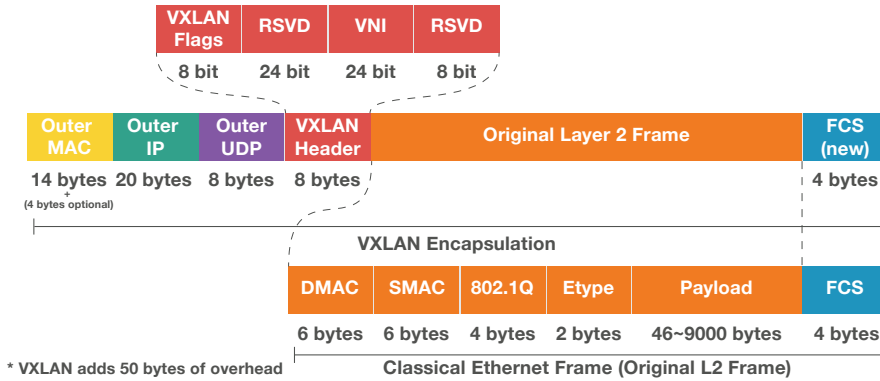


## VXLAN Encapsulation



## Terminology

**VXLAN Overlay** layer 2 overlay on top of Layer 3 underlay, identified by VNID & extends/tunnels traffic from one VTEP to another

**VXLAN Underlay** services such as OSPF, IS-IS, EIGRP, Multicast & BGP that provides the transport for VXLAN

**VXLAN Tunnel End Point (VTEP)** a device that perform VXLAN encap/decapsulation, could be hardware or software

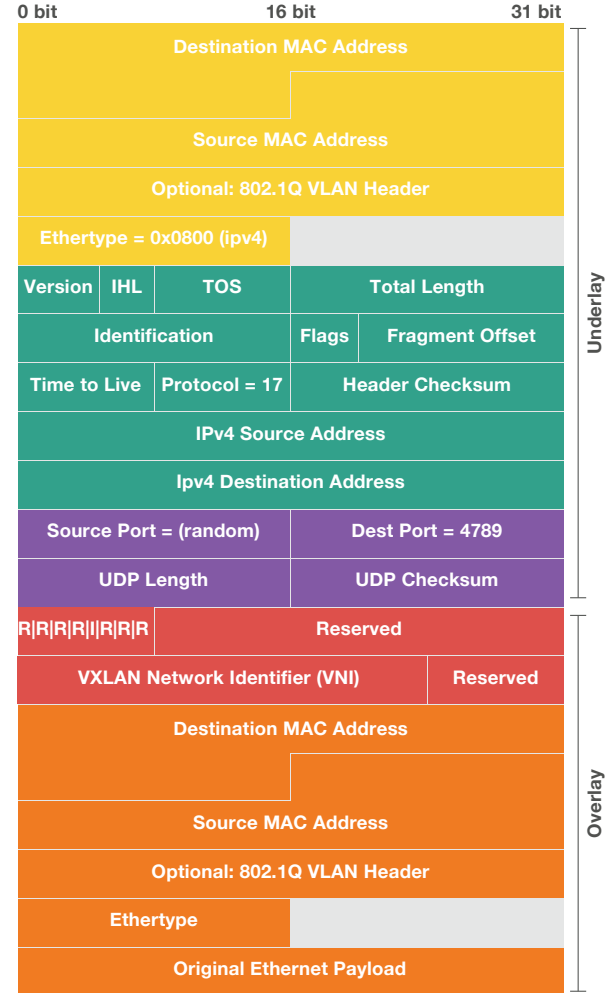
**VNI/VNID** each VXLAN segment identified by 24-bit segment ID, only hosts on the same VNI are allowed to communicate with each other. It overcome 4094 VLAN scale limitation. Thus, segment IDs are globally significant and VLAN IDs are locally significant

**VXLAN Gateway** VTEP that bridge layer 2/3 traffic between VXLAN segments

**Network virtualization Edge (NVE)** logical representation of the VTEP, i.e. NVE is the tunnel interface

**BUM Traffic** Broadcast, Unknown Layer-2 Unicast and Multicast

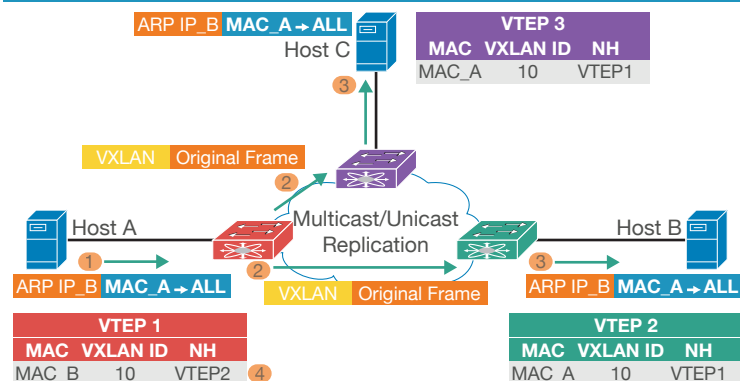
## VXLAN Encapsulation(Detail)



## Flood & Learn vs EVPN Control Plane

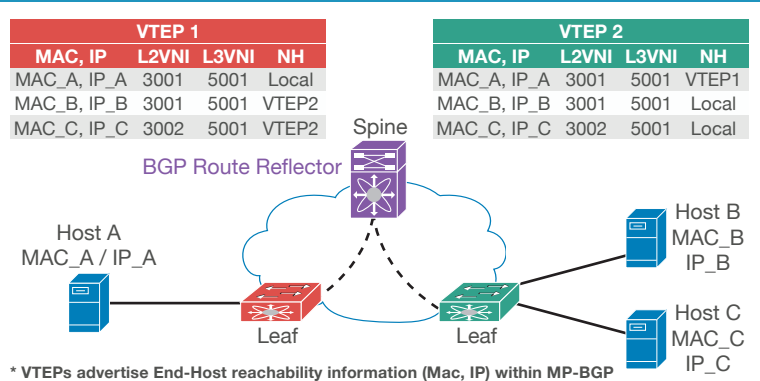
	Encapsulation	Peer Discovery	Peer Authentication	Host Route Distribution	Host Route Learning
<b>Flood &amp; Learn</b>	MAC in UDP	Data driven flood & Learn	Not available	No route distribution	Local & Remote host: Data driven flood & Learn
<b>EVPN Control Plane</b>	MAC in UDP	MP-BGP	MP-BGP	MP-BGP	Local host: Data driven Remote host: MP-BGP

## VXLAN - Flood & Learn



Data Plane learning technique for VXLAN, VTEP will flood the packet to all neighbor and will learn the remote end.

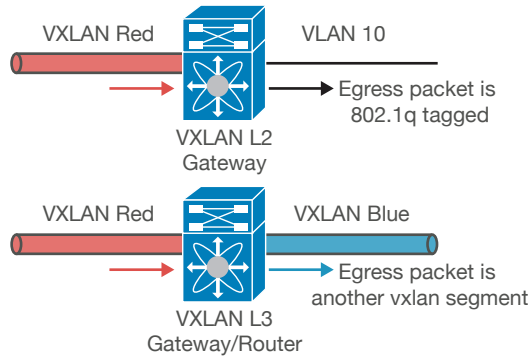
## VXLAN - EVPN Control Plane



\* VTEPs advertise End-Host reachability information (Mac, IP) within MP-BGP

MP-BGP EVPN introduces control-plane learning for end hosts behind remote VTEPs. Provides control & data plane separation

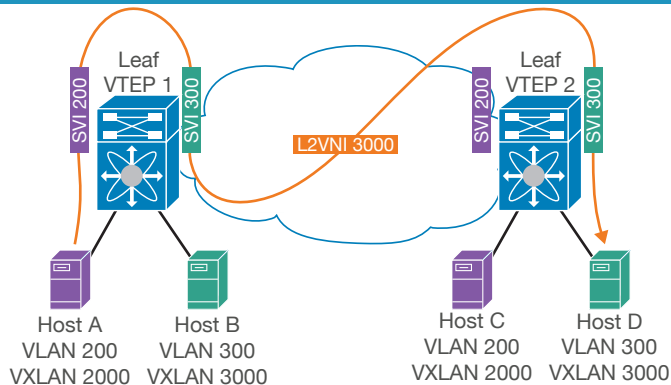
## Gateway Types



**Layer 2 Gateway** is required when layer 2 traffic (802.1q) comes from VLAN into VXLAN segment (encapsulation) or the ingress VXLAN packet egresses out an 802.1q tagged interface (decapsulation) where packet is bridged to a new vlan

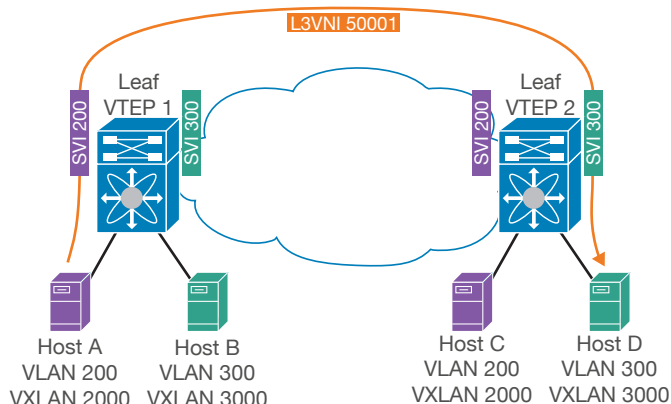
**Layer 3 Gateway** is used when there is a VXLAN to VXLAN routing. The ingress packet is a VXLAN packet on a routed segment but the packet egresses out on a tagged 802.1q interface and the packet is routed to a new VLAN

## Asymmetric IRB



Routing and Bridging on the ingress VTEP, Bridging on the egress VTEP, both source and destination VNI need to reside on the ingress VTEP. Similar to Inter-VLAN routing

## Symmetric IRB



Routing on both ingress and egress VTEPs, Ingress VTEP routes packets onto the layer 3 VNI, Egress VTEP routes packet to the destination layer 2 VNI

## Leaf Node Configuration - L2 VNI

```
# 1-Feature enablement
feature bgp/pim/interface-vlan
vn-segment-vlan-based
nv overlay/nxapi/lldp
fabric/fabric forward
nv overlay evpn

# 2-Map VLAN to VXLAN
vlan 100
vn-segment 10000

# 3-Create L2 VNI
evpn
vni 10000 l2
rd 10000:1
route-target import 10000:1
route-target export 10000:1

# 4-Configure NVE Interface
interface nve1
source-interface lo 0
host-reachability prot bgp
member vni 10000
mcast-group 239.1.1.1
supress-arp

# 5-Anycast addresses
fabric forward any-cast-gateway 0001.0001.0001
interface vlan 100
vrf member EVPN-TENANT
ip add 100.1.1.254/24
fabric forw mode anycast

# 6-Configure BGP
router bgp 100
router-id 192.168.1.1
address-family l2vpn evpn
neighbor 192.168.10.10
remote-as 100
update-source lo0
address-fam l2vpn evpn
send-comm extended
vrf EVPN-TENANT
address-fam ipv4 unicast
advertise l2vpn evpn
```

## Leaf Node Configuration - L3 VNI

```
# 1-Feature enablement
feature bgp/pim/interface-vlan
vn-segment-vlan-based
nv overlay/nxapi/lldp
fabric/fabric forward
nv overlay evpn

# 2-Map VLAN to VXLAN
vlan 200
vn-segment 20000

# 3-Create L3 VNI
vrf context EVPN-TENANT
vni-20000
rd 20000:1
address-famil ipv4 unicast
route-target imp 20000:1
route-target imp 20000:1 evpn
route-target exp 20000:1
route-target exp 20000:1 evpn

# 4-Configure NVE Interface
interface nve1
source-interface lo 0
host-reachability prot bgp
member vni 20000 associate-vrf

# 5-Configure interface
interface vlan 200
vrf member EVPN-TENANT
ip forward

interface loopback 200
vrf member EVPN-TENANT
ip add 200.1.1.1/32

# 6-Configure BGP
router bgp 100
vrf EVPN-TENANT
address-family ipv4 un
network 200.1.1.1/32
advertise l2vpn evpn
```

## Troubleshooting & Debugging

```
show bgp l2vpn evpn
show nve [interface | vni | peers | vxlan-param]
show interface nve1
show forwarding nve l3 peers
show l2route evpn mac-ip evi 100
show ip arp suppression-cache [local | remote]
show ip route vrf EVPN-TENANT
debug nve [errors | events | pim-library | all]
```