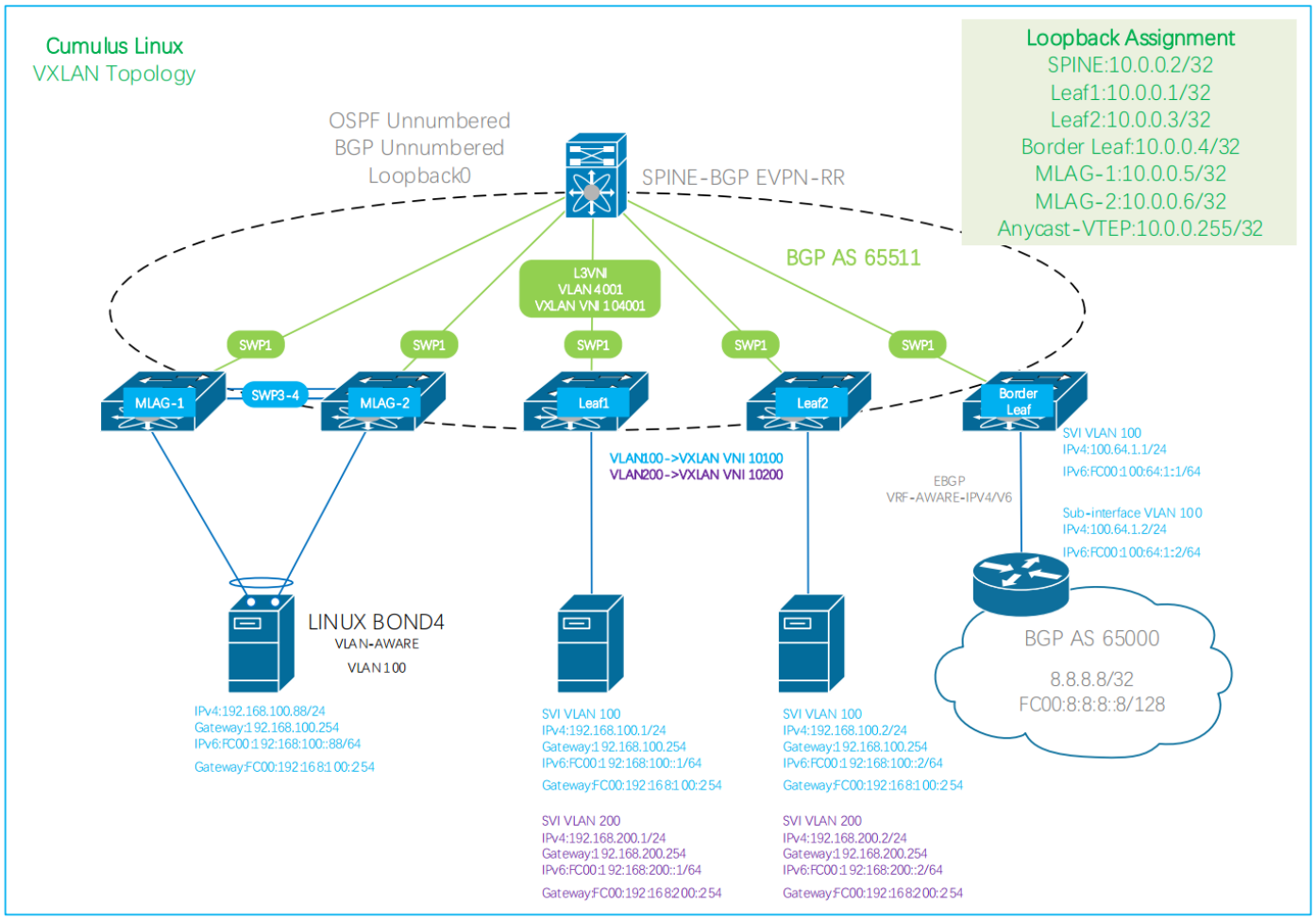
CUMULUS LINUX OPEN-SOURCE VXLAN DEPLOYMENT GUIDE

CUMULUS-LINUX VERSION3.7

CUMULUS-LINUX

TOPOLOGY INFO



FRROUTING CONFIGURATION

```
##Cumulus credentials
Username:cumulus
Password:CumulusLinux!
##Enable open-source components for control-plane/data-plane.
cumulus@MLAG1:/etc/frr$ ls
daemons  daemons.conf  frr.conf  frr.conf.sav  vtysh.conf
cumulus@MLAG1:/etc/frr$ cat daemons
# This file tells the frr package which daemons to start.
#
# Entries are in the format: <daemon>=(yes|no|priority)
#   0, "no"  = disabled
#   1, "yes" = highest priority
#   2 .. 10  = lower priorities
# Read /usr/share/doc/frr/README.Debian for details.
#
# Sample configurations for these daemons can be found in
```

```
# /usr/share/doc/frr/examples/.
#
# ATTENTION:
#
# When activation a daemon at the first time, a config file, even if it is
# empty, has to be present *and* be owned by the user and group "frr", else
# the daemon will not be started by /etc/init.d/frr. The permissions should
# be u=rw,g=r,o=.
# When using "vtysh" such a config file is also needed. It should be owned by
# group "frrvty" and set to ug=rw,o= though. Check /etc/pam.d/frr, too.
#
# The watchfrr daemon is always started. Per default in monitoring-only but
# that can be changed via /etc/frr/daemons.conf.
#
zebra=yes
bgpd=yes
ospfd=yes
ospf6d=no
ripd=no
ripngd=no
isisd=no
pimd=no
ldpd=no
nhrpd=no
eigrpd=no
babeld=no
sharpd=no
pbrd=no
```

使用 NANO 编辑器更改 daemon 文件，ctrl+X 退出，按 yes 确认保存配置

```
cumulus@MLAG1:/etc/frr$ sudo systemctl restart frr.service
[sudo] password for cumulus: CumulusLinux!
```

重启 frr.service 服务，输入 sudo systemctl status frr.service，检查状态

```
cumulus@MLAG1:/etc/frr$ sudo systemctl restart frr.service
[sudo] password for cumulus:
Sorry, try again.
[sudo] password for cumulus:

Sorry, try again.
[sudo] password for cumulus:
^CSorry, try again.
sudo: 3 incorrect password attempts
cumulus@MLAG1:/etc/frr$ sudo systemctl status frr.service
[sudo] password for cumulus:
● frr.service - FRRouting
   Loaded: loaded (/lib/systemd/system/frr.service; enabled)
   Active: active (running) since Sun 2018-10-21 10:11:34 UTC; 1 day 18h ago
   CGroup: /system.slice/frr.service
           ├─1680 /usr/lib/frr/zebra -M snmp -s 90000000 --daemon -A 127.0.0.1
           ├─1687 /usr/lib/frr/bgpd -M snmp --daemon -A 127.0.0.1
           ├─1696 /usr/lib/frr/ospfd -M snmp --daemon -A 127.0.0.1
           └─1703 /usr/lib/frr/watchfrr -d -r /usr/sbin/servicebBfrrbBrestartbB%s
```

INTERFACE/OSPF/BGP CONFIGURATION

SPINE configuration

```
net add interface swp1-5 ip address 10.0.0.2/32
net add bgp autonomous-system 65511
net add interface swp1-5 ospf area 0.0.0.0
net add interface swp1-5 ospf network point-to-point
net add loopback lo ospf area 0.0.0.0
net add bgp router-id 10.0.0.2
net add bgp neighbor swp1 interface remote-as internal
net add bgp neighbor swp2 interface remote-as internal
net add bgp neighbor swp3 interface remote-as internal
net add bgp neighbor swp4 interface remote-as internal
net add bgp neighbor swp5 interface remote-as internal
net add bgp neighbor swp6 interface remote-as internal
net add bgp neighbor swp7 interface remote-as internal
net add bgp ipv4 unicast network 10.0.0.2/32
net add bgp ipv4 unicast neighbor swp1 route-reflector-client
net add bgp ipv4 unicast neighbor swp2 route-reflector-client
net add bgp ipv4 unicast neighbor swp3 route-reflector-client
net add bgp ipv4 unicast neighbor swp4 route-reflector-client
net add bgp ipv4 unicast neighbor swp5 route-reflector-client
net add bgp ipv4 unicast neighbor swp6 route-reflector-client
net add bgp ipv4 unicast neighbor swp7 route-reflector-client
net add bgp l2vpn evpn  neighbor swp1 activate
net add bgp l2vpn evpn  neighbor swp1 route-reflector-client
net add bgp l2vpn evpn  neighbor swp2 activate
net add bgp l2vpn evpn  neighbor swp2 route-reflector-client
net add bgp l2vpn evpn  neighbor swp3 activate
net add bgp l2vpn evpn  neighbor swp3 route-reflector-client
```

```
net add bgp l2vpn evpn  neighbor swp4 activate
net add bgp l2vpn evpn  neighbor swp4 route-reflector-client
net add bgp l2vpn evpn  neighbor swp5 activate
net add bgp l2vpn evpn  neighbor swp5 route-reflector-client
net add bgp l2vpn evpn  neighbor swp6 activate
net add bgp l2vpn evpn  neighbor swp6 route-reflector-client
net add bgp l2vpn evpn  neighbor swp7 activate
net add bgp l2vpn evpn  neighbor swp7 route-reflector-client
net add ospf router-id 10.0.0.2
net add ospf passive-interface lo
net pending
net commit
```

leaf1 configuration example

```
##Add interface/ip address assignment
net add interface swp1 ip address 10.0.0.1/32
net add interface swp2-7
net add interface swp1 ip address 10.0.0.1/32
net add interface swp2-7
net add loopback lo ip address 10.0.0.1/32
##BGP AS number setting
net add bgp autonomous-system 65511
net add bgp router-id 10.0.0.1
##BGP IBGP neighbor advertise
net add bgp neighbor swp1 interface remote-as internal
net add bgp ipv4 unicast network 10.0.0.1/32
##BGP EVPN AFI activate
net add bgp l2vpn evpn  neighbor swp1 activate
net add bgp l2vpn evpn  advertise-all-vni
net add bgp l2vpn evpn  advertise-default-gw
net add bgp l2vpn evpn  advertise ipv4 unicast
net add bgp l2vpn evpn  advertise ipv6 unicast
##BGP vrf-aware AS number setting for Tenant A
net add bgp vrf A autonomous-system 65511
net add bgp vrf A l2vpn evpn  advertise ipv4 unicast
net add bgp vrf A l2vpn evpn  advertise ipv6 unicast
##OSPF setting
net add loopback lo ospf area 0.0.0.0
net add interface swp1 ospf area 0.0.0.0
net add interface swp1 ospf network point-to-point
net add ospf router-id 10.0.0.1
net add ospf passive-interface lo
##Create vrf A for tenant A
net add vrf A vrf-table auto
##Create Linux VLAN-aware bridge
net add bridge bridge ports swp7,vni100,vni200,vni104001,vni104001
```

```
net add bridge bridge vids 100,200,4001
net add bridge bridge vlan-aware
##Tenant A SVI interface setting with Anycast-gateway
net add vlan 100 hwaddress 12:34:56:78:9a:bc
net add vlan 100 ip address 192.168.100.254/24
net add vlan 100 ipv6 address fc00:192:168:100::254/64
net add vlan 100 vlan-id 100
net add vlan 100 vlan-raw-device bridge
net add vlan 100 vrf A
net add vlan 200 hwaddress 12:34:56:78:9a:bc
net add vlan 200 ip address 192.168.200.254/24
net add vlan 200 ipv6 address fc00:192:168:200::254/64
net add vlan 200 vlan-id 200
net add vlan 200 vlan-raw-device bridge
net add vlan 200 vrf A
net add vrf A vni 104001
##Create VXLAN VNI
net add vxlan vni100 vxlan id 10100
net add vxlan vni104001 vxlan id 104001
net add vxlan vni200 vxlan id 10200
##VLAN mapping VXLAN VNI
net add vxlan vni100 bridge access 100
net add vxlan vni200 bridge access 200
net add vxlan vni104001 bridge access 4001
##L3VNI setting for symmetric routing
net add vlan 4001 vlan-id 4001
net add vlan 4001 vlan-raw-device bridge
net add vlan 4001 vrf A
##Disable Linux VXLAN driver default behavior
net add vxlan vni100,200,104001 bridge learning off
net add vxlan vni100,200,104001 stp bpduguard
net add vxlan vni100,200,104001 stp portbpdufilter
##Create VXLAN ENCAP/DECAP logical interface/equivalent CISCO NXOS NVE interface
net add vxlan vni100,200,104001 vxlan local-tunnelip 10.0.0.1
##Enable arp-nd suppress feature, reduce BUM traffic over the network.
net add vxlan vni104001 bridge arp-nd-suppress on
net pending
net commit
```

VERIFYING CONFIGURATION

$ip a

```
cumulus@spine1:/etc/frr$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet 10.0.0.2/32 scope global lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:50:00:00:06:00 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.1/24 brd 192.168.1.255 scope global eth0
       valid_lft forever preferred_lft forever
    inet6 fe80::250:ff:fe00:600/64 scope link tentative dadfailed
       valid_lft forever preferred_lft forever
3: swp1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:50:00:00:06:01 brd ff:ff:ff:ff:ff:ff
    inet 10.0.0.2/32 scope global swp1
       valid_lft forever preferred_lft forever
    inet6 fe80::250:ff:fe00:601/64 scope link
       valid_lft forever preferred_lft forever
4: swp2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:50:00:00:06:02 brd ff:ff:ff:ff:ff:ff
    inet 10.0.0.2/32 scope global swp2
       valid_lft forever preferred_lft forever
    inet6 fe80::250:ff:fe00:602/64 scope link
       valid_lft forever preferred_lft forever
5: swp3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
```

$net show ospf neighbor

```
cumulus@spine1:/etc/frr$ net show ospf neighbor

Neighbor ID     Pri State           Dead Time Address         Interface            RXmtL RqstL DBsmL
10.0.0.1          1 Full/DROther      37.376s 10.0.0.1        swp1:10.0.0.2            0     0     0
10.0.0.3          1 Full/DROther      38.732s 10.0.0.3        swp2:10.0.0.2            0     0     0
10.0.0.5          1 Full/DROther      38.149s 10.0.0.5        swp3:10.0.0.2            0     0     0
10.0.0.6          1 Full/DROther      38.733s 10.0.0.6        swp4:10.0.0.2            0     0     0
10.0.0.4          1 Full/DROther      34.962s 10.0.0.4        swp5:10.0.0.2            0     0     0

cumulus@spine1:/etc/frr$
```

$net show bgp l2vpn evpn summary

```
cumulus@spine1:/etc/frr$ net show bgp l2vpn evpn summary
BGP router identifier 10.0.0.2, local AS number 65511 vrf-id 0
BGP table version 0
RIB entries 15, using 2280 bytes of memory
Peers 7, using 135 KiB of memory

Neighbor        V         AS MsgRcvd MsgSent   TblVer  InQ OutQ  Up/Down State/PfxRcd
leaf1(swp1)     4      65511   80900  127015        0    0    0 1d19h06m           17
leaf2(swp2)     4      65511   51850  127015        0    0    0 1d19h06m           14
MLAG1(swp3)     4      65511   74678  126485        0    0    0 1d18h42m            5
MLAG2(swp4)     4      65511   84420  126486        0    0    0 1d18h41m            7
Borderleaf(swp5) 4     65511   51756  126977        0    0    0 17:59:29           13
swp6            4          0       0       0        0    0    0    never       Idle
swp7            4          0       0       0        0    0    0    never       Idle

Total number of neighbors 7
cumulus@spine1:/etc/frr$
```

$route -n

```
cumulus@spine1:/etc/frr$ route -n
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0         192.168.1.254   0.0.0.0         UG    0      0        0 eth0
10.0.0.1        10.0.0.1        255.255.255.255 UGH   20     0        0 swp1
10.0.0.3        10.0.0.3        255.255.255.255 UGH   20     0        0 swp2
10.0.0.4        10.0.0.4        255.255.255.255 UGH   20     0        0 swp5
10.0.0.5        10.0.0.5        255.255.255.255 UGH   20     0        0 swp3
10.0.0.6        10.0.0.6        255.255.255.255 UGH   20     0        0 swp4
10.0.0.255      10.0.0.6        255.255.255.255 UGH   20     0        0 swp4
192.168.1.0     0.0.0.0         255.255.255.0   U     0      0        0 eth0
192.168.30.0    0.0.0.0         255.255.255.0   U     0      0        0 vlan30
192.168.40.0    0.0.0.0         255.255.255.0   U     0      0        0 vlan40
192.168.50.0    0.0.0.0         255.255.255.0   U     0      0        0 vlan50
cumulus@spine1:/etc/frr$
```

$ip route show

```
cumulus@spine1:/etc/frr$ ip route show
default via 192.168.1.254 dev eth0
10.0.0.1 via 10.0.0.1 dev swp1  proto ospf  metric 20 onlink
10.0.0.3 via 10.0.0.3 dev swp2  proto ospf  metric 20 onlink
10.0.0.4 via 10.0.0.4 dev swp5  proto ospf  metric 20 onlink
10.0.0.5 via 10.0.0.5 dev swp3  proto ospf  metric 20 onlink
10.0.0.6 via 10.0.0.6 dev swp4  proto ospf  metric 20 onlink
10.0.0.255  proto ospf  metric 20
        nexthop via 10.0.0.6  dev swp4 weight 1 onlink
        nexthop via 10.0.0.5  dev swp3 weight 1 onlink
192.168.1.0/24 dev eth0  proto kernel  scope link  src 192.168.1.1
192.168.30.0/24 dev vlan30  proto kernel  scope link  src 192.168.30.254
192.168.40.0/24 dev vlan40  proto kernel  scope link  src 192.168.40.254
192.168.50.0/24 dev vlan50  proto kernel  scope link  src 192.168.50.254
cumulus@spine1:/etc/frr$
```

$net show bgp l2vpn evpn vni

```
cumulus@leaf2:~$ net show bgp l2vpn evpn vni
Advertise Gateway Macip: Enabled
Advertise All VNI flag: Enabled
Number of L2 VNIs: 2
Number of L3 VNIs: 1
Flags: * - Kernel
  VNI        Type RD                  Import RT             Export RT             Tenant VRF

* 10200      L2   10.0.0.3:3         65511:10200           65511:10200           A

* 10100      L2   10.0.0.3:2         65511:10100           65511:10100           A

* 104001     L3   192.168.200.254:4  65511:104001          65511:104001          A

cumulus@leaf2:~$
```

$net show bgp l2vpn evpn route

```
cumulus@leaf2:~$ net show bgp l2vpn evpn route
BGP table version is 3, local router ID is 10.0.0.3
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal
Origin codes: i - IGP, e - EGP, ? - incomplete
EVPN type-2 prefix: [2]:[ESI]:[EthTag]:[MAClen]:[MAC]:[IPlen]:[IP]
EVPN type-3 prefix: [3]:[EthTag]:[IPlen]:[OrigIP]
EVPN type-5 prefix: [5]:[ESI]:[EthTag]:[IPlen]:[IP]

   Network          Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 0:0
*> [5]:[0]:[0]:[32]:[10.0.0.1]
                    0.0.0.0                  0    100      0 i
*> [5]:[0]:[0]:[32]:[10.0.0.2]
                    0.0.0.0                  0    100      0 i
*> [5]:[0]:[0]:[32]:[10.0.0.3]
                    0.0.0.0                  0         32768 i
Route Distinguisher: 0:0
*>i[5]:[0]:[0]:[32]:[10.0.0.1]
                    10.0.0.1                 0    100      0 i
*>i[5]:[0]:[0]:[32]:[10.0.0.2]
                    10.0.0.1                 0    100      0 i
*>i[5]:[0]:[0]:[32]:[10.0.0.3]
                    10.0.0.1                 0    100      0 i
Route Distinguisher: 10.0.0.1:2
*>i[2]:[0]:[0]:[48]:[12:34:56:78:9a:bc]
```

$net show bgp l2vpn evpn route type macip

```
cumulus@leaf2:~$ net show bgp l2vpn evpn route type macip
BGP table version is 83323, local router ID is 10.0.0.3
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal
Origin codes: i - IGP, e - EGP, ? - incomplete
EVPN type-2 prefix: [2]:[ESI]:[EthTag]:[MAClen]:[MAC]:[IPlen]:[IP]
EVPN type-3 prefix: [3]:[EthTag]:[IPlen]:[OrigIP]
EVPN type-5 prefix: [5]:[ESI]:[EthTag]:[IPlen]:[IP]

   Network          Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 10.0.0.1:2
*>i[2]:[0]:[0]:[48]:[12:34:56:78:9a:bc]
                    10.0.0.1                 0    100      0 i
*>i[2]:[0]:[0]:[48]:[12:34:56:78:9a:bc]:[32]:[192.168.100.254]
                    10.0.0.1                 0    100      0 i
*>i[2]:[0]:[0]:[48]:[12:34:56:78:9a:bc]:[128]:[fe80::1034:56ff:fe78:9abc]
                    10.0.0.1                 0    100      0 i
*>i[2]:[0]:[0]:[48]:[50:00:00:0a:00:00]
                    10.0.0.1                 0    100      0 i
*>i[2]:[0]:[0]:[48]:[50:00:00:0a:80:64]
                    10.0.0.1                 0    100      0 i
```

MLAG CONFIGURATION

MLAG-1 configuration

```
##MLAG member port setting
net add bond bond-to-host-22 bond slaves swp2
net add bond peerlink bond slaves swp3,swp4
net add bond bond-to-host-22 bridge vids 100-200
net add bond bond-to-host-22 clag id 2
net add bridge bridge ports bond-to-host-22,peerlink,vni100,vni104001,vni104001
net add bridge bridge vids 100-200,4001
net add bridge bridge vlan-aware
##Peer-link setting
net add interface peerlink.4094 clag backup-ip 10.0.0.6
net add interface peerlink.4094 clag peer-ip 169.254.1.2
net add interface peerlink.4094 clag priority 1000
net add interface peerlink.4094 clag sys-mac 44:38:39:FF:01:01
net add interface peerlink.4094 ip address 169.254.1.1/30
net add interface swp1 ip address 10.0.0.5/32
net add interface swp2-7
##Anycast-vtep loopback for BGP next-hop
net add loopback lo clag vxlan-anycast-ip 10.0.0.255
```

MLAG-2 configuration

```
##MLAG member port setting
net add bond bond-to-host-22 bond slaves swp2
net add bond peerlink bond slaves swp3,swp4
net add bond bond-to-host-22 bridge vids 100-200
net add bond bond-to-host-22 clag id 2
net add bridge bridge ports bond-to-host-22,peerlink,vni100,vni104001,vni104001
net add bridge bridge vids 100-200,4001
net add bridge bridge vlan-aware
##Peer-link setting
net add interface peerlink.4094 clag backup-ip 10.0.0.5
net add interface peerlink.4094 clag peer-ip 169.254.1.1
net add interface peerlink.4094 clag priority 1000
net add interface peerlink.4094 clag sys-mac 44:38:39:FF:01:01
net add interface peerlink.4094 ip address 169.254.1.2/30
net add interface swp1 ip address 10.0.0.6/32
net add interface swp2-7
##Anycast-vtep loopback for BGP next-hop
net add loopback lo clag vxlan-anycast-ip 10.0.0.255
```

SERVER-UBUNTU configuration

```
cumulus@HOST:/etc/network$ cat interfaces
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).
```

```
source /etc/network/interfaces.d/*.intf

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto eth0
iface eth0 inet dhcp

auto swp1
iface swp1

auto swp2
iface swp2

auto bond-host-11
iface bond-host-11
    bond-slaves swp1 swp2
    bridge-vids 100-200

auto bridge
iface bridge
    bridge-ports bond-host-11
    bridge-vids 100-200
    bridge-vlan-aware yes

auto vlan100
iface vlan100
    address 192.168.100.88/24
    address fc00:192:168:100::88/64
    gateway 192.168.100.254
    gateway fc00:192:168:100::254
    vlan-id 100
    vlan-raw-device bridge
cumulus@HOST:/etc/network$
```

VERIFYING MLAG CONFIGURATION

```
$net show clag
```

```
cumulus@MLAG2:/etc/frr$ net show clag
The peer is alive
    Peer Priority, ID, and Role: 1000 00:50:00:00:03:03 primary
     Our Priority, ID, and Role: 1000 00:50:00:00:0c:03 secondary
        Peer Interface and IP: peerlink.4094 169.254.1.1
             VxLAN Anycast IP: 10.0.0.255
                   Backup IP: 10.0.0.5 (active)
                  System MAC: 44:38:39:ff:01:01

CLAG Interfaces
Our Interface      Peer Interface     CLAG Id   Conflicts               Proto-Down Reason
----------------   ----------------   -------   ---------------------   -----------------
 bond-to-host-22   bond-to-host-22    2         -                       -
       vni100      vni100             -         -                       -
    vni104001      vni104001          -         -                       -
cumulus@MLAG2:/etc/frr$
```

$net show interface

```
cumulus@MLAG2:/etc/frr$ net show interface
State  Name             Spd  MTU    Mode          LLDP                         Summary
-----  ---------------  ---  -----  ------------  ---------------------------  ---------------------------
UP     lo               N/A  65536  Loopback                                   IP: 127.0.0.1/8
       lo                                                                      IP: 10.0.0.6/32
       lo                                                                      IP: 10.0.0.255/32
       lo                                                                      IP: ::1/128
UP     eth0             1G   1500   Mgmt          MGMT-SW (GigabitEthernet1/2) IP: 192.168.1.7/24(DHCP)
UP     swp1             1G   1500   Interface/L3  spine1 (swp4)                IP: 10.0.0.6/32
UP     swp2             1G   1500   BondMember    HOST (swp2)                  Master: bond-to-host-22(UP)
UP     swp3             1G   1500   BondMember    MLAG1 (swp3)                 Master: peerlink(UP)
UP     swp4             1G   1500   BondMember    MLAG1 (swp4)                 Master: peerlink(UP)
UP     A                N/A  65536  NotConfigured
UP     bond-to-host-22  1G   1500   802.3ad                                    Master: bridge(UP)
       bond-to-host-22                                                         Bond Members: swp2(UP)
UP     bridge           N/A  1500   Bridge/L2
UP     peerlink         2G   1500   802.3ad                                    Master: bridge(UP)
       peerlink                                                                Bond Members: swp3(UP)
       peerlink                                                                Bond Members: swp4(UP)
UP     peerlink.4094    2G   1500   SubInt/L3                                  IP: 169.254.1.2/30
UP     vlan100          N/A  1500   Interface/L3                               Master: A(UP)
       vlan100                                                                 IP: 192.168.100.254/24
       vlan100                                                                 IP: fc00:192:168:100::254/64
UP     vlan4001         N/A  1500   NotConfigured                              Master: A(UP)
UP     vni100           N/A  1500   Access/L2                                  Master: bridge(UP)
UP     vni104001        N/A  1500   Access/L2                                  Master: bridge(UP)

cumulus@MLAG2:/etc/frr$
```

/proc/net/bonding$ cat bond-host-11

```
cumulus@HOST:/proc/net/bonding$ cat bond-host-11
Ethernet Channel Bonding Driver: v3.7.1 (April 27, 2011)

Bonding Mode: IEEE 802.3ad Dynamic link aggregation
Transmit Hash Policy: layer3+4 (1)
MII Status: up
MII Polling Interval (ms): 100
Up Delay (ms): 0
Down Delay (ms): 0

802.3ad info
LACP rate: fast
Min links: 1
Aggregator selection policy (ad_select): stable

Slave Interface: swp2
MII Status: up
Speed: 1000 Mbps
Duplex: full
Link Failure Count: 0
Permanent HW addr: 00:50:00:00:10:02
Slave queue ID: 0
Aggregator ID: 2
Actor Churn State: none
Partner Churn State: none
Actor Churned Count: 2
Partner Churned Count: 2

Slave Interface: swp1
```

$ifconfig bond-host-11

```
cumulus@HOST:/proc/net/bonding$ ifconfig bond-host-11
bond-host-11 Link encap:Ethernet  HWaddr 00:50:00:00:10:02
          UP BROADCAST RUNNING MASTER MULTICAST  MTU:1500  Metric:1
          RX packets:436066 errors:0 dropped:0 overruns:0 frame:0
          TX packets:420813 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:49709780 (47.4 MiB)  TX bytes:46563664 (44.4 MiB)
```

$ping 192.168.100.254

$ping6 fc00:192:168:100::254

```
cumulus@HOST:/$ ping 192.168.100.254
PING 192.168.100.254 (192.168.100.254) 56(84) bytes of data.
64 bytes from 192.168.100.254: icmp_seq=1 ttl=64 time=1.50 ms
64 bytes from 192.168.100.254: icmp_seq=2 ttl=64 time=0.998 ms
64 bytes from 192.168.100.254: icmp_seq=3 ttl=64 time=1.48 ms
64 bytes from 192.168.100.254: icmp_seq=3 ttl=64 time=2.13 ms (DUP!)
^C
--- 192.168.100.254 ping statistics ---
3 packets transmitted, 3 received, +1 duplicates, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 0.998/1.527/2.130/0.402 ms
cumulus@HOST:/$ ping6 fc00:192:168:100::254
PING fc00:192:168:100::254(fc00:192:168:100::254) 56 data bytes
64 bytes from fc00:192:168:100::254: icmp_seq=1 ttl=64 time=5.65 ms
64 bytes from fc00:192:168:100::254: icmp_seq=2 ttl=64 time=0.739 ms
64 bytes from fc00:192:168:100::254: icmp_seq=3 ttl=64 time=0.701 ms
64 bytes from fc00:192:168:100::254: icmp_seq=4 ttl=64 time=1.06 ms
^C
--- fc00:192:168:100::254 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3003ms
rtt min/avg/max/mdev = 0.701/2.037/5.650/2.090 ms
cumulus@HOST:/$
```

$arp

```
cumulus@HOST:/$ arp
Address                  HWtype  HWaddress           Flags Mask            Iface
192.168.1.253            ether   50:00:00:07:80:01   C                     eth0
192.168.100.1            ether   50:00:00:0a:80:64   C                     vlan100
192.168.1.254            ether   ca:08:54:b7:00:1c   C                     eth0
192.168.100.2            ether   50:00:00:09:80:64   C                     vlan100
192.168.100.254          ether   12:34:56:78:9a:bc   C                     vlan100
150.1.1.253              ether   ca:08:54:b7:00:1c   C                     eth0
```

$ip -6 neigh

```
cumulus@HOST:/$ ip -6 neigh
fe80::1034:56ff:fe78:9abc dev vlan100 lladdr 12:34:56:78:9a:bc router REACHABLE
fe80::5200:ff:fe0a:8064 dev vlan100 lladdr 50:00:00:0a:80:64 router REACHABLE
fe80::5200:ff:fe09:8064 dev vlan100 lladdr 50:00:00:09:80:64 router STALE
fc00:192:168:100::254 dev vlan100 lladdr 12:34:56:78:9a:bc router REACHABLE
cumulus@HOST:/$
```

BORDER-LEAF CONFIGURATION

Border-Leaf configuration

```
net add bgp autonomous-system 65511
net add loopback lo ospf area 0.0.0.0
net add interface swp1 ospf area 0.0.0.0
net add interface swp1 ospf network point-to-point
net add vrf A vni 104001
net add bgp router-id 10.0.0.4
net add bgp bestpath as-path multipath-relax
net add bgp neighbor swp1 interface remote-as internal
net add bgp l2vpn evpn  neighbor swp1 activate
net add bgp l2vpn evpn  advertise-all-vni
net add bgp l2vpn evpn  advertise-default-gw
net add bgp l2vpn evpn  advertise ipv4 unicast
net add bgp l2vpn evpn  advertise ipv6 unicast
net add bgp vrf A autonomous-system 65511
net add bgp vrf A neighbor 100.64.1.2 remote-as 65000
net add bgp vrf A neighbor fc00:100:64:1::2 remote-as 65000
net del bgp vrf A ipv4 unicast neighbor fc00:100:64:1::2 activate
net add bgp vrf A ipv6 unicast neighbor fc00:100:64:1::2 activate
net add bgp vrf A l2vpn evpn  advertise ipv4 unicast
net add bgp vrf A l2vpn evpn  advertise ipv6 unicast
net add ospf router-id 10.0.0.4
net add ospf passive-interface lo
net add dns nameserver ipv4 4.2.2.1
net add vxlan vni104001 vxlan id 104001
net add bridge bridge ports swp2,vni104001,vni104001
net add bridge bridge vids 100,4001
net add bridge bridge vlan-aware
net add interface swp1 ip address 10.0.0.4/32
net add interface swp2-7
net add loopback lo ip address 10.0.0.4/32
net add vlan 100 hwaddress 12:34:56:78:9a:bc
net add vlan 100 ip address 100.64.1.1/24
net add vlan 100 ipv6 address fc00:100:64:1::1/64
net add vlan 100 vlan-id 100
net add vlan 100 vlan-raw-device bridge
net add vlan 100 vrf A
net add vlan 4001 vlan-id 4001
net add vlan 4001 vlan-raw-device bridge
net add vlan 4001 vrf A
net add vrf A vrf-table auto
net add vxlan vni104001 bridge access 4001
net add vxlan vni104001 bridge arp-nd-suppress on
```

```
net add vxlan vni104001 bridge learning off
net add vxlan vni104001 stp bpduguard
net add vxlan vni104001 stp portbpdufilter
net add vxlan vni104001 vxlan local-tunnelip 10.0.0.4
```

EXTERNAL CISCO ROUTER configuration

```
vrf definition A
 rd 1:1
 !
 address-family ipv4
 exit-address-family
 !
 address-family ipv6
 exit-address-family
end
interface Loopback0
 vrf forwarding A
 ip address 8.8.8.1 255.255.255.255 secondary
 ip address 8.8.8.2 255.255.255.255 secondary
 ip address 8.8.8.3 255.255.255.255 secondary
 ip address 8.8.8.4 255.255.255.255 secondary
 ip address 8.8.8.5 255.255.255.255 secondary
 ip address 8.8.8.6 255.255.255.255 secondary
 ip address 8.8.8.7 255.255.255.255 secondary
 ip address 8.8.8.8 255.255.255.255
 ipv6 address FC00:8:8:8::4/128
 ipv6 address FC00:8:8:8::5/128
 ipv6 address FC00:8:8:8::6/128
 ipv6 address FC00:8:8:8::7/128
 ipv6 address FC00:8:8:8::8/128

interface GigabitEthernet2.100
 encapsulation dot1Q 100
 vrf forwarding A
 ip address 100.64.1.2 255.255.255.0
 ipv6 address FC00:100:64:1::2/64

router bgp 65000
 bgp router-id 100.64.1.2
 bgp log-neighbor-changes
 no bgp default ipv4-unicast
 !
 address-family ipv4 vrf A
  network 8.8.8.1 mask 255.255.255.255
  network 8.8.8.2 mask 255.255.255.255
  network 8.8.8.3 mask 255.255.255.255
```

```
  network 8.8.8.4 mask 255.255.255.255
  network 8.8.8.5 mask 255.255.255.255
  network 8.8.8.6 mask 255.255.255.255
  network 8.8.8.7 mask 255.255.255.255
  network 8.8.8.8 mask 255.255.255.255
  neighbor 100.64.1.1 remote-as 65511
  neighbor 100.64.1.1 activate
 exit-address-family
 !
 address-family ipv6 vrf A
  network FC00:8:8:8::4/128
  network FC00:8:8:8::5/128
  network FC00:8:8:8::6/128
  network FC00:8:8:8::7/128
  network FC00:8:8:8::8/128
  neighbor FC00:100:64:1::1 remote-as 65511
  neighbor FC00:100:64:1::1 activate
 exit-address-family
```

VERIFYING EBGP NEIGHBOR

```
EXTERNAL-BGP#show bgp vpnv4 unicast all summary
BGP router identifier 100.64.1.2, local AS number 65000
BGP table version is 9659, main routing table version 9659
13 network entries using 3328 bytes of memory
13 path entries using 1560 bytes of memory
16/5 BGP path/bestpath attribute entries using 4224 bytes of memory
1 BGP AS-PATH entries using 24 bytes of memory
25 BGP extended community entries using 2310 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 11446 total bytes of memory
BGP activity 1418/1396 prefixes, 11961/11940 paths, scan interval 60 secs

Neighbor        V         AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
100.64.1.1      4      65511   34225   20569     9659    0    0 17:32:58        5

EXTERNAL-BGP#show bgp vpnv6 unicast all summary
BGP router identifier 100.64.1.2, local AS number 65000
BGP table version is 517, main routing table version 517
8 network entries using 2240 bytes of memory
8 path entries using 1184 bytes of memory
15/4 BGP path/bestpath attribute entries using 3960 bytes of memory
1 BGP AS-PATH entries using 24 bytes of memory
35 BGP extended community entries using 3230 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 10638 total bytes of memory
BGP activity 1418/1396 prefixes, 11964/11943 paths, scan interval 60 secs

Neighbor        V         AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
FC00:100:64:1::1
                4      65511   21419   20592      517    0    0 17:33:29        3

EXTERNAL-BGP#show bgp vpnv4 unicast all
BGP table version is 9664, local router ID is 100.64.1.2
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
```

```
Route Distinguisher: 1:1 (default for vrf A)
 *>  8.8.8.1/32       0.0.0.0                  0         32768 i
 *>  8.8.8.2/32       0.0.0.0                  0         32768 i
 *>  8.8.8.3/32       0.0.0.0                  0         32768 i
 *>  8.8.8.4/32       0.0.0.0                  0         32768 i
 *>  8.8.8.5/32       0.0.0.0                  0         32768 i
 *>  8.8.8.6/32       0.0.0.0                  0         32768 i
 *>  8.8.8.7/32       0.0.0.0                  0         32768 i
 *>  8.8.8.8/32       0.0.0.0                  0         32768 i
 *>  192.168.100.1/32 100.64.1.1                          0 65511 i
 *>  192.168.100.254/32
                      100.64.1.1                        0 65511 i
 *>  192.168.200.2/32 100.64.1.1                          0 65511 i
 *>  192.168.200.254/32
                      100.64.1.1                        0 65511 i
EXTERNAL-BGP#show bgp vpnv6 unicast all
BGP table version is 519, local router ID is 100.64.1.2
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

    Network          Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 1:1 (default for vrf A)
 *>  FC00:8:8:8::4/128
                      ::                       0         32768 i
 *>  FC00:8:8:8::5/128
                      ::                       0         32768 i
 *>  FC00:8:8:8::6/128
                      ::                       0         32768 i
 *>  FC00:8:8:8::7/128
                      ::                       0         32768 i
 *>  FC00:8:8:8::8/128
                      ::                       0         32768 i
 *>  FC00:192:168:100::1/128
                      FC00:100:64:1::1
                                                         0 65511 i
 *>  FC00:192:168:200::2/128
    Network          Next Hop            Metric LocPrf Weight Path
                      FC00:100:64:1::1
                                                         0 65511 i
 *>  FC00:192:168:200::254/128
                      FC00:100:64:1::1
                                                         0 65511 i
```

EXTERNAL-BGP#

$net show bgp vrf A ipv4 unicast

```
cumulus@leaf1:~$ net show bgp vrf A ipv4 unicast
BGP table version is 23723, local router ID is 192.168.200.254
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, r RIB-failure, S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*>i8.8.8.1/32       10.0.0.4                 0    100      0 65000 i
*>i8.8.8.2/32       10.0.0.4                 0    100      0 65000 i
*>i8.8.8.3/32       10.0.0.4                 0    100      0 65000 i
*>i8.8.8.4/32       10.0.0.4                 0    100      0 65000 i
*>i8.8.8.5/32       10.0.0.4                 0    100      0 65000 i
*>i8.8.8.6/32       10.0.0.4                 0    100      0 65000 i
*>i8.8.8.7/32       10.0.0.4                 0    100      0 65000 i
*>i8.8.8.8/32       10.0.0.4                 0    100      0 65000 i
*>i192.168.200.2/32 10.0.0.3                 0    100      0 i
*>i192.168.200.254/32
                    10.0.0.3                 0    100      0 i

Displayed  10 routes and 10 total paths
cumulus@leaf1:~$
```

$net show bgp vrf A ipv6 unicast

```
cumulus@leaf1:~$ net show bgp vrf A ipv6 unicast
BGP table version is 1920, local router ID is 192.168.200.254
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, r RIB-failure, S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*>ifc00:8:8:8::4/128
                    swp1                     0    100      0 65000 i
*>ifc00:8:8:8::5/128
                    swp1                     0    100      0 65000 i
*>ifc00:8:8:8::6/128
                    swp1                     0    100      0 65000 i
*>ifc00:8:8:8::7/128
                    swp1                     0    100      0 65000 i
*>ifc00:8:8:8::8/128
                    swp1                     0    100      0 65000 i
*>ifc00:192:168:200::2/128
                    swp1                     0    100      0 i
*>ifc00:192:168:200::254/128
                    swp1                     0    100      0 i
*>ife80::1034:56ff:fe78:9abc/128
                    swp1                     0    100      0 i

Displayed  8 routes and 8 total paths
cumulus@leaf1:~$
```

$ping -I A 100.64.1.2

```
cumulus@Borderleaf:~$ ping -I A 100.64.1.2
ping: Warning: source address might be selected on device other than A.
PING 100.64.1.2 (100.64.1.2) from 100.64.1.1 A: 56(84) bytes of data.
64 bytes from 100.64.1.2: icmp_seq=1 ttl=255 time=3.73 ms
64 bytes from 100.64.1.2: icmp_seq=2 ttl=255 time=4.13 ms
64 bytes from 100.64.1.2: icmp_seq=3 ttl=255 time=3.36 ms
64 bytes from 100.64.1.2: icmp_seq=4 ttl=255 time=3.50 ms
^C
--- 100.64.1.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3005ms
rtt min/avg/max/mdev = 3.363/3.682/4.130/0.296 ms
cumulus@Borderleaf:~$
```

$ip route show table A

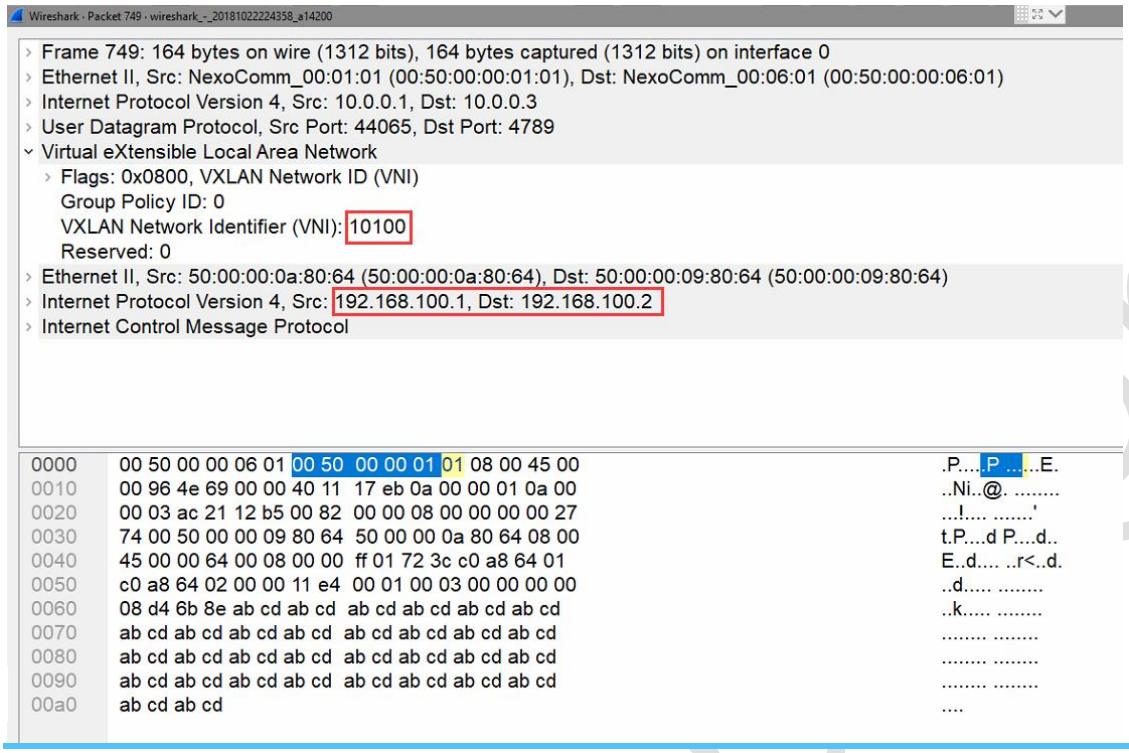
```
cumulus@Borderleaf:~$ ip route show table A
unreachable default  metric 4278198272
8.8.8.1 via 100.64.1.2 dev vlan100  proto bgp  metric 20
8.8.8.2 via 100.64.1.2 dev vlan100  proto bgp  metric 20
8.8.8.3 via 100.64.1.2 dev vlan100  proto bgp  metric 20
8.8.8.4 via 100.64.1.2 dev vlan100  proto bgp  metric 20
8.8.8.5 via 100.64.1.2 dev vlan100  proto bgp  metric 20
8.8.8.6 via 100.64.1.2 dev vlan100  proto bgp  metric 20
8.8.8.7 via 100.64.1.2 dev vlan100  proto bgp  metric 20
8.8.8.8 via 100.64.1.2 dev vlan100  proto bgp  metric 20
broadcast 100.64.1.0 dev vlan100  proto kernel  scope link  src 100.64.1.1
100.64.1.0/24 dev vlan100  proto kernel  scope link  src 100.64.1.1
local 100.64.1.1 dev vlan100  proto kernel  scope host  src 100.64.1.1
broadcast 100.64.1.255 dev vlan100  proto kernel  scope link  src 100.64.1.1
192.168.100.1 via 10.0.0.1 dev vlan4001  proto bgp  metric 20 onlink
192.168.100.254 via 10.0.0.1 dev vlan4001  proto bgp  metric 20 onlink
192.168.200.2 via 10.0.0.3 dev vlan4001  proto bgp  metric 20 onlink
192.168.200.254  proto bgp  metric 20
        nexthop via 10.0.0.1  dev vlan4001 weight 1 onlink
        nexthop via 10.0.0.3  dev vlan4001 weight 1 onlink
cumulus@Borderleaf:~$
```

#ping

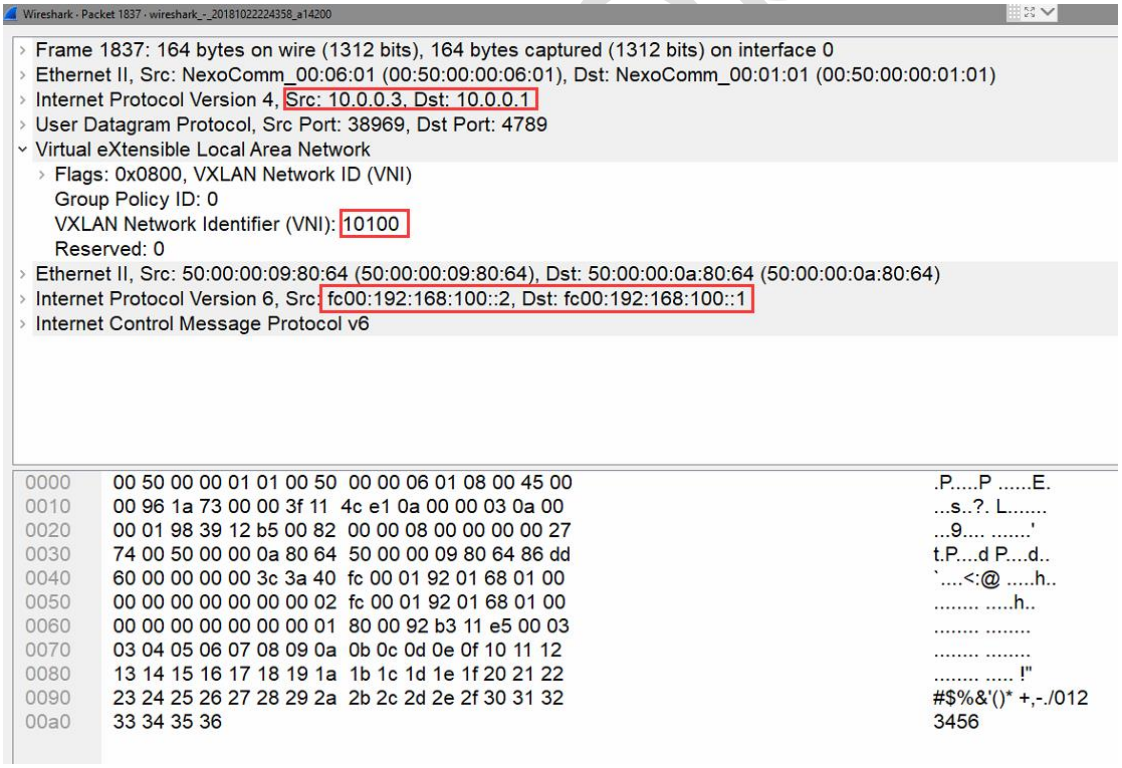
```
EXTERNAL-BGP#ping vrf A FC00:192:168:100::1 source loopback 0
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to FC00:192:168:100::1, timeout is 2 seconds:
Packet sent with a source address of FC00:8:8:8::4%A
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 7/16/54 ms
EXTERNAL-BGP#ping vrf A 192.168.100.1 source loopback 0
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.100.1, timeout is 2 seconds:
Packet sent with a source address of 8.8.8.8
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 6/10/20 ms
EXTERNAL-BGP#
```

PCAP

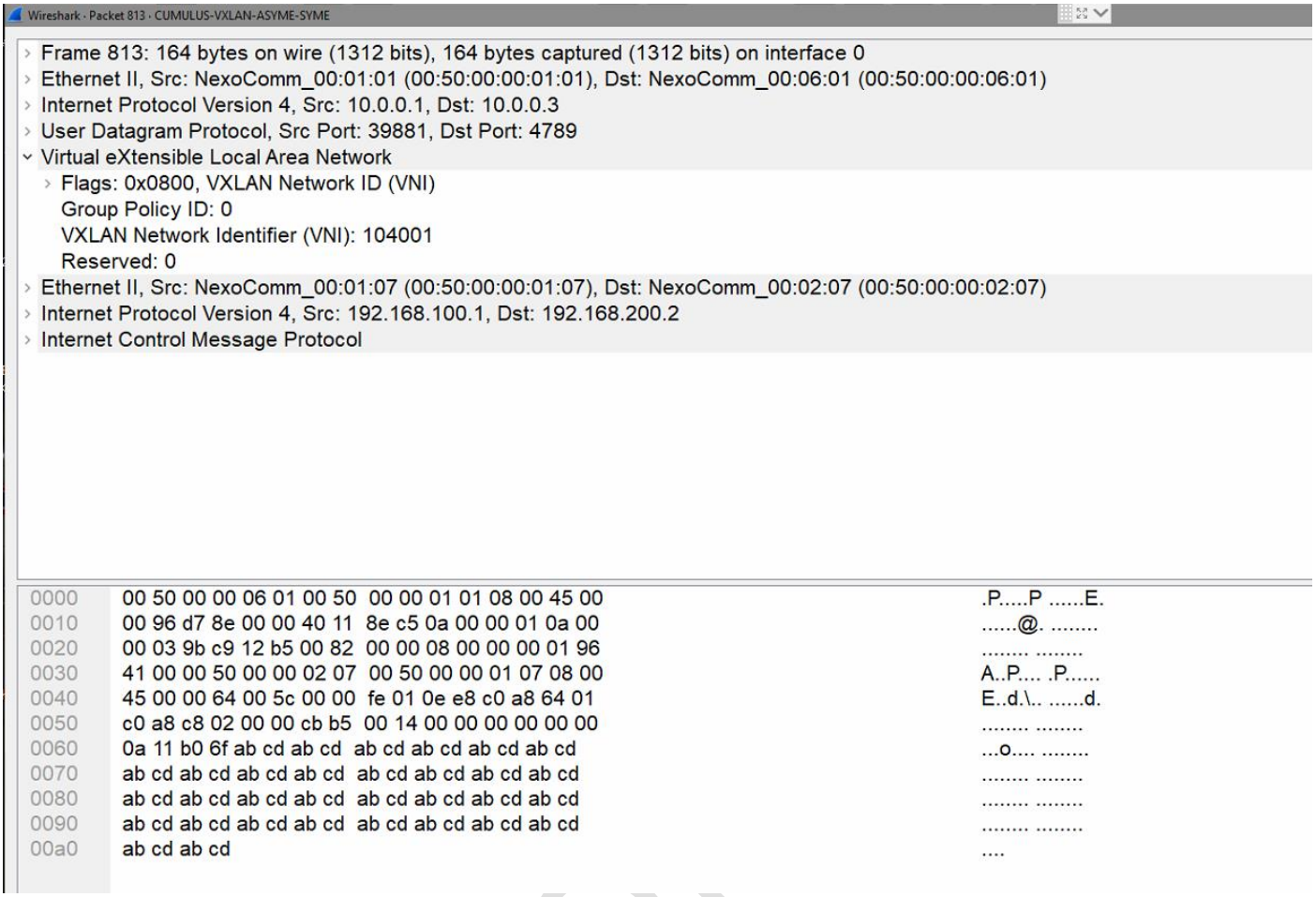
L2VNI-IPV4 OVER IPV4



L2VNI-IPV6 OVER IPV4



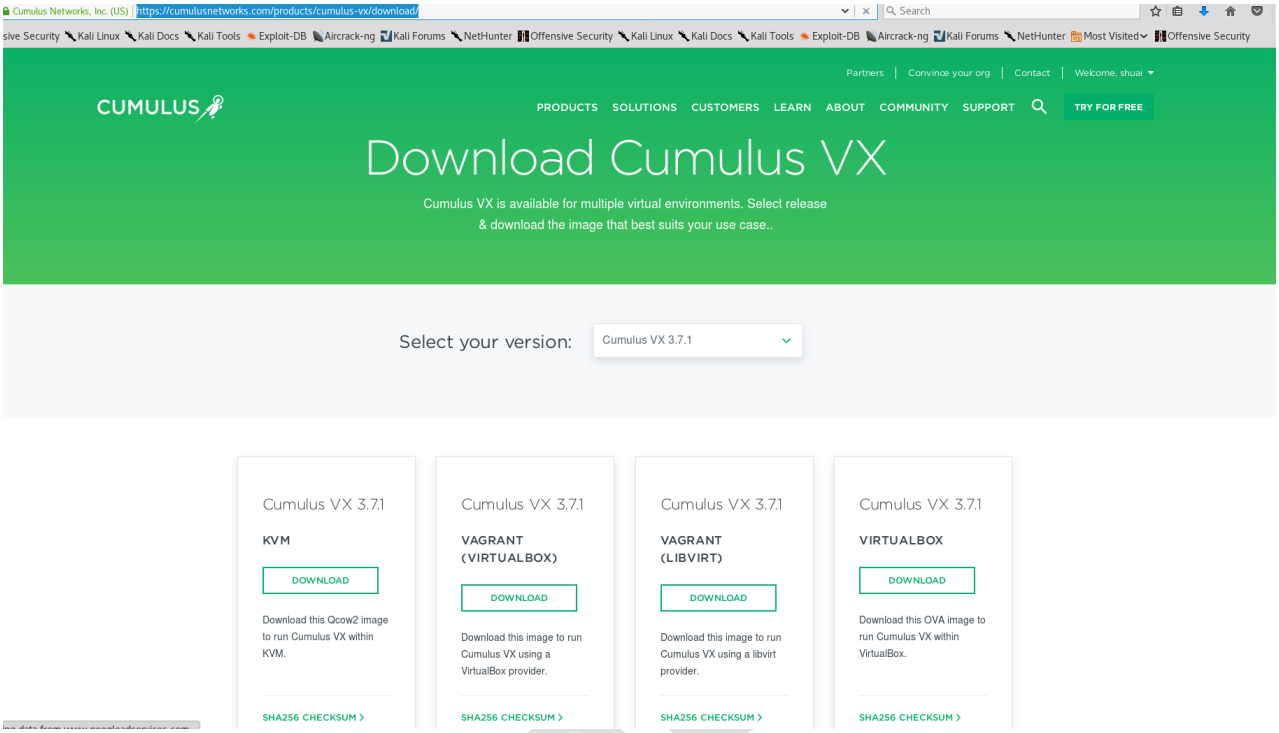
L3VNI-Symmetric-routing


Wireshark · Packet 813 · CUMULUS-VXLAN-ASYME-SYME
Frame 813: 164 bytes on wire (1312 bits), 164 bytes captured (1312 bits) on interface 0
Ethernet II, Src: NexoComm_00:01:01 (00:50:00:00:01:01), Dst: NexoComm_00:06:01 (00:50:00:00:06:01)
Internet Protocol Version 4, Src: 10.0.0.1, Dst: 10.0.0.3
User Datagram Protocol, Src Port: 39881, Dst Port: 4789
Virtual eXtensible Local Area Network
Flags: 0x0800, VXLAN Network ID (VNI)
Group Policy ID: 0
VXLAN Network Identifier (VNI): 104001
Reserved: 0
Ethernet II, Src: NexoComm_00:01:07 (00:50:00:00:01:07), Dst: NexoComm_00:02:07 (00:50:00:00:02:07)
Internet Protocol Version 4, Src: 192.168.100.1, Dst: 192.168.200.2
Internet Control Message Protocol
0000 00 50 00 00 06 01 00 50 00 00 01 01 08 00 45 00 .P.....P ......E.
0010 00 96 d7 8e 00 00 40 11 8e c5 0a 00 00 01 0a 00 ......@. ....
0020 00 03 9b c9 12 b5 00 82 00 00 08 00 00 00 01 96 ....
0030 41 00 00 50 00 00 02 07 00 50 00 00 01 07 08 00 A..P.... .P......
0040 45 00 00 64 00 5c 00 00 fe 01 0e e8 c0 a8 64 01 E..d.\.. ......d.
0050 c0 a8 c8 02 00 00 cb b5 00 14 00 00 00 00 00 00 ....
0060 0a 11 b0 6f ab cd ab cd ab cd ab cd ab cd ab cd ...o.... ....
0070 ab cd ab cd ab cd ab cd ab cd ab cd ab cd ab cd ....
0080 ab cd ab cd ab cd ab cd ab cd ab cd ab cd ab cd ....
0090 ab cd ab cd ab cd ab cd ab cd ab cd ab cd ab cd ....
00a0 ab cd ab cd ....

CUMULUS LINUX REFERENCE

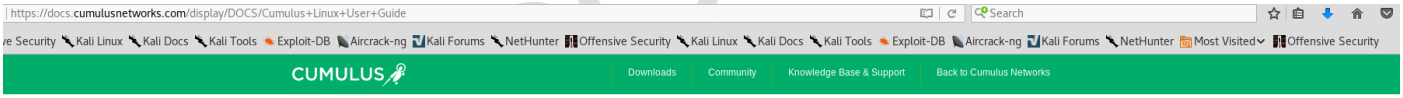
##DOWNLOAD WEBSITE

https://cumulusnetworks.com/products/cumulus-vx/download/



##Documentation

https://docs.cumulusnetworks.com/display/DOCS/Cumulus+Linux+User+Guide



Technical Documentation