53/1+, Vx1
12    VLAN0012                         active    Cpu, Et53/1+, Vx1
13    VLAN0013                         active    Cpu, Et53/1+, Vx1


+ indicates a private VLAN promoted port
```

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PVLAN over EVPN VXLAN Configuration

VLAN and port configuration is the same as in PVLAN configuration without EVPN VXLAN

```
router bgp 65002
...
  !
  vlan 10
       rd 10.2.0.2:10
       route-target both 10:
       redistribute learned
  !
  vlan 11
       rd 10.2.0.2:11
       route-target both 11:11
  !
  vlan 12
       rd 10.2.0.2:12
       route-target both 12:
  !
  vlan 13
       rd 10.2.0.2:13
       route-target both 13:13
```

Learned MAC redistribution only on Primary VLAN

MAC VRF for all Primary and Secondary VLANs

```
interface Vxlan1
    vxlan source-interface Loopback1
    vxlan udp-port 4789
    vxlan vlan 10 vni 10
    vxlan vlan 11 vni 11
    vxlan vlan 12 vni 12
    vxlan vlan 13 vni 13
```

Primary and Secondary VLAN/VNI mapping

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EVPN Route-Type 3

```
Leaf1#sh bgp neighbors 10.2.0.2 evpn advertised-routes route-type imet detail
Router identifier 10.1.1.1, local AS number 65001
BGP routing table entry for imet 10.1.1.1, Route Distinguisher: 10.2.0.1:10
 Paths: 1 available
   65001
               10.1.1.1 from - (0.0.0.0)
               Origin IGP, metric -, localpref 100, weight 0, valid, local, best
               Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan
               VNI: 10
               PMSI Tunnel: Ingress Replication, MPLS Label: 10, Leaf Information Required: false, Tunnel ID: 10.1.1.1
BGP routing table entry for imet 10.1.1.1, Route Distinguisher: 10.2.0.1:11
 Paths: 1 available
   65001
               10.1.1.1 from - (0.0.0.0)
               Origin IGP, metric -, localpref 100, weight 0, valid, local, best
               Extended Community: Route-Target-AS:11:11 TunnelEncap:tunnelTypeVxlan
               VNI: 11
               PMSI Tunnel: Ingress Replication, MPLS Label: 11, Leaf Information Required: false, Tunnel ID: 10.1
BGP routing table entry for imet 10.1.1.1, Route Distinguisher: 10.2.0.1:12
 Paths: 1 available
   65001
               10.1.1.1 from - (0.0.0.0)
               Origin IGP, metric -, localpref 100, weight 0, valid, local, best
               Extended Community: Route-Target-AS:12:12 TunnelEncap:tunnelTypeVxlan
               VNI: 12
               PMSI Tunnel: Ingress Replication, MPLS Label: 12, Leaf Information Required: false, Tunnel ID: 10.1
BGP routing table entry for imet 10.1.1.1, Route Distinguisher: 10.2.0.1:13
 Paths: 1 available
   65001
               10.1.1.1 from - (0.0.0.0)
               Origin IGP, metric -, localpref 100, weight 0, valid, local, best
               Extended Community: Route-Target-AS:13:13 TunnelEncap:tunnelTypeVxlan
               VNI: 13
               PMSI Tunnel: Ingress Replication, MPLS Label: 13, Leaf Information Required: false, Tunnel ID: 10.1.1.1
```

Primary VLAN

Secondary VLAN

Secondary VLAN

Secondary VLAN

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VXLAN Flood-list

```
Leaf2#sh vxlan flood vtep


VXLAN Flood VTEP Table

-----------------------------------------------------



VLANS                           Ip Address
-----------------------------------------------------

10-13                           10.1.1.1
```

Primary and Secondary VLANs in VXLAN flood-list

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EVPN Route-Type 2

```
leaf1#sh bgp evpn route-type mac-ip detail
BGP routing table information for VRF default
Router identifier 10.1.1.1, local AS number 65001
BGP routing table entry for mac-ip 444c.a88d.27c1, Route Distinguisher: 10.2.0.2:10
 Paths: 1 available
  65002
    10.2.1.2 from 10.2.0.2 (10.0.0.1)
      Origin IGP, metric -, localpref 100, weight 0, valid, external, best
      Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan
      VNI: 10 ESI: 0000:0000:0000:0000:0000
BGP routing table entry for mac-ip 985d.82b4.ca61, Route Distinguisher: 10.1.0.1:10
 Paths: 1 available
  Local
    - from - (0.0.0.0)
      Origin IGP, metric -, localpref -, weight 0, valid, local, best
      Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan
      VNI: 10 ESI: 0000:0000:0000:0000:0000
BGP routing table entry for mac-ip 985d.82b4.ccf5, Route Distinguisher: 10.1.0.1:10
 Paths: 1 available
  Local
    - from - (0.0.0.0)
      Origin IGP, metric -, localpref -, weight 0, valid, local, best
      Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan
      VNI: 10 ESI: 0000:0000:0000:0000:0000
```

Primary VLAN

Secondary VLAN

Secondary VLAN

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MAC Address and VXLAN Address Table

```
Leaf2#show vxlan address-table


VLAN  Mac Address      Type      Prt  VTEP              Moves  Last Move
----  -----------      ----      ---  ----              -----  ---------
  10  985d.82b4.ca61   EVPN      Vx1  10.1.1.1          1      0:00:26 ago
  10  985d.82b4.ccf5   EVPN      Vx1  10.1.1.1          1      0:00:29 ago
Total Remote Mac Addresses for this criterion: 2
```

MAC Learned in
Primary VLAN

```
Leaf2#show mac address-table


VLAN   Mac Address      Type      Ports    Moves  Last Move
----   -----------      ----      -----    -----  ---------
  10   001c.7300.dc01   STATIC    Router
  10   444c.a88d.27c1   DYNAMIC   Et53/1   1      0:00:10 ago
  10   985d.82b4.ca61   DYNAMIC   Vx1      1      0:00:07 ago
  10   985d.82b4.ccf5   DYNAMIC   Vx1      1      0:00:10 ago
Total Mac Addresses for this criterion: 4
```

MAC Learned in
Primary VLAN

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Sand Support for PVLAN with EVPN VXLAN

- Limitation of at most 7 PVLAN domains shared across VTEPs
- There is no limitation in numbers of secondary VLANs per primary VLAN

- More Private VLAN Domains can be configured locally, but won't be able to stretch

Leaf 1

Leaf 2

Primary VLAN

Sec. VLAN

Primary VLAN

Sec. VLAN
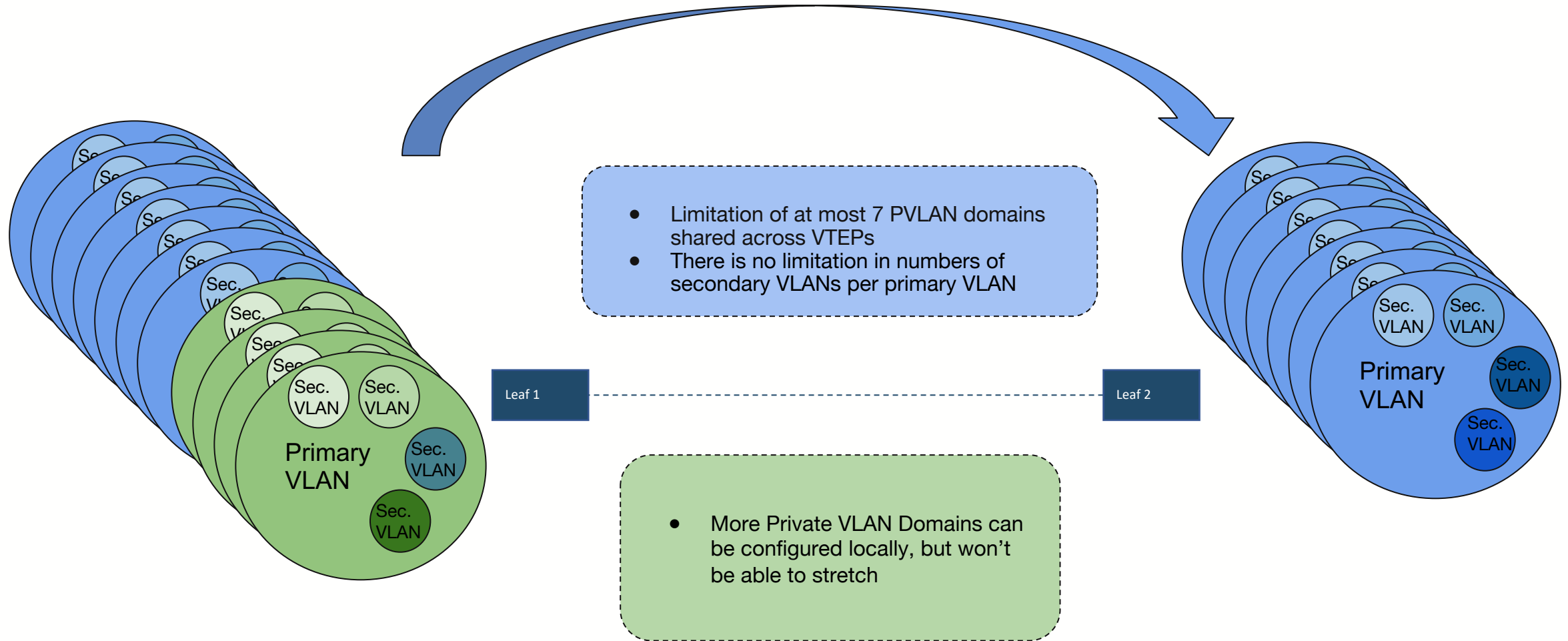
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Arista Support for PVLAN with EVPN VXLAN

- PVLAN + EVPN/VXLAN supported in 4.26.1F (Quebec) for Trident 3 platforms (7050X3)

- PVLAN + EVPN/VXLAN supported in 4.26.2F (Rio) on Jericho/Jericho+ platforms (7280R/R2)

- PVLAN + EVPN/VXLAN supported in 4.26.2F (Rio) on Qumran platforms (7020R)

- Limitations for Jericho/Jericho+/Qumran platforms:
  - Support of maximum 7 stretched private VLANs Domain per switch
  - Currently no MLAG support

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Special Thanks

- Claus Holbech

- Pierre Dezitter

- Basil Saji

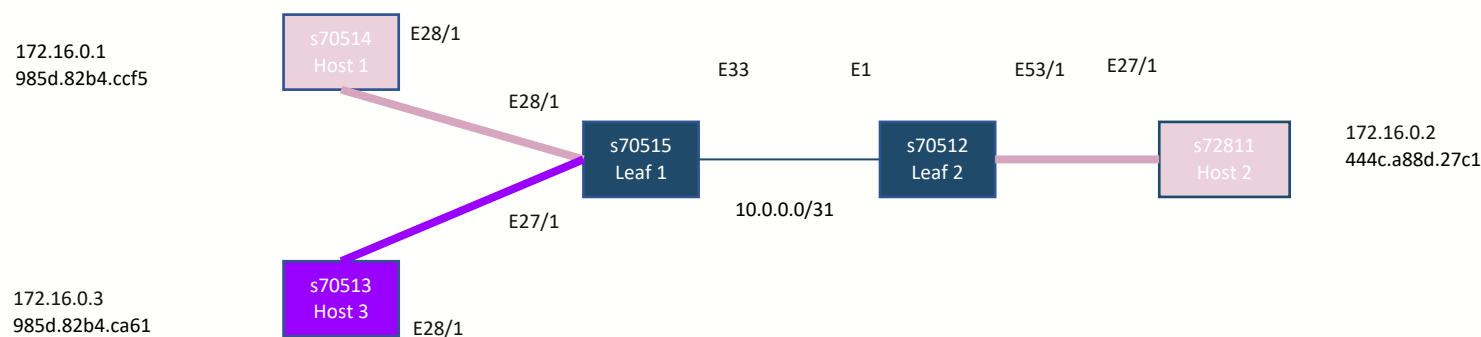- Milind Kulkarni

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Test Agenda

- Community VLAN <--> Primary VLAN

- Community VLAN X <--> Community VLAN Y

- Community VLAN <--> Isolated VLAN

- Primary VLAN <--> Isolated VLAN

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Community VLAN <--> Primary VLAN

H3 in VLAN 12, H1 and H2 in VLAN 10

172.16.0.1
985d.82b4.ccf5

s70514
Host 1

E28/1

E28/1

E33

E1

E53/1

E27/1

s70515
Leaf 1

s70512
Leaf 2

s72811
Host 2

172.16.0.2
444c.a88d.27c1

E27/1

10.0.0.0/31

172.16.0.3
985d.82b4.ca61

s70513
Host 3

E28/1

Leaf

Host
in vlan
10

Primary VLAN: 10
Isolated VLAN: 11
Community VLAN: 12
Community VLAN: 13

Host
in vlan
11

Host
in vlan
12

Host
in vlan
13

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VLAN : H3 in VLAN 12, H1 and H2 in VLAN 10

```
Leaf1#sh vlan


VLAN  Name                             Status    Ports
----- -------------------------------- --------- --------------------------------
1       default                          active
10      VLAN0010                         active    Cpu, Et27/1+, Et28/1, Vx1
11      VLAN0011                         active    Cpu, Et28/1+, Vx1
12      VLAN0012                         active    Cpu, Et27/1, Et28/1+, Vx1
13      VLAN0013                         active    Cpu, Et28/1+, Vx1


+ indicates a private VLAN promoted port

```

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Encapsulated Traffic: H3 in VLAN 12, H1 and H2 in VLAN 10

ping H3 → H2 (OK)

15:54:16.254254 98:5d:82:b4:dd:f9 > 98:5d:82:c1:6b:03, ethertype 802.1Q (0x8100), length 168: vlan 1006, p 0, ethertype IPv4 (0x0800), **10.1.1.1.18655 > 10.2.1.2.4789: VXLAN**, flags [I] (0x08), **vni 12**

98:5d:82:b4:ca:61 > 44:4c:a8:8d:27:c1, ethertype IPv4 (0x0800), length 114: **172.16.0.3 > 172.16.0.2: ICMP echo request**, id 16640, seq 1, length 80

15:54:16.254328 98:5d:82:c1:6b:03 > 98:5d:82:b4:dd:f9, ethertype IPv4 (0x0800), length 164: **10.2.1.2.20406 > 10.1.1.1.4789: VXLAN**, flags [I] (0x08), **vni 10**

44:4c:a8:8d:27:c1 > 98:5d:82:b4:ca:61, ethertype IPv4 (0x0800), length 114: **172.16.0.2 > 172.16.0.3: ICMP echo reply**, id 16640, seq 1, length 80

ping H2 → H3 (OK)

15:57:22.901888 98:5d:82:c1:6b:03 > 98:5d:82:b4:dd:f9, ethertype IPv4 (0x0800), length 164: **10.2.1.2.20406 > 10.1.1.1.4789: VXLAN**, flags [I] (0x08), **vni 10**

44:4c:a8:8d:27:c1 > 98:5d:82:b4:ca:61, ethertype IPv4 (0x0800), length 114: **172.16.0.2 > 172.16.0.3: ICMP echo request**, id 2289, seq 1, length 80

15:57:22.901985 98:5d:82:b4:dd:f9 > 98:5d:82:c1:6b:03, ethertype 802.1Q (0x8100), length 168: vlan 1006, p 0, ethertype IPv4 (0x0800), **10.1.1.1.18655 > 10.2.1.2.4789: VXLAN**, flags [I] (0x08), **vni 12**

98:5d:82:b4:ca:61 > 44:4c:a8:8d:27:c1, ethertype IPv4 (0x0800), length 114: **172.16.0.3 > 172.16.0.2: ICMP echo reply**, id 2289, seq 1, length 80

EVPN Control-Plane: H3 in VLAN 12, H1 and H2 in VLAN 10

```
Leaf1(config-if-Et34)#sh bgp evpn route-type mac-ip detail

BGP routing table information for VRF default

Router identifier 10.1.1.1, local AS number 65001

BGP routing table entry for mac-ip 444c.a88d.27c1, Route Distinguisher: 10.2.0.2:10

 Paths: 1 available

  65002

          10.2.1.2 from 10.2.0.2 (10.2.1.2)

          Origin IGP, metric -, localpref 100, weight 0, valid, external, best

          Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan

          VNI: 10 ESI: 0000:0000:0000:0000:0000

BGP routing table entry for mac-ip 985d.82b4.ca61, Route Distinguisher: 10.2.0.1:10

 Paths: 1 available

  Local

          - from - (0.0.0.0)

          Origin IGP, metric -, localpref -, weight 0, valid, local, best

          Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan

          VNI: 10 ESI: 0000:0000:0000:0000:0000

BGP routing table entry for mac-ip 985d.82b4.ccf5, Route Distinguisher: 10.2.0.1:10

 Paths: 1 available

  Local

          - from - (0.0.0.0)

          Origin IGP, metric -, localpref -, weight 0, valid, local, best

          Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan

          VNI: 10 ESI: 0000:0000:0000:0000:0000
```

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VXLAN Address Table: H3 in VLAN 12, H1 and H2 in VLAN 10

```
Leaf2(config)#sh vxlan address-table

        Vxlan Mac Address Table
----------------------------------------------------------------

VLAN   Mac Address   Type       Prt  VTEP          Moves    Last Move
----   -----------   ----       ---  ----          -----    ---------
  10   985d.82b4.ca61  EVPN           Vx1  10.1.1.1     1       0:02:41 ago
  10   985d.82b4.ccf5  EVPN           Vx1  10.1.1.1     1       0:02:34 ago
Total Remote Mac Addresses for this criterion: 2
```
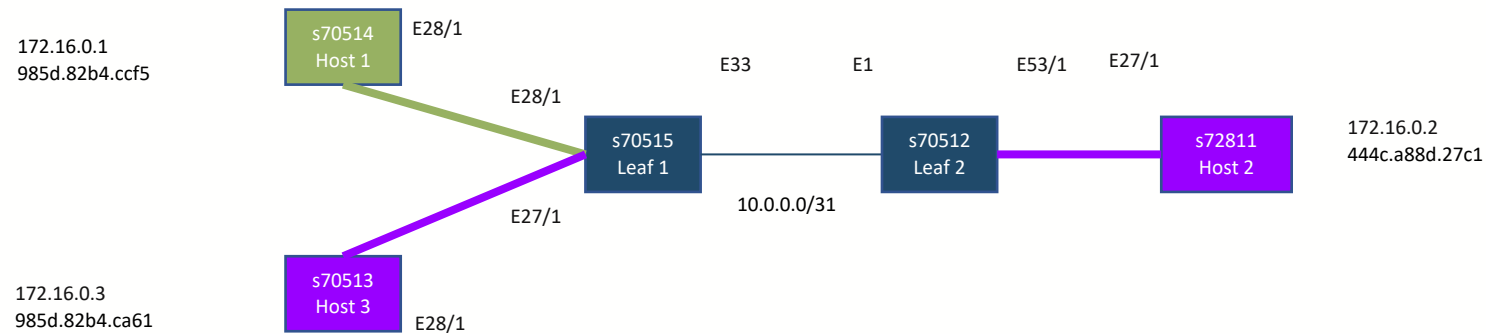
H3 is attached to the vlan 12 on the source VTEP but is learned in vlan 10

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Community 1 VLAN <--> Community 2 VLAN
H1 in VLAN 13, H2 and H3 in VLAN 12

VLAN : H1 in VLAN 13, H2 and H3 in VLAN 12

```
Leaf1(config-router-bgp)#sh vlan


VLAN  Name                              Status    Ports

----- --------------------------------- --------- --------------------------------

1       default                         active

10      VLAN0010                        active    Cpu, Et27/1+, Et28/1+, Vx1

11      VLAN0011                        active    Cpu, Vx1

12      VLAN0012                        active    Cpu, Et27/1, Vx1

13      VLAN0013                        active    Cpu, Et28/1, Vx1


+ indicates a private VLAN promoted port
```

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Encapsulated Traffic: H1 in VLAN 13, H2 and H3 in VLAN 12

ping H3 → H2 (OK)

16:30:17.181670 98:5d:82:b4:dd:f9 > 98:5d:82:c1:6b:03, ethertype 802.1Q (0x8100), length 168: vlan 1006, p 0, ethertype IPv4 (0x0800), **10.1.1.1.18655 > 10.2.1.2.4789: VXLAN**, flags [I] (0x08), **vni 12**

98:5d:82:b4:ca:61 > 44:4c:a8:8d:27:c1, ethertype IPv4 (0x0800), length 114: **172.16.0.3 > 172.16.0.2: ICMP echo request**, id 18917, seq 1, length 80

16:30:17.181814 98:5d:82:c1:6b:03 > 98:5d:82:b4:dd:f9, ethertype IPv4 (0x0800), length 164: **10.2.1.2.20406 > 10.1.1.1.4789: VXLAN**, flags [I] (0x08), **vni 12**

44:4c:a8:8d:27:c1 > 98:5d:82:b4:ca:61, ethertype IPv4 (0x0800), length 114: **172.16.0.2 > 172.16.0.3: ICMP echo reply**, id 18917, seq 1, length 80

ping H2 → H1 (NOK)

16:32:48.107108 98:5d:82:c1:6b:03 > 98:5d:82:b4:dd:f9, ethertype IPv4 (0x0800), length 164: **10.2.1.2.37622 > 10.1.1.1.4789: VXLAN**, flags [I] (0x08), **vni 12**

44:4c:a8:8d:27:c1 > 98:5d:82:b4:cc:f5, ethertype IPv4 (0x0800), length 114: **172.16.0.2 > 172.16.0.1: ICMP echo request**, id 6485, seq 1, length 80

There is no echo reply.

ping H1 → H2 (NOK)

16:36:11.517270 98:5d:82:b4:dd:f9 > 98:5d:82:c1:6b:03, ethertype 802.1Q (0x8100), length 168: vlan 1006, p 0, ethertype IPv4 (0x0800), **10.1.1.1.54434 > 10.2.1.2.4789: VXLAN**, flags [I] (0x08), **vni 13**

98:5d:82:b4:cc:f5 > 44:4c:a8:8d:27:c1, ethertype IPv4 (0x0800), length 114: **172.16.0.1 > 172.16.0.2: ICMP echo request**, id 18969, seq 1, length 80

There is no echo reply.

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EVPN Control-Plane: H1 in VLAN 13, H2 and H3 in VLAN 12

```
Leaf1(config-router-bgp)#sh bgp evpn route-type mac-ip detail

BGP routing table information for VRF default

Router identifier 10.1.1.1, local AS number 65001

BGP routing table entry for mac-ip 444c.a88d.27c1, Route Distinguisher: 10.2.0.2:10

 Paths: 1 available

  65002

            10.2.1.2 from 10.2.0.2 (10.2.1.2)

            Origin IGP, metric -, localpref 100, weight 0, valid, external, best

            Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan

            VNI: 10 ESI: 0000:0000:0000:0000:0000

BGP routing table entry for mac-ip 985d.82b4.ca61, Route Distinguisher: 10.2.0.1:10

 Paths: 1 available

  Local

            - from - (0.0.0.0)

            Origin IGP, metric -, localpref -, weight 0, valid, local, best

            Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan

            VNI: 10 ESI: 0000:0000:0000:0000:0000

BGP routing table entry for mac-ip 985d.82b4.ccf5, Route Distinguisher: 10.2.0.1:10

 Paths: 1 available

  Local

            - from - (0.0.0.0)

            Origin IGP, metric -, localpref -, weight 0, valid, local, best

            Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan

            VNI: 10 ESI: 0000:0000:0000:0000:0000
```
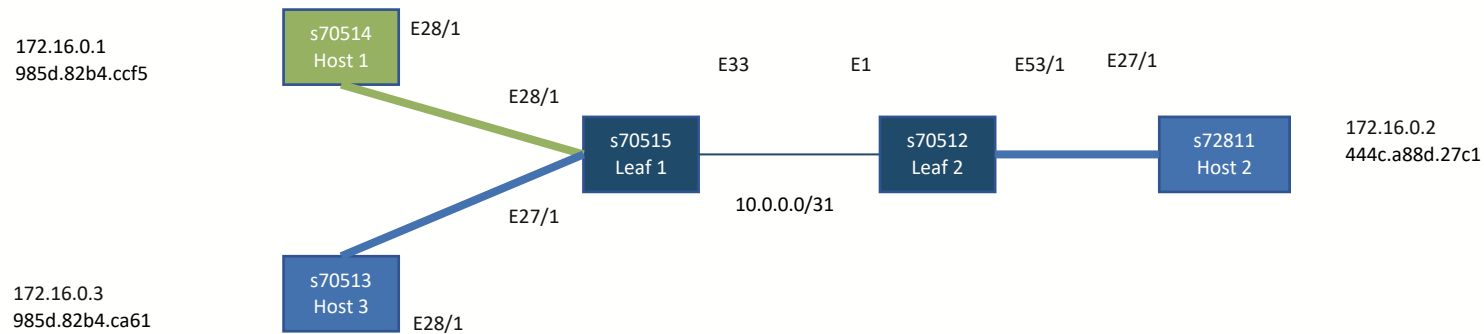
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VXLAN Address Table: H1 in VLAN 13, H2 and H3 in VLAN 12

```
Leaf2(config-macvrf-13)#sh vxlan address-table

Vxlan Mac Address Table
----------------------------------------------------------------

VLAN   Mac Address   Type       Prt  VTEP             Moves   Last Move
----   -----------   ----       ---  ----             -----   ---------
  10   985d.82b4.ca61  EVPN            Vx1  10.1.1.1      1
          0:01:51 ago
  10   985d.82b4.ccf5  EVPN            Vx1  10.1.1.1      1
          0:01:56 ago
Total Remote Mac Addresses for this criterion: 2
```

H3 and H1 are attached to the vlan 12 and vlan 13 respectively on the source VTEP

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Community VLAN <--> Isolated VLAN
H1 in VLAN 13, H2 and H3 in VLAN 11

172.16.0.1
985d.82b4.ccf5

s70514
Host 1

E28/1

E28/1

E33   E1   E53/1   E27/1

s70515
Leaf 1

s70512
Leaf 2

s72811
Host 2

172.16.0.2
444c.a88d.27c1

10.0.0.0/31

E27/1

172.16.0.3
985d.82b4.ca61

s70513
Host 3

E28/1

Leaf

Host in vlan 10

Primary VLAN: 10
Isolated VLAN: 11
Community VLAN: 12
Community VLAN: 13

Host in vlan 11

Host in vlan 12

Host in vlan 13

ARISTA

VLAN : H1 in VLAN 13, H2 and H3 in VLAN 11

```
Leaf1(config-macvrf-11)#sh vlan


VLAN  Name                            Status    Ports

----- ------------------------------- --------- -------------------------------

1        default                      active

10       VLAN0010                     active    Cpu, Et27/1+, Et28/1+, Vx1

11       VLAN0011                     active    Cpu, Et27/1, Vx1

12       VLAN0012                     active    Cpu, Vx1

13       VLAN0013                     active    Cpu, Et28/1, Vx1


+ indicates a private VLAN promoted port
```

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Encapsulated Traffic: H1 in VLAN 13, H2 and H3 in VLAN 11

ping H2 → H1 (NOK)

17:08:31.280671 98:5d:82:c1:6b:03 > 98:5d:82:b4:dd:f9, ethertype IPv4 (0x0800), length 164: **10.2.1.2.37622 > 10.1.1.1.4789: VXLAN**, flags [I] (0x08), **vni 11**

44:4c:a8:8d:27:c1 > 98:5d:82:b4:cc:f5, ethertype IPv4 (0x0800), length 114: **172.16.0.2 > 172.16.0.1: ICMP echo request**, id 10152, seq 1, length 80

There is no echo reply.

ping H2 → H3 (NOK)

17:25:32.742515 98:5d:82:c1:6b:03 > 98:5d:82:b4:dd:f9, ethertype IPv4 (0x0800), length 164: **10.2.1.2.20406 > 10.1.1.1.4789: VXLAN**, flags [I] (0x08), **vni 11**

44:4c:a8:8d:27:c1 > 98:5d:82:b4:ca:61, ethertype IPv4 (0x0800), length 114: **172.16.0.2 > 172.16.0.3: ICMP echo request**, id 12108, seq 1, length 80

There is no echo reply.

ping H2 → H1 (NOK)

17:28:05.119710 98:5d:82:b4:dd:f9 > 98:5d:82:c1:6b:03, ethertype 802.1Q (0x8100), length 168: vlan 1006, p 0, ethertype IPv4 (0x0800), **10.1.1.1.54434 > 10.2.1.2.4789: VXLAN**, flags [I] (0x08), **vni 13**

98:5d:82:b4:cc:f5 > 44:4c:a8:8d:27:c1, ethertype IPv4 (0x0800), length 114: **172.16.0.1 > 172.16.0.2: ICMP echo request**, id 22381, seq 1, length 80

There is no echo reply.

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EVPN Control-Plane: H1 in VLAN 13, H2 and H3 in VLAN 11

```
Leaf1(config-macvrf-11)#sh bgp evpn route-type mac-ip detail
BGP routing table information for VRF default
Router identifier 10.1.1.1, local AS number 65001
BGP routing table entry for mac-ip 444c.a88d.27c1, Route Distinguisher: 10.2.0.2:10
 Paths: 1 available
  65002
            10.2.1.2 from 10.2.0.2 (10.2.1.2)
            Origin IGP, metric -, localpref 100, weight 0, valid, external, best
            Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan
            VNI: 10 ESI: 0000:0000:0000:0000:0000
BGP routing table entry for mac-ip 985d.82b4.ca61, Route Distinguisher: 10.2.0.1:10
 Paths: 1 available
  Local
            - from - (0.0.0.0)
            Origin IGP, metric -, localpref -, weight 0, valid, local, best
            Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan
            VNI: 10 ESI: 0000:0000:0000:0000:0000
BGP routing table entry for mac-ip 985d.82b4.ccf5, Route Distinguisher: 10.2.0.1:10
 Paths: 1 available
  Local
            - from - (0.0.0.0)
            Origin IGP, metric -, localpref -, weight 0, valid, local, best
            Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan
            VNI: 10 ESI: 0000:0000:0000:0000:0000
```

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VXLAN Address Table: H1 in VLAN 13, H2 and H3 in VLAN 11

```
Leaf2(config-macvrf-11)#sh vxlan address-table


        Vxlan Mac Address Table
----------------------------------------------------------------

VLAN  Mac Address  Type       Prt  VTEP            Moves   Last Move
----  -----------  ----       ---  ----            -----   ---------
  10  985d.82b4.ca61  EVPN          Vx1  10.1.1.1    1       0:02:18
ago
  10  985d.82b4.ccf5  EVPN          Vx1  10.1.1.1    1       0:02:23
ago
Total Remote Mac Addresses for this criterion: 2
```
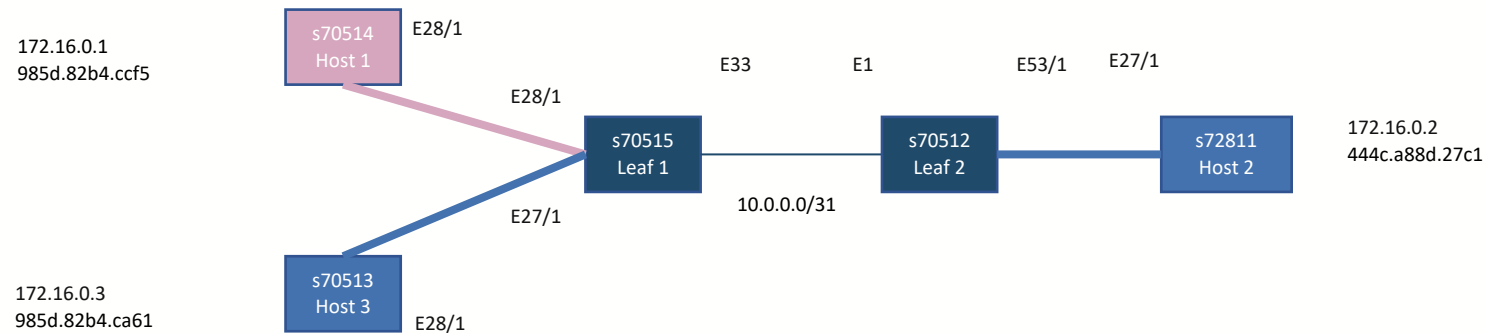
H3 and H1 are attached to the vlan 11 and vlan 13 respectively on the source VTEP

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Primary VLAN <--> Isolated VLAN
H1 in VLAN 10, H2 and H3 in VLAN 11

VLAN : H1 in VLAN 10, H2 and H3 in VLAN 11

```
Leaf1(config-if-Et28/1)#sh vlan


VLAN  Name                              Status    Ports

----- --------------------------------- --------- --------------------------------

1         default                       active

10        VLAN0010                      active    Cpu, Et27/1+, Et28/1, Vx1

11        VLAN0011                      active    Cpu, Et27/1, Et28/1+, Vx1

12        VLAN0012                      active    Cpu, Et28/1+, Vx1

13        VLAN0013                      active    Cpu, Et28/1+, Vx1


+ indicates a private VLAN promoted port
```

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Encapsulated Traffic: H1 in VLAN 10, H2 and H3 in VLAN 11

ping H2 → H1 (OK)

17:55:00.617044 98:5d:82:c1:6b:03 > 98:5d:82:b4:dd:f9, ethertype IPv4 (0x0800), length 164: **10.2.1.2.37622 > 10.1.1.1.4789: VXLAN**, flags [I] (0x08), **vni 11**

44:4c:a8:8d:27:c1 > 98:5d:82:b4:cc:f5, ethertype IPv4 (0x0800), length 114: **172.16.0.2 > 172.16.0.1: ICMP echo request**, id 15107, seq 1, length 80

17:55:00.617159 98:5d:82:b4:dd:f9 > 98:5d:82:c1:6b:03, ethertype 802.1Q (0x8100), length 168: vlan 1006, p 0, ethertype IPv4 (0x0800), **10.1.1.1.54434 > 10.2.1.2.4789: VXLAN**, flags [I] (0x08), **vni 10**

98:5d:82:b4:cc:f5 > 44:4c:a8:8d:27:c1, ethertype IPv4 (0x0800), length 114: **172.16.0.1 > 172.16.0.2: ICMP echo reply**, id 15107, seq 1, length 80

ping H1 → H2 (OK)

17:51:58.472818 98:5d:82:b4:dd:f9 > 98:5d:82:c1:6b:03, ethertype 802.1Q (0x8100), length 168: vlan 1006, p 0, ethertype IPv4 (0x0800), **10.1.1.1.54434 > 10.2.1.2.4789**: VXLAN, flags [I] (0x08), **vni 10**

98:5d:82:b4:cc:f5 > 44:4c:a8:8d:27:c1, ethertype IPv4 (0x0800), length 114: **172.16.0.1 > 172.16.0.2: ICMP echo request**, id 24100, seq 1, length 80

17:51:58.472944 98:5d:82:c1:6b:03 > 98:5d:82:b4:dd:f9, ethertype IPv4 (0x0800), length 164: **10.2.1.2.37622 > 10.1.1.1.4789: VXLAN**, flags [I] (0x08), **vni 11**

44:4c:a8:8d:27:c1 > 98:5d:82:b4:cc:f5, ethertype IPv4 (0x0800), length 114: **172.16.0.2 > 172.16.0.1: ICMP echo reply**, id 24100, seq 1, length 80

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EVPN Control-Plane: H1 in VLAN 10, H2 and H3 in VLAN 11

```
Leaf1(config-router-bgp)#sh bgp evpn route-type mac-ip detail
BGP routing table information for VRF default
Router identifier 10.1.1.1, local AS number 65001
BGP routing table entry for mac-ip 444c.a88d.27c1, Route Distinguisher: 10.2.0.2:10
 Paths: 1 available
  65002
            10.2.1.2 from 10.2.0.2 (10.2.1.2)
            Origin IGP, metric -, localpref 100, weight 0, valid, external, best
            Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan
            VNI: 10 ESI: 0000:0000:0000:0000:0000
BGP routing table entry for mac-ip 985d.82b4.ca61, Route Distinguisher: 10.2.0.1:10
 Paths: 1 available
  Local
            - from - (0.0.0.0)
            Origin IGP, metric -, localpref -, weight 0, valid, local, best
            Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan
            VNI: 10 ESI: 0000:0000:0000:0000:0000
BGP routing table entry for mac-ip 985d.82b4.ccf5, Route Distinguisher: 10.2.0.1:10
 Paths: 1 available
  Local
            - from - (0.0.0.0)
            Origin IGP, metric -, localpref -, weight 0, valid, local, best
            Extended Community: Route-Target-AS:10:10 TunnelEncap:tunnelTypeVxlan
            VNI: 10 ESI: 0000:0000:0000:0000:0000
```

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VXLAN Address Table: H1 in VLAN 10, H2 and H3 in VLAN 11

```
Leaf2(config-macvrf-13)#sh vxlan address-table

Vxlan Mac Address Table
----------------------------------------------------------------

VLAN   Mac Address   Type       Prt  VTEP            Moves    Last Move
----   -----------   ----       ---  ----            -----    ---------
  10   985d.82b4.ca61  EVPN           Vx1  10.1.1.1     1        0:01:51 ago
  10   985d.82b4.ccf5  EVPN           Vx1  10.1.1.1     1        0:01:56 ago
Total Remote Mac Addresses for this criterion: 2
```

H2 and H3 is attached to the vlan 12 and vlan 13 respectively on the source VTEP

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