



**OcNOS®**  
**Open Compute**  
**Network Operating System**  
**for Service Providers**  
**Version 6.4.2**

**Virtual Extensible LAN Guide**

**December 2023**

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# Preface

---

This guide describes how to configure OcNOS.

---

## Audience

This guide is intended for network administrators and other engineering professionals who configure OcNOS.

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## Conventions

[Table P-1](#) shows the conventions used in this guide.

**Table P-1: Conventions**

| Convention                   | Description  |
|------------------------------|--|
| Italics                      | Emphasized terms; titles of books                                  |
| Note:                        | Special instructions, suggestions, or warnings                     |
| <code>monospaced type</code> | Code elements such as commands, parameters, files, and directories |

---

## Chapter Organization

The chapters in command references are organized as described in [Command Description Format](#).

The chapters in configuration guides are organized into these major sections:

- An overview that explains a configuration in words
- Topology with a diagram that shows the devices and connections used in the configuration
- Configuration steps in a table for each device where the left-hand side shows the commands you enter and the right-hand side explains the actions that the commands perform
- Validation which shows commands and their output that verify the configuration

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## Related Documentation

For information about installing OcNOS, see the *Installation Guide* for your platform.

---

## Feature Availability

The features described in this document that are available depend upon the OcNOS SKU that you purchased. See the *Feature Matrix* for a description of the OcNOS SKUs.

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## Migration Guide

Check the *Migration Guide* for configuration changes to make when migrating from one version of OcNOS to another.

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# Command Line Interface

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This chapter introduces the OcNOS Command Line Interface (CLI) and how to use its features.

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## Overview

You use the CLI to configure, monitor, and maintain OcNOS devices. The CLI is text-based and each command is usually associated with a specific task.

You can give the commands described in this manual locally from the console of a device running OcNOS or remotely from a terminal emulator such as `putty` or `xterm`. You can also use the commands in scripts to automate configuration tasks.

---

## Command Line Interface Help

You access the CLI help by entering a full or partial command string and a question mark “?”. The CLI displays the command keywords or parameters along with a short description. For example, at the CLI command prompt, type:

```
> show ?
```

The CLI displays this keyword list with short descriptions for each keyword:

```
show ?
  application-priority      Application Priority
  arp                      Internet Protocol (IP)
  bfd                      Bidirectional Forwarding Detection (BFD)
  bgp                      Border Gateway Protocol (BGP)
  bi-lsp                   Bi-directional lsp status and configuration
  bridge                   Bridge group commands
  ce-vlan                  COS Preservation for Customer Edge VLAN
  class-map                Class map entry
  cli                      Show CLI tree of current mode
  clns                    Connectionless-Mode Network Service (CLNS)
  control-adjacency       Control Adjacency status and configuration
  control-channel         Control Channel status and configuration
  cspf                    CSPF Information
  customer                Display Customer spanning-tree
  cvlan                   Display CVLAN information
  debugging               Debugging functions (see also 'undebug')
  etherchannel            LACP etherchannel
  ethernet                Layer-2
  ...
```

If you type the ? in the middle of a keyword, the CLI displays help for that keyword only.

```
> show de?
debugging Debugging functions (see also 'undebug')
```

If you type the ? in the middle of a keyword, but the incomplete keyword matches several other keywords, OcNOS displays help for all matching keywords.

```
> show i? (CLI does not display the question mark).
interface Interface status and configuration
ip IP information
isis ISIS information
```

---

## Command Completion

The CLI can complete the spelling of a command or a parameter. Begin typing the command or parameter and then press the tab key. For example, at the CLI command prompt type `sh`:

```
> sh
```

Press the tab key. The CLI displays:

```
> show
```

If the spelling of a command or parameter is ambiguous, the CLI displays the choices that match the abbreviation. Type `show i` and press the tab key. The CLI displays:

```
> show i
  interface ip          ipv6          isis
> show i
```

The CLI displays the `interface` and `ip` keywords. Type `n` to select `interface` and press the tab key. The CLI displays:

```
> show in
> show interface
```

Type `?` and the CLI displays the list of parameters for the `show interface` command.

```
> show interface
  IFNAME  Interface name
  |       Output modifiers
  >       Output redirection
  <cr>
```

The CLI displays the only parameter associated with this command, the `IFNAME` parameter.

---

## Command Abbreviations

The CLI accepts abbreviations that uniquely identify a keyword in commands. For example:

```
> sh int xe0
```

is an abbreviation for:

```
> show interface xe0
```

---

## Command Line Errors

Any unknown spelling causes the CLI to display the error `Unrecognized command` in response to the `?`. The CLI displays the command again as last entered.

```
> show dd?
% Unrecognized command
> show dd
```

When you press the Enter key after typing an invalid command, the CLI displays:

```
(config)#router ospf here
                               ^
% Invalid input detected at '^' marker.
```

where the `^` points to the first character in error in the command.

If a command is incomplete, the CLI displays the following message:

```
> show
% Incomplete command.
```

Some commands are too long for the display line and can wrap mid-parameter or mid-keyword, as shown below. This does *not* cause an error and the command performs as expected:

```
area 10.10.0.18 virtual-link 10.10.0.19 authent
ication-key 57393
```

---

## Command Negation

Many commands have a `no` form that resets a feature to its default value or disables the feature. For example:

- The `ip address` command assigns an IPv4 address to an interface
- The `no ip address` command removes an IPv4 address from an interface

---

## Syntax Conventions

[Table P-2](#) describes the conventions used to represent command syntax in this reference.

**Table P-2: Syntax conventions**

| Convention      | Description   | Example   |
|-----------------|---|---|
| monospaced font | Command strings entered on a command line   | <code>show ip ospf</code>   |
| lowercase       | Keywords that you enter exactly as shown in the command syntax.   | <code>show ip ospf</code>   |
| UPPERCASE       | See <a href="#">Variable Placeholders</a>   | <code>IFNAME</code>   |
| ( )             | Optional parameters, from which you must select one. Vertical bars delimit the selections. Do not enter the parentheses or vertical bars as part of the command.    | <code>(A.B.C.D &lt;0-4294967295&gt;)</code>   |
| ( )             | Optional parameters, from which you select one or none. Vertical bars delimit the selections. Do not enter the parentheses or vertical bars as part of the command. | <code>(A.B.C.D &lt;0-4294967295&gt; )</code>  |
| ( )             | Optional parameter which you can specify or omit. Do not enter the parentheses or vertical bar as part of the command.  | <code>(IFNAME )</code>  |
| { }             | Optional parameters, from which you must select one or more. Vertical bars delimit the selections. Do not enter the braces or vertical bars as part of the command. | <code>{intra-area &lt;1-255&gt; inter-area &lt;1-255&gt; external &lt;1-255&gt;}</code> |

**Table P-2: Syntax conventions (Continued)**

| Convention | Description  | Example  |
|------------|--|--|
| [ ]        | Optional parameters, from which you select zero or more. Vertical bars delimit the selections. Do not enter the brackets or vertical bars as part of the command.    | [<1-65535> AA:NN internet local-AS no-advertise no-export] |
| ?          | Nonrepeatable parameter. The parameter that follows a question mark can only appear once in a command string. Do not enter the question mark as part of the command. | ?route-map WORD  |
| .          | Repeatable parameter. The parameter that follows a period can be repeated more than once. Do not enter the period as part of the command.                            | set as-path prepend .<1-65535>                             |

---

## Variable Placeholders

Table P-3 shows the tokens used in command syntax use to represent variables for which you supply a value.

**Table P-3: Variable placeholders**

| Token  | Description   |
|--|---|
| WORD   | A contiguous text string (excluding spaces)   |
| LINE   | A text string, including spaces; no other parameters can follow this parameter                              |
| IFNAME   | Interface name whose format varies depending on the platform; examples are: eth0, Ethernet0, ethernet0, xe0 |
| A.B.C.D  | IPv4 address  |
| A.B.C.D/M  | IPv4 address and mask/prefix  |
| X:X::X:X   | IPv6 address  |
| X:X::X:X/M   | IPv6 address and mask/prefix  |
| HH:MM:SS   | Time format   |
| AA:NN  | BGP community value   |
| XX:XX:XX:XX:XX:XX                                      | MAC address   |
| <1-5><br><1-65535><br><0-2147483647><br><0-4294967295> | Numeric range   |

---

## Command Description Format

Table P-4 explains the sections used to describe each command in this reference.

**Table P-4: Command descriptions**

| Section               | Description   |
|-----------------------|---|
| <b>Command Name</b>   | The name of the command, followed by what the command does and when should it be used |
| <b>Command Syntax</b> | The syntax of the command   |
| <b>Parameters</b>     | Parameters and options for the command  |
| <b>Default</b>        | The state before the command is executed  |
| <b>Command Mode</b>   | The mode in which the command runs; see <a href="#">Command Modes</a>                 |
| <b>Example</b>        | An example of the command being executed  |

---

## Keyboard Operations

Table P-5 lists the operations you can perform from the keyboard.

**Table P-5: Keyboard operations**

| Key combination       | Operation  |
|-----------------------|--|
| Left arrow or Ctrl+b  | Moves one character to the left. When a command extends beyond a single line, you can press left arrow or Ctrl+b repeatedly to scroll toward the beginning of the line, or you can press Ctrl+a to go directly to the beginning of the line. |
| Right arrow or Ctrl-f | Moves one character to the right. When a command extends beyond a single line, you can press right arrow or Ctrl+f repeatedly to scroll toward the end of the line, or you can press Ctrl+e to go directly to the end of the line.           |
| Esc, b                | Moves back one word  |
| Esc, f                | Moves forward one word   |
| Ctrl+e                | Moves to end of the line   |
| Ctrl+a                | Moves to the beginning of the line   |
| Ctrl+u                | Deletes the line   |
| Ctrl+w                | Deletes from the cursor to the previous whitespace   |
| Alt+d                 | Deletes the current word   |
| Ctrl+k                | Deletes from the cursor to the end of line   |
| Ctrl+y                | Pastes text previously deleted with Ctrl+k, Alt+d, Ctrl+w, or Ctrl+u at the cursor   |

**Table P-5: Keyboard operations (Continued)**

| Key combination      | Operation  |
|----------------------|--|
| Ctrl+t               | Transposes the current character with the previous character |
| Ctrl+c               | Ignores the current line and redisplay the command prompt    |
| Ctrl+z               | Ends configuration mode and returns to exec mode             |
| Ctrl+l               | Clears the screen  |
| Up Arrow or Ctrl+p   | Scroll backward through command history                      |
| Down Arrow or Ctrl+n | Scroll forward through command history                       |

---

## Show Command Modifiers

You can use two tokens to modify the output of a `show` command. Enter a question mark to display these tokens:

```
# show users ?
  | Output modifiers
  > Output redirection
```

You can type the `|` (vertical bar character) to use output modifiers. For example:

```
> show rsvp | ?
begin      Begin with the line that matches
exclude    Exclude lines that match
include    Include lines that match
last       Last few lines
redirect   Redirect output
```

---

## Begin Modifier

The `begin` modifier displays the output beginning with the first line that contains the input string (everything typed after the `begin` keyword). For example:

```
# show running-config | begin xe1
...skipping
interface xe1
  ipv6 address fe80::204:75ff:fee6:5393/64
!
interface xe2
  ipv6 address fe80::20d:56ff:fe96:725a/64
!
line con 0
  login
!
end
```

You can specify a regular expression after the `begin` keyword. This example begins the output at a line with either “xe2” or “xe4”:

```
# show running-config | begin xe[3-4]
...skipping
```



```

interface xe3
 shutdown
 !
interface xe4
 shutdown
 !
interface svlan0.1
 no shutdown
 !
route-map myroute permit 3
 !
route-map mymap1 permit 10
 !
route-map rmap1 permit 3
 !
line con 0
 login
line vty 0 4
 login
 !
end

```

---

## Include Modifier

The `include` modifier includes only those lines of output that contain the input string. In the output below, all lines containing the word “input” are included:

```

# show interface xe1 | include input
input packets 80434552, bytes 2147483647, dropped 0, multicast packets 0
input errors 0, length 0, overrun 0, CRC 0, frame 0, fifo 1, missed 0

```

You can specify a regular expression after the `include` keyword. This examples includes all lines with “input” or “output”:

```

#show interface xe0 | include (in|out)put
input packets 597058, bytes 338081476, dropped 0, multicast packets 0
input errors 0, length 0, overrun 0, CRC 0, frame 0, fifo 0, missed 0
output packets 613147, bytes 126055987, dropped 0
output errors 0, aborted 0, carrier 0, fifo 0, heartbeat 0, window 0

```

---

## Exclude Modifier

The `exclude` modifier excludes all lines of output that contain the input string. In the following output example, all lines containing the word “input” are excluded:

```

# show interface xe1 | exclude input
Interface xe1
Scope: both
Hardware is Ethernet, address is 0004.75e6.5393
index 3 metric 1 mtu 1500 <UP,BROADCAST,RUNNING,MULTICAST>
VRF Binding: Not bound
Administrative Group(s): None
DSTE Bandwidth Constraint Mode is MAM
inet6 fe80::204:75ff:fee6:5393/64
output packets 4438, bytes 394940, dropped 0
output errors 0, aborted 0, carrier 0, fifo 0, heartbeat 0, window 0
collisions 0

```

You can specify a regular expression after the `exclude` keyword. This example excludes lines with “output” or “input”:

```
# show interface xe0 | exclude (in|out)put
Interface xe0
  Scope: both
  Hardware is Ethernet Current HW addr: 001b.2139.6c4a
  Physical:001b.2139.6c4a Logical:(not set)
  index 2 metric 1 mtu 1500 duplex-full arp ageing timeout 3000
  <UP,BROADCAST,RUNNING,MULTICAST>
  VRF Binding: Not bound
  Bandwidth 100m
  DHCP client is disabled.
  inet 10.1.2.173/24 broadcast 10.1.2.255
  VRRP Master of : VRRP is not configured on this interface.
  inet6 fe80::21b:21ff:fe39:6c4a/64
  collisions 0
```

---

## Redirect Modifier

The `redirect` modifier writes the output into a file. The output is not displayed.

```
# show cli history | redirect /var/frame.txt
```

The output redirection token (`>`) does the same thing:

```
# show cli history >/var/frame.txt
```

---

## Last Modifier

The `last` modifier displays the output of last few number of lines (As per the user input). The last number ranges from 1 to 9999.

For example:

```
#show running-config | last 10
```

---

## String Parameters

The restrictions in [Table P-6](#) apply for all string parameters used in OcnOS commands, unless some other restrictions are noted for a particular command.

**Table P-6: String parameter restrictions**

| Restriction                   | Description  |
|-------------------------------|--|
| Input length                  | 1965 characters or less  |
| Restricted special characters | “?”, “,”, “>”, “ ”, and “=”<br>The “ ” character is allowed only for the <code>description</code> command in interface mode. |

---

## Command Modes

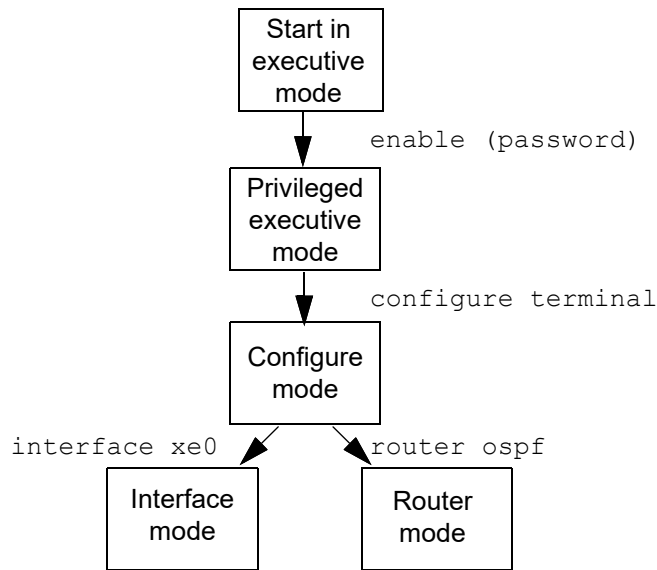
Commands are grouped into modes arranged in a hierarchy. Each mode has its own set of commands. [Table P-7](#) lists the command modes common to all protocols.

**Table P-7: Common command modes**

| Name                      | Description  |
|---------------------------|--|
| Executive mode            | Also called <i>view</i> mode, this is the first mode to appear after you start the CLI. It is a base mode from where you can perform basic commands such as <code>show</code> , <code>exit</code> , <code>quit</code> , <code>help</code> , and <code>enable</code> .  |
| Privileged executive mode | Also called <i>enable</i> mode, in this mode you can run additional basic commands such as <code>debug</code> , <code>write</code> , and <code>show</code> .   |
| Configure mode            | Also called <i>configure terminal</i> mode, in this mode you can run configuration commands and go into other modes such as <code>interface</code> , <code>router</code> , <code>route map</code> , <code>key chain</code> , and <code>address family</code> .<br><br>Configure mode is single user. Only one user at a time can be in configure mode. |
| Interface mode            | In this mode you can configure protocol-specific settings for a particular interface. Any setting you configure in this mode overrides a setting configured in router mode.  |
| Router mode               | This mode is used to configure router-specific settings for a protocol such as BGP or OSPF.  |

## Command Mode Tree

The diagram below shows the common command mode hierarchy.



**Figure P-1: Common command modes**

To change modes:

1. Enter privileged executive mode by entering `enable` in Executive mode.
2. Enter configure mode by entering `configure terminal` in Privileged Executive mode.

The example below shows moving from executive mode to privileged executive mode to configure mode and finally to router mode:

```

> enable mypassword
# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
(config)# router ospf
(config-router)#
  
```

Note: Each protocol can have modes in addition to the common command modes. See the command reference for the respective protocol for details.

---

## Transaction-based Command-line Interface

The OcNOS command line interface is transaction based:

- Any changes done in configure mode are stored in a separate *candidate* configuration that you can view with the `show transaction current` command.
- When a configuration is complete, apply the candidate configuration to the running configuration with the `commit` command.
- If a `commit` fails, no configuration is applied as the entire transaction is considered failed. You can continue to change the candidate configuration and then retry the `commit`.
- Discard the candidate configuration with the `abort transaction` command.
- Check the last aborted transaction with the `show transaction last-aborted` command.
- Multiple configurations cannot be removed with a single `commit`. You must remove each configuration followed by a `commit`.

Note: All commands MUST be executed only in the default CML shell (`cmlsh`). If you log in as root and start `imish`, then the system configurations will go out of sync. The `imish` shell is not supported and should not be started manually.



# Virtual Extensible LAN Configuration Guide





## CHAPTER 1 Overview

This chapter provides an overview of Virtual eXtensible Local Area Network (VxLAN) and its implementation with OcNOS. VxLAN creates LAN segments using a MAC in IP encapsulation. The encapsulation carries the original L2 frame received from a host to the destination in another server using IP tunnels. The endpoints of the virtualized tunnel formed using VxLAN are called VTEPs (VxLAN Tunnel EndPoints). This technology allows the network to support several tenants with minimum changes in the network. The VTEPs carry tenant data in L3 tunnels over the network. The tenant data is not used in routing or switching. This aids in tenant machine movement and allows the tenants to have the same IP or MAC addresses on end devices, hosts/VM's.

OcNOS supports VxLAN IPv4 tunnels, but both IPv4 and IPv6 hosts are supported.

Note: To configure VxLAN mapping to access ports, use one of the following two methods:

- [Enable NVO access-if mode on a physical interface](#)
- [Activate access-if-evpn mode on an L2 sub-interface](#)

---

## Terminology

Terms related to VxLAN configuration are defined in the table below.

|               |   |
|---------------|---|
| IGMP          | Internet Group Management Protocol  |
| PIM           | Protocol Independent Multicast  |
| VLAN          | Virtual Local Area Network  |
| VM            | Virtual Machine   |
| VNI           | VxLAN Network Identifier (or VxLAN Segment ID)                                    |
| VTEP          | VxLAN Tunnel End Point. An entity that originates and/or terminates VxLAN tunnels |
| VxLAN         | Virtual eXtensible Local Area Network   |
| VxLAN Segment | VxLAN Layer 2 overlay network over which VMs communicate                          |
| VxLAN Gateway | An entity that forwards traffic between VxLANs                                    |

---

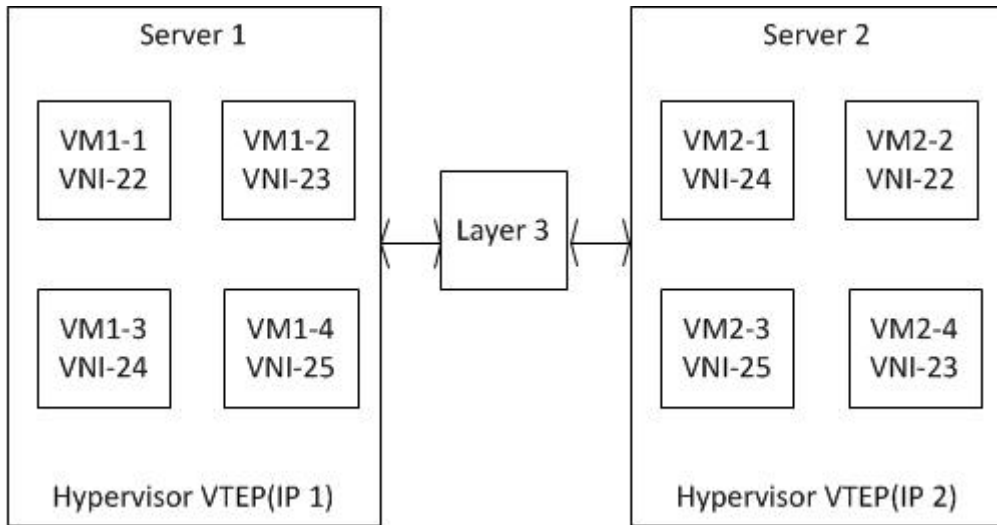
## VxLAN Architecture

VxLAN runs over the existing networking infrastructure. It provides a means to “stretch” a Layer 2 network. In short, VxLAN is a Layer 2 overlay scheme on a Layer 3 network.

Each overlay is termed as a VxLAN segment. Only VMs within the same VxLAN segment can communicate with each other. Each VxLAN segment is identified through a 24-bit segment ID termed the “VxLAN Network Identifier (VNI)”. This allows up to 16 million VxLAN segments to coexist within the same administrative domain.

VNI identifies the scope of the inner MAC frame originated by the individual VM. Hence, we can have overlapping MAC addresses across segments but never have traffic “cross over” since the traffic is isolated using the VNI. The VNI is in an outer header that encapsulates the inner MAC frame originated by the VM.

Any packets (including ARP-ND) that are uplifted to the VxLAN CPU queue from any port are rate limited to 500 packets/second. This is done to protect the system and CPU during an ARP storm.



**Figure 1-1: VxLAN Deployment - VTEPs across a Layer 3 Network**

## CHAPTER 2 VxLAN Unicast Configuration

This chapter contains basic Static-VxLAN unicast configuration examples.

### Port Mapping

In this example each VTEP (VTEP1 and VTEP2) is a multilayer switch where xe2 is an access port while xe1 is network port.

After we start sending a packet (say untagged ipv4 packet) from VM1, it hits the VTEP1, VTEP1 does encapsulation based on the VNID configured and send it on xe1. Now the packet reaches VTEP2 and it does decapsulation of the packet. Now based on VNID packet is sent out on access port and it reaches destination VM, VM2.

### Topology

The procedures in this section use the topology in [Figure 2-2](#)

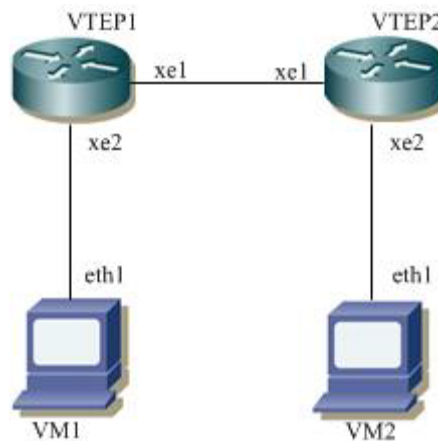


Figure 2-2: VxLAN unicast

### VTEP1

|  |   |
|--|---|
| #configure terminal                            | Enter the configure mode                                |
| (config)#interface xe2                         | Enter interface mode                                    |
| (config-if)#switchport                         | Configure the interface as switchport                   |
| (config-if)#no shutdown                        | Bring the interface into operation with the no shutdown |
| (config-if)#exit                               | Exit interface mode                                     |
| (config)#interface lo                          | Enter the configure mode                                |
| (config-if)#ip address 1.1.1.1/32<br>secondary | Configure IP address on the interface xe1               |
| (config-if)#no shutdown                        | Bring the interface into operation with the no shutdown |
| (config-if)#exit                               | Exit interface mode                                     |
| (config)#interface xe1                         | Enter the configure mode                                |
| (config-if)#ip address 5.5.5.2/24              | Configure IP address on the interface xe1               |

## VxLAN Unicast Configuration

|  |   |
|--|---|
| (config-if)#no shutdown  | Bring the interface into operation with the no shutdown   |
| (config-if)#exit   | Exit interface mode   |
| (config)#ip route 2.2.2.2/32 5.5.5.4                             | Configure static route  |
| (config)#hardware-profile filter vxlan enable                    | Enable hardware-profile filter for VxLAN  |
| (config)#nvo vxlan enable  | Enable VxLAN globally on this vtep  |
| (config)#interface Tunnel 2                                      | Specify the interface (Tunnel2)to be configured and Enter interface mode  |
| (config-if)#tunnel mode vxlan                                    | Assign this tunnel mode as VxLAN  |
| (config-if)#tunnel source 1.1.1.1                                | Configure the source IP of this tunnel as an IP address which is configured on the interface xe1 of VTEP1       |
| (config-if)#tunnel destination 2.2.2.2                           | Configure the destination IP of this tunnel as an IP address which is configured on the interface xe1 of VTEP2. |
| (config-if)#exit   | Exit interface mode   |
| (config-if)#nvo vxlan vtep-ip-global 1.1.1.1                     | Configure Source vtep-ip-global configuration - Use loopback ip address   |
| (config)#nvo vxlan id 100 ingress-replication inner-vid-disabled | Configure a VNID on this VTEP and enter the nvo mode.   |
| (config-nvo)#vxlan map-network tunnel Tunnel2                    | Map the tunnel 2 with VNID 2  |
| (config-nvo)#exit  | Exit the nvo mode   |
| (config)#nvo vxlan access-if port xe2 10                         | Map the access port xe2 of this VTEP  |
| (config-nvo-acc-if)#map vnid 100                                 | Map the VNID 2 to access-port xe2   |
| (config-nvo-acc-if)# arp-cache disable                           | Disable arp-cache - mandatory   |
| (config-nvo-acc-if)#exit   | Exit the nvo access-if mode   |
| (config)#commit  | Perform commit operation for the changes to take effect.  |

## VTEP2

|   |   |
|---|---|
| #configure terminal                         | Enter the configure mode                                |
| (config)#interface xe2                      | Enter interface mode                                    |
| (config-if)#switchport                      | Configure the interface as switchport                   |
| (config-if)#no shutdown                     | Bring the interface into operation with the no shutdown |
| (config-if)#exit                            | Exit interface mode                                     |
| (config)#interface lo                       | Enter the configure mode                                |
| (config-if)#ip address 2.2.2.2/32 secondary | Configure IP address on the interface xe1               |
| (config-if)#no shutdown                     | Bring the interface into operation with the no shutdown |
| (config-if)#exit                            | Exit interface mode                                     |
| (config)#interface xe1                      | Enter the configure mode                                |
| (config-if)#ip address 5.5.5.4/24           | Configure IP address on the interface xe1               |
| (config-if)#no shutdown                     | Bring the interface into operation with the no shutdown |
| (config-if)#exit                            | Exit interface mode                                     |
| (config)#ip route 1.1.1.1/32 5.5.5.2        | Configure static route                                  |

|  |   |
|--|---|
| (config)#hardware-profile filter vxlan enable                    | Enable hardware-profile filter for VxLAN  |
| (config)#nvo vxlan enable  | Enable VxLAN globally on this vtep  |
| (config)#interface tunnel 2                                      | Specify the interface (Tunnel2)to be configured and Enter interface mode.                                       |
| (config-if)#tunnel mode vxlan                                    | Assign this tunnel mode as VxLAN  |
| (config-if)#tunnel source 2.2.2.2                                | Configure the source IP of this tunnel as an IP address which is configured on the interface xe1 of VTEP1.      |
| (config-if)#tunnel destination 1.1.1.1                           | Configure the destination IP of this tunnel as an IP address which is configured on the interface xe1 of VTEP2. |
| (config-if)#exit   | Exit interface mode.  |
| (config-if)#nvo vxlan vtep-ip-global 2.2.2.2                     | Configure Source vtep-ip-global configuration - Use loopback ip address   |
| (config)#nvo vxlan id 100 ingress-replication inner-vid-disabled | Configure a VNID on this VTEP and enter the nvo mode.   |
| (config-nvo)#vxlan map-network tunnel Tunnel2                    | Map the tunnel 4 with VNID 2  |
| (config-nvo)#exit  | Exit the nvo mode.  |
| (config)#nvo vxlan access-if port xe2 10                         | Map the access port xe2 of this VTEP  |
| (config-nvo-acc-if)#map vnid 100                                 | Map the VNID 100 to access-port xe2   |
| (config-nvo-acc-if)# arp-cache disable                           | Disable arp-cache - mandatory   |
| (config-nvo-acc-if)#exit   | Exit the nvo access-if mode   |
| (config)#commit  | Perform commit operation for the changes to take effect.  |

## Validation

### VTEP1

```
VTEP1#sh nvo vxlan tunnel
```

```
VxLAN Network tunnel Entries
```

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 1.1.1.1 | 2.2.2.2     | Installed | 00:04:59 | 00:04:59 |

```
Total number of entries are 1
```

```
VTEP1#sh nvo vxlan mac-table
```

```
=====
VxLAN MAC Entries
=====
VNID      Interface VlanId   In-VlanId Mac-Addr      VTEP-Ip/ESI
Type          Status   MAC move AccessPortDesc
-----
100       xe2      10         ----      903c.b393.e001 1.1.1.1
          Dynamic Local ----- 0          -----
```

## VxLAN Unicast Configuration

---

Total number of entries are : 1

VTEP1#sh nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

| VNID | Ip-Addr | Mac-Addr | Type | Age-Out | Retries-Left |
|------|---------|----------|------|---------|--------------|
|------|---------|----------|------|---------|--------------|

---

Total number of entries are 0

VTEP1#sh nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port

AC - Access Port

(u) - Untagged

| VNID   | VNI-Name  | VNI-Type | Type     | Interface | ESI | VLAN | Vlan |
|--------|-----------|----------|----------|-----------|-----|------|------|
| -Range | DF-Status | Src-Addr | Dst-Addr |           |     |      |      |

---

|      |         |      |         |      |      |                   |      |    |
|------|---------|------|---------|------|------|-------------------|------|----|
| 100  | ----    | L2   | NW      | ---- | ---- |                   | ---- |    |
| ---- | 1.1.1.1 |      | 2.2.2.2 |      |      |                   |      |    |
| 100  | ----    | --   | AC      | xe2  | ---  | Single Homed Port | ---  | 10 |
| ---- | ----    | ---- |         | ---- |      |                   |      |    |

Total number of entries are 2

VTEP1#

VTEP1#sh nvo vxlan access-if brief

| Interface | Vlan | Inner<br>vlan | Vlan<br>Range | Ifindex | Vnid | Admin<br>status | Link<br>status |
|-----------|------|---------------|---------------|---------|------|-----------------|----------------|
| xe2       | 10   | ---           | ---           | 500000  | 100  | up              | up             |

Total number of entries are 1

VTEP1#

VTEP1#

=====  
=====

### VTEP2#

VTEP2#sh nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 2.2.2.2 | 1.1.1.1     | Installed | 00:05:30 | 00:05:30 |

Total number of entries are 1  
VTEP2#sh nvo vxlan mac-table

```
=====
VxLAN MAC Entries
=====
```

| VNID | Interface Type | VlanId Status | In-VlanId MAC move | Mac-Addr AccessPortDesc | VTEP-Ip/ESI |
|------|----------------|---------------|--------------------|-------------------------|-------------|
| 100  | xe2            | 10            | ----               | 0018.2359.69b7          | 2.2.2.2     |
|      | Dynamic Local  | -----         | 0                  | -----                   |             |

Total number of entries are : 1

VTEP2#sh nvo vxlan  
VxLAN Information

```
=====
Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged
```

| VNID -Range | VNI-Name DF-Status | VNI-Type Src-Addr | Type Dst-Addr | Interface | ESI  | VLAN              | Vlan |
|-------------|--------------------|-------------------|---------------|-----------|------|-------------------|------|
| 100         | ----               | L2                | NW            | ----      | ---- |                   | ---- |
|             | 2.2.2.2            |                   | 1.1.1.1       |           |      |                   |      |
| 100         | ----               | --                | AC            | xe2       | ---  | Single Homed Port | 10   |
|             | ----               | ----              | ----          | ----      |      |                   |      |

Total number of entries are 2

VTEP2#sh nvo vxlan access-if brief

| Interface | Vlan | Inner vlan | Vlan Range | Ifindex | Vnid | Admin status | Link status |
|-----------|------|------------|------------|---------|------|--------------|-------------|
| xe2       | 10   | ---        | ---        | 500000  | 100  | up           | up          |

Total number of entries are 1  
VTEP2#

```
=====  
=====  
host-1#ping 10.10.10.2  
Press CTRL+C to exit  
PING 10.10.10.2 (10.10.10.2) 56(84) bytes of data.  
64 bytes from 10.10.10.2: icmp_seq=1 ttl=64 time=0.392 ms  
  
--- 10.10.10.2 ping statistics ---  
1 packets transmitted, 1 received, 0% packet loss, time 0ms  
rtt min/avg/max/mdev = 0.392/0.392/0.392/0.000 ms
```

```
7015-Host#ping 10.10.10.1  
Press CTRL+C to exit  
PING 10.10.10.1 (10.10.10.1) 56(84) bytes of data.  
64 bytes from 10.10.10.1: icmp_seq=1 ttl=64 time=0.704 ms  
64 bytes from 10.10.10.1: icmp_seq=2 ttl=64 time=0.259 ms
```

---

## Intermediate Non-VxLAN Router

This example is same as port mapping but we have an intermediate non VxLAN router. It does forwarding based on IP header.

---

## Topology

The procedures in this section use the topology in [Figure 2-3](#)

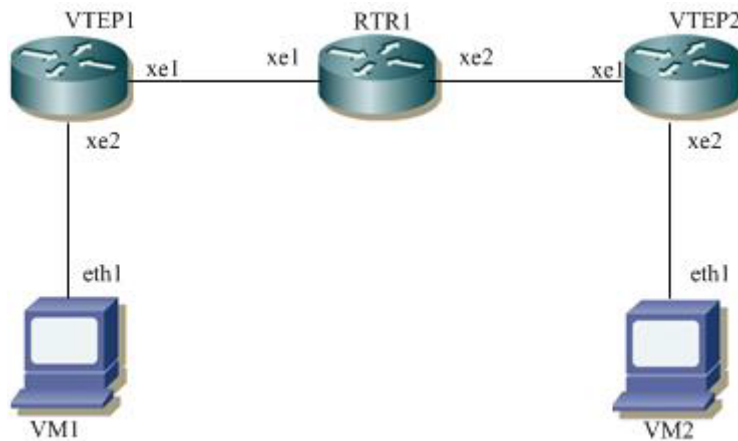


Figure 2-3: VxLAN unicast

### VTEP1

|                         |   |
|-------------------------|---|
| #configure terminal     | Enter the configure mode.                               |
| (config)#interface xe2  | Enter interface mode.                                   |
| (config-if)#switchport  | Configure the interface as switchport.                  |
| (config-if)#no shutdown | Bring the interface into operation with the no shutdown |



|  |   |
|--|---|
| (config-if)#exit   | Exit interface mode.  |
| (config)#interface xe1   | Enter the configure mode.   |
| (config-if)#ip address 2.2.2.4/24  | Configure IP address on the interface xe1.  |
| (config-if)#no shutdown  | Bring the interface into operation with the no shutdown   |
| (config-if)#exit   | Exit interface mode.  |
| (config)#ip route 3.3.3.0/24 2.2.2.1   | Configuring static route  |
| (config)#hardware-profile filter vxlan enable                                  | Enable hardware-profile filter for VxLAN  |
| (config)#nvo vxlan enable  | Enable VxLAN globally on this vtep.   |
| (config)#interface tunnel 4  | Specify the interface (Tunnel4)to be configured and Enter interface mode.                                       |
| (config-if)#tunnel mode vxlan  | Assign this tunnel mode as VxLAN.   |
| (config-if)#tunnel source 2.2.2.4  | Configure the source IP of this tunnel as an IP address which is configured on the interface xe1 of VTEP1.      |
| (config-if)#tunnel destination 3.3.3.4   | Configure the destination IP of this tunnel as an IP address which is configured on the interface xe1 of VTEP2. |
| (config-if)#exit   | Exit interface mode.  |
| (config)#nvo vxlan id 3  | Configure a VNID on this VTEP and enter the nvo mode.   |
| (config-nvo)#vxlan map-network tunnel Tunnel4                                  | Map the tunnel 4 with this VNID   |
| (config-nvo)#vxlan static-entry host-mac 0000.0000.aaaa remote-vtep-ip 3.3.3.4 | Configure a static entry for remote VM with MAC address and IP address.   |
| (config)#nvo vxlan access-if port xe2  | Map the access port xe2 of this VTEP  |
| (config-nvo-acc-if)#map vnid 3   | Map the VNID 2 to access-port xe2   |
| (config-nvo-acc-if)#exit   | Exit NVO access-interface mode  |
| (config)#commit  | Perform commit operation for the changes to take effect.  |

**RTR1**

|                                   |  |
|-----------------------------------|--|
| (config)#interface xe1            | Enter the configure mode.                                |
| (config-if)#ip address 2.2.2.1/24 | Configure IP address on the interface xe1.               |
| (config-if)#no shutdown           | Bring the interface into operation with the no shutdown  |
| (config-if)#exit                  | Exit interface mode.                                     |
| (config)#interface xe2            | Enter the configure mode.                                |
| (config-if)#ip address 3.3.3.1/24 | Configure IP address on the interface xe2.               |
| (config-if)#no shutdown           | Bring the interface into operation with the no shutdown  |
| (config-if)#exit                  | Exit interface mode.                                     |
| (config)#commit                   | Perform commit operation for the changes to take effect. |

**VTEP2**

|                        |                           |
|------------------------|---------------------------|
| #configure terminal    | Enter the configure mode. |
| (config)#interface xe2 | Enter interface mode.     |

## VxLAN Unicast Configuration

|  |   |
|--|---|
| (config-if)#switchport   | Configure the interface as switchport.  |
| (config-if)#no shutdown  | Bring the interface into operation with the no shutdown   |
| (config-if)#exit   | Exit interface mode.  |
| (config)#interface xe1   | Enter the configure mode.   |
| (config-if)#ip address 3.3.3.4/24  | Configure IP address on the interface xe1.  |
| (config-if)#no shutdown  | Bring the interface into operation with the no shutdown   |
| (config-if)#exit   | Exit interface mode.  |
| (config)#ip route 2.2.2.0/24 3.3.3.1   | Configuring static route  |
| (config)#hardware-profile filter vxlan enable                                  | Enable hardware-profile filter for VxLAN  |
| (config)#nvo vxlan enable  | Enable VxLAN globally on this vtep.   |
| (config)#interface tunnel 4  | Specify the interface (Tunnel4)to be configured and Enter interface mode.                                       |
| (config-if)#tunnel mode vxlan  | Assign this tunnel mode as VxLAN.   |
| (config-if)#tunnel source 3.3.3.4  | Configure the source IP of this tunnel as an IP address which is configured on the interface xe1 of VTEP1.      |
| (config-if)#tunnel destination 2.2.2.4   | Configure the destination IP of this tunnel as an IP address which is configured on the interface xe1 of VTEP2. |
| (config-if)#exit   | Exit interface mode.  |
| (config)#nvo vxlan id 3  | Configure a VNID on this VTEP and enter the nvo mode.   |
| (config-nvo)#vxlan map-network tunnel Tunnel4                                  | Map the tunnel 4 with this VNID   |
| (config-nvo)#vxlan static-entry host-mac 0000.0000.bbbb remote-vtep-ip 2.2.2.4 | Configure a static entry for remote VM with MAC address and IP address.   |
| (config)#nvo vxlan access-if port xe2  | Map the access port xe2 of this VTEP  |
| (config-nvo-acc-if)#map vnid 3   | Map the VNID 3 to access-port xe2   |
| (config-nvo-acc-if)#exit   | Exit the NVO access interface mode  |
| (config)#commit  | Perform commit operation for the changes to take effect.  |

## Validation

### VTEP1

```
VTEP1#show nvo vxlan tunnel
VxLAN Network tunnel Entries
```

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 2.2.2.4 | 3.3.3.4     | Installed | 00:37:56 | 00:37:56 |

Total number of entries are 1

```
VTEP1#show nvo vxlan
VxLAN Information
```

```
=====
Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged
```

| VNID   | VNI-Name | VNI-Type | Type | Interface | ESI | VLAN | DF- |
|--------|----------|----------|------|-----------|-----|------|-----|
| Status | Src-Addr | Dst-Addr |      |           |     |      |     |

|    |         |         |    |      |       |                   |     |
|----|---------|---------|----|------|-------|-------------------|-----|
| 3  | ----    | L2      | NW | ---- | ----- | ----              | --  |
| -- | 2.2.2.4 | 3.3.3.4 |    |      |       |                   |     |
| 3  | ----    | --      | AC | xe2  | ---   | Single Homed Port | --- |

Total number of entries are 2

VTEP1#

VTEP1#show nvo vxlan mac-table

```

=====
=====
=====
                                     VxLAN MAC Entries
=====
=====
=====

```

| VNID   | Interface | VlanId | Inner-VlanId | Mac-Addr       | VTEP-Ip/ESI |
|--------|-----------|--------|--------------|----------------|-------------|
| Type   |           | Status |              | AccessPortDesc |             |
| 3      | ----      | ----   | ----         | 0000.0000.aaaa | 3.3.3.4     |
| Static | Remote    | -----  |              | -----          |             |
| 3      | xe2       | ----   | ----         | 0000.0000.bbbb | Dynamic     |
| Local  | -----     |        | -----        |                |             |

Total number of entries are : 2

VTEP1#sh nvo vxlan mac-table vnid 3

```

=====
=====
=====
                                     VxLAN MAC Entries
=====
=====
=====

```

| VNID   | Interface | VlanId | Inner-VlanId | Mac-Addr       | VTEP-Ip/ESI |
|--------|-----------|--------|--------------|----------------|-------------|
| Type   |           | Status |              | AccessPortDesc |             |
| 3      | ----      | ----   | ----         | 0000.0000.aaaa | 3.3.3.4     |
| Static | Remote    | -----  |              | -----          |             |
| 3      | xe2       | ----   | ----         | 0000.0000.bbbb | Dynamic     |
| Local  | -----     |        | -----        |                |             |

Total number of entries are : 2

**VTEP2**

VTEP2#show nvo vxlan tunnel

## VxLAN Unicast Configuration

VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 3.3.3.4 | 2.2.2.4     | Installed | 00:34:02 | 00:34:02 |

Total number of entries are 1

VTEP2#show nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port  
 AC - Access Port  
 (u) - Untagged

| VNID   | VNI-Name | VNI-Type | Type | Interface | ESI | VLAN | DF- |
|--------|----------|----------|------|-----------|-----|------|-----|
| Status | Src-Addr | Dst-Addr |      |           |     |      |     |

|    |         |         |    |      |       |                   |     |
|----|---------|---------|----|------|-------|-------------------|-----|
| 3  | ----    | L2      | NW | ---- | ----- | ----              | --  |
| -- | 3.3.3.4 | 2.2.2.4 |    |      |       |                   |     |
| 3  | ----    | --      | AC | xe1  | ---   | Single Homed Port | --- |
| -- | ----    | ----    |    |      |       |                   | --  |

Total number of entries are 2

VTEP2#sh nvo vxlan mac-table

=====

VxLAN MAC Entries

| VNID   | Interface | VlanId | Inner-VlanId | Mac-Addr       | VTEP-Ip/ESI |
|--------|-----------|--------|--------------|----------------|-------------|
| Type   |           | Status |              | AccessPortDesc |             |
| 3      | xe1       | ----   | ----         | 0000.0000.aaaa |             |
| Local  | -----     |        | -----        |                | Dynamic     |
| 3      | ----      | ----   | ----         | 0000.0000.bbbb | 2.2.2.4     |
| Static | Remote    | -----  |              | -----          |             |

Total number of entries are : 2

VTEP2#sh nvo vxlan mac-table vnid 3

=====

VxLAN MAC Entries

| VNID | Interface | VlanId | Inner-VlanId | Mac-Addr       | VTEP-Ip/ESI |
|------|-----------|--------|--------------|----------------|-------------|
| Type |           | Status |              | AccessPortDesc |             |

```

3          xe1          ----  ----          0000.0000.aaaa          Dynamic
Local      -----          -----
3          ----          ----  ----          0000.0000.bbbb 2.2.2.4
Static Remote      -----          -----

```

Total number of entries are : 2



## CHAPTER 3 VxLAN-EVPN Configuration

This section contains basic VxLAN-EVPN configuration examples.

VxLAN (Virtual eXtended LAN) creates LAN segments using a MAC-in-IP encapsulation. The encapsulation carries the original L2 frame received from a host to the destination in another host using IP tunnels. The endpoints of the virtualized tunnel formed using VxLAN are called VTEPs (VxLAN Tunnel End Points). The VTEPs carry tenant data in L3 tunnels over the network which permits the network to support multiple tenants. The tenant data is not used in routing or switching. This aids in tenant machine movement and allows the tenants to have same IP/MAC addresses.

Information about the given VM to get to the VTEP is crucial in VxLAN protocol; therefore BGP-MP is used to carry this information across VTEPS.

Note: For port-channel/Static-channel interface, storm control will be applied on each member port. For Example: if Interface eth1 and interface eth2 is part of port-channel i.e. po1 and storm control 2mbps is applied for broadcast traffic, then the storm control settings will be applied on each member port and broadcast traffic on each member port will be rate limited to 2mbps each.

### Topology

The procedures in this section use the topology in [Figure 3-4](#).

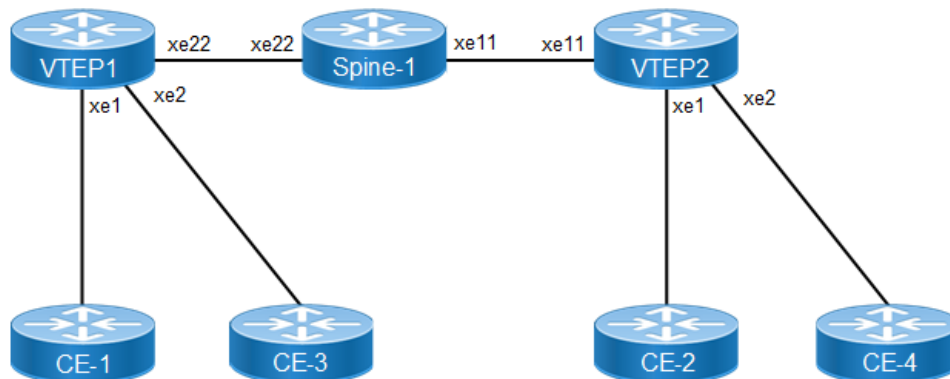


Figure 3-4: VxLAN EVPN

#### VTEP1

Enable NVO access-if mode on a physical interface

|                         |   |
|-------------------------|---|
| #configure terminal     | Enter configure mode                      |
| (config)#interface xe1  | Enter interface mode                      |
| (config-if)#switchport  | Configure the interface as a switch port. |
| (config-if)#no shutdown | Bring the interface into operation        |
| (config-if)#exit        | Exit interface mode                       |
| (config)#interface xe2  | Enter interface mode                      |
| (config-if)#switchport  | Configure the interface as switch port.   |
| (config-if)#no shutdown | Bring the interface into operation.       |
| (config-if)#exit        | Exit interface mode.                      |

## VxLAN-EVPN Configuration

|   |  |
|---|--|
| <code>(config)#interface xe22</code>                                      | Enter interface mode.  |
| <code>(config-if)#ip address 10.1.1.1/24</code>                           | Set an IP address on the interface.  |
| <code>(config-if)#no shutdown</code>                                      | Bring the interface into operation.  |
| <code>(config-if)#exit</code>   | Exit interface mode.   |
| <code>(config)#interface lo</code>  | Enter interface mode.  |
| <code>(config-if)#ip address 1.1.1.1/32<br/>secondary</code>              | Set an IP address on the interface.  |
| <code>(config-if)#no shutdown</code>                                      | Bring the interface into operation.  |
| <code>(config-if)#exit</code>   | Exit interface mode.   |
| <code>(config)#router isis ABC</code>                                     | Create an IS-IS routing instance (ABC).  |
| <code>(config-router)#is-type level-1</code>                              | Configure instance as level-1-only routing.  |
| <code>(config-router)#net<br/>49.0001.1111.1111.1111.00</code>            | Set a Network Entity Title for this instance, specifying the area address and the system ID.               |
| <code>(config-router)#exit</code>   | Exit router mode.  |
| <code>(config)#interface xe22</code>                                      | Enter interface mode   |
| <code>(config-if)#ip router isis ABC</code>                               | Enable IS-IS routing on an interface (ABC).  |
| <code>(config-if)#isis circuit-type level-1</code>                        | Configure instance as level-1-only routing.  |
| <code>(config-if)#exit</code>   | Exit interface mode.   |
| <code>(config)#interface lo</code>  | Enter interface mode.  |
| <code>(config-if)#ip router isis ABC</code>                               | Enable IS-IS routing on an interface for area 49 (ABC).  |
| <code>(config-if)#isis circuit-type level-1</code>                        | Configure instance as level-1-only routing.  |
| <code>(config-if)#exit</code>   | Exit interface mode.   |
| <code>(config)#mac vrf vrf_evpn_100</code>                                | Configure a new VRF named <code>vrf_evpn_100</code> .  |
| <code>(config-vrf)#rd 1.1.1.1:1</code>                                    | Assign the Route Distinguisher value.  |
| <code>(config-vrf)#route-target both 100:1</code>                         | Configure route target to import and export the routes.  |
| <code>(config-vrf)#exit</code>  | Exit VRF mode.   |
| <code>(config)#router bgp 1</code>  | Define the routing process. The number 1 specifies the AS number of VTEP1.                                 |
| <code>(config-router)#bgp router-id 1.1.1.1</code>                        | Configure router-id for this BGP process.  |
| <code>(config-router)#neighbor 2.2.2.2 remote-as<br/>1</code>             | Define BGP neighbor: 2.2.2.2 is the IP address of the neighbor (VTEP2), and 1 is the neighbor's AS number. |
| <code>(config-router)# neighbor 2.2.2.2 update-<br/>source 1.1.1.1</code> | Define BGP neighbor: 1.1.1.1 is the peer interface.  |
| <code>(config-router)#address-family l2vpn evpn</code>                    | Configure address-family L2VPN EVPN.   |
| <code>(config-router-af)#neighbor 2.2.2.2<br/>activate</code>             | Activate the neighbor in the EVPN address family.  |
| <code>(config-router-af)#exit-address-family</code>                       | Exit the address-family mode.  |
| <code>(config-router)#exit</code>   | Exit router mode.  |
| <code>(config)#hardware-profile filter vxlan<br/>enable</code>            | Enable hardware-profile filter for VxLAN.  |
| <code>(config)#nvo vxlan enable</code>                                    | Enable VxLAN globally on this VTEP.  |
| <code>(config)#nvo vxlan vtep-ip-global 1.1.1.1</code>                    | Assign a global IP to the VTEP.  |
| <code>(config)#nvo vxlan id 100 ingress-<br/>replication</code>           | Configure a VNID on this VTEP and enter NVO mode.  |



|   |  |
|---|--|
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf_evpn_100 | Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100. |
| (config-nvo)#exit   | Exit NVO mode.   |
| (config)#nvo vxlan access-if port-vlan xe1 2                        | Configure access-port xe1 and map vlan 2   |
| (config-nvo-acc-if)#map vnid 100                                    | Map VNID 100 to access-port xe1.   |
| (config-nvo-acc-if)#exit  | Exit NVO access-if mode.   |
| (config)#nvo vxlan id 200 ingress-replication                       | Configure second VNID on this VTEP and enter NVO mode.                                     |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf_evpn_100 | Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100  |
| (config-nvo)#exit   | Exit NVO mode.   |
| (config)#nvo vxlan access-if port-vlan xe2 3                        | Configure access-port xe2 and map vlan 3   |
| (config-nvo-acc-if)#map vnid 200                                    | Map VNID 200 to access-port xe2.   |
| (config-nvo-acc-if)#exit  | Exit NVO access-if mode.   |
| (config)#commit   | Commit the configurations  |

### Activate access-if-evpn mode on an L2 sub-interface

|                                     |  |
|-------------------------------------|--|
| (config)#interface xe1.1 switchport | Create L2 subinterface xe1.1                 |
| (config-if)#encapsulation dot1q 2   | Configure encapsulation dot1q with vlan-id 2 |
| (config-if)#access-if-evpn          | Enter access-if-evpn mode                    |
| (config-acc-if-evpn)#map vpn-id 100 | Map vnid 100 to access interface xe1.1       |
| (config-acc-if-evpn)#exit           | Exit access-if-evpn mode                     |
| (config)#interface xe2.1 switchport | Create L2 subinterface xe2.1                 |
| (config-if)#encapsulation dot1q 3   | Configure encapsulation dot1q with vlan-id 3 |
| (config-if)#access-if-evpn          | Enter access-if-evpn mode                    |
| (config-acc-if-evpn)#map vpn-id 200 | Map vnid 200 to access interface xe2.1       |
| (config-acc-if-evpn)#exit           | Exit access-if-evpn mode                     |
| (config-if)#commit                  | Commit the configurations                    |

### Spine-1

|                                    |                                     |
|------------------------------------|-------------------------------------|
| #configure terminal                | Enter configure mode.               |
| (config)#interface xe22            | Enter interface mode.               |
| (config-if)#ip address 10.1.1.2/24 | Set an IP address on the interface. |
| (config-if)#no shutdown            | Bring the interface into operation  |
| (config-if)#exit                   | Exit interface mode.                |
| (config)#interface xe11            | Enter interface mode.               |
| (config-if)#ip address 20.1.1.2/24 | Set an IP address on the interface. |
| (config-if)#no shutdown            | Bring the interface into operation  |
| (config-if)#exit                   | Exit interface mode.                |

|  |  |
|--|--|
| (config)#router isis ABC                         | Create an IS-IS routing instance (ABC).  |
| (config-router)#is-type level-1                  | Configure instance as level-1-only routing.  |
| (config-router)#net<br>49.0001.3333.3333.3333.00 | Set a Network Entity Title for this instance, specifying the area address and the system ID. |
| (config-router)#exit                             | Exit router mode.  |
| (config)#interface xe22                          | Enter interface mode.  |
| (config-if)#ip router isis ABC                   | Enable IS-IS routing on an interface (ABC).  |
| (config-if)#isis circuit-type level-1            | Configure instance as level-1-only routing.  |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#interface xe11                          | Enter interface mode.  |
| (config-if)#ip router isis ABC                   | Enable IS-IS routing on an interface (ABC).  |
| (config-if)#isis circuit-type level-1            | Configure instance as level-1-only routing.  |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#commit                                  | Commit the configurations  |

**VTEP2****Enable NVO access-if mode on a physical interface**

|  |  |
|--|--|
| #configure terminal                              | Enter configure mode.  |
| (config)#interface xe1                           | Enter interface mode.  |
| (config-if)#switchport                           | Configure the interface as switchport.   |
| (config-if)#no shutdown                          | Bring the interface into operation   |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#interface xe2                           | Enter interface mode.  |
| (config-if)#switchport                           | Configure the interface as switchport.   |
| (config-if)#no shutdown                          | Bring the interface into operation   |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#interface xe11                          | Enter interface mode.  |
| (config-if)#ip address 20.1.1.1/24               | Set an IP address on the interface.  |
| (config-if)#no shutdown                          | Bring the interface into operation   |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#interface lo                            | Enter interface mode.  |
| (config-if)#ip address 2.2.2.2/32 secondary      | Set an IP address on the interface.  |
| (config-if)#no shutdown                          | Bring the interface into operation   |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#router isis ABC                         | Create an IS-IS routing instance (ABC).  |
| (config-router)#is-type level-1                  | Configure instance as level-1-only routing.  |
| (config-router)#net<br>49.0001.2222.2222.2222.00 | Set a Network Entity Title for this instance, specifying the area address and the system ID. |
| (config-router)#exit                             | Exit router mode.  |
| (config)#interface xe11                          | Enter interface mode.  |

|   |  |
|---|--|
| (config-if)#ip router isis ABC                                      | Enable IS-IS routing on an interface (ABC).  |
| (config-if)#isis circuit-type level-1                               | Configure instance as level-1-only routing.  |
| (config-if)#exit  | Exit interface mode.   |
| (config)#interface lo   | Enter interface mode.  |
| (config-if)#ip router isis ABC                                      | Enable IS-IS routing on an interface for area 49 (ABC).  |
| (config-if)#isis circuit-type level-1                               | Configure instance as level-1-only routing.  |
| (config-if)#exit  | Exit interface mode.   |
| (config)#mac vrf vrf_evpn_100                                       | Configure a new VRF named vrf_evpn_100.  |
| (config-vrf)#rd 2.2.2.1:1   | Assign the Route Distinguisher value.  |
| (config-vrf)#route-target both 100:1                                | Configure route target to import and export the routes.  |
| (config-vrf)#exit   | Exit VRF mode.   |
| (config)#router bgp 1   | Define the routing process. The number 1 specifies the AS number of VTEP1.                                 |
| (config-router)#neighbor 1.1.1.1 remote-as 1                        | Define BGP neighbor: 1.1.1.1 is the IP address of the neighbor (VTEP1), and 1 is the neighbor's AS number. |
| (config-router)# neighbor 1.1.1.1 update-source 2.2.2.2             | Define BGP neighbor: 2.2.2.2 is the peer interface.  |
| (config-router)#address-family l2vpn evpn                           | Configure address-family L2VPN EVPN.   |
| (config-router-af)#neighbor 1.1.1.1 activate                        | Activate the neighbor in the EVPN address family.  |
| (config-router-af)#exit-address-family                              | Exit address-family mode.  |
| (config-router)#exit  | Exit router mode.  |
| (config)#hardware-profile filter vxlan enable                       | Enable hardware-profile filter for VxLAN.  |
| (config)#nvo vxlan enable   | Enable VxLAN globally on this VTEP.  |
| (config)#nvo vxlan vtep-ip-global 2.2.2.2                           | Assign a global IP to the VTEP.  |
| (config)#nvo vxlan id 100 ingress-replication                       | Configure a VNID on this VTEP and enter NVO mode.  |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf_evpn_100 | Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100.                 |
| (config-nvo)#exit   | Exit NVO mode.   |
| (config)#nvo vxlan access-if port-vlan xe1 2                        | Configure access-port xe1 and map vlan 2   |
| (config-nvo-acc-if)#map vnid 100                                    | Map VNID 100 to access-port xe1.   |
| (config-nvo-acc-if)#exit  | Exit NVO access-if mode.   |
| (config)#nvo vxlan id 200 ingress-replication                       | Configure second VNID on this VTEP and enter NVO mode.   |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf_evpn_100 | Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100                  |
| (config-nvo)#exit   | Exit NVO mode.   |
| (config)#nvo vxlan access-if port-vlan xe2 3                        | Configure access-port xe2 and map vlan 3   |
| (config-nvo-acc-if)#map vnid 200                                    | Map VNID 200 to access-port xe2.   |
| (config-nvo-acc-if)#exit  | Exit NVO access-if mode.   |
| (config)#commit   | Commit the configurations  |

## Activate access-if-evpn mode on an L2 sub-interface

|                                     |  |
|-------------------------------------|--|
| (config)#interface xe1.1 switchport | Create L2 subinterface xe1.1                 |
| (config-if)#encapsulation dot1q 2   | Configure encapsulation dot1q with vlan-id 2 |
| (config-if)#access-if-evpn          | Enter access-if-evpn mode                    |
| (config-acc-if-evpn)#map vpn-id 100 | Map vnid 100 to access interface xe1.1       |
| (config-acc-if-evpn)#exit           | Exit access-if-evpn mode                     |
| (config)#interface xe2.1 switchport | Create L2 subinterface xe2.1                 |
| (config-if)#encapsulation dot1q 3   | Configure encapsulation dot1q with vlan-id 3 |
| (config-if)#access-if-evpn          | Enter access-if-evpn mode                    |
| (config-acc-if-evpn)#map vpn-id 200 | Map vnid 200 to access interface xe2.1       |
| (config-acc-if-evpn)#exit           | Exit access-if-evpn mode                     |
| (config-if)#commit                  | Commit the configurations                    |

## Validation

CE1 and CE2 have hosts configured with MAC addresses, IP addresses, and VLAN identifiers as shown below.

|       |      | VLAN | IP Address  | Mac Address    |
|-------|------|------|-------------|----------------|
| VTEP1 | CE-1 | 2    | 12.12.12.10 | 0000.0000.abab |
| VTEP2 | CE-2 | 2    | 12.12.12.20 | 0000.0000.cdcd |
| VTEP1 | CE-1 | 3    | 13.13.13.10 | 0000:0b60:25f2 |
| VTEP2 | CE-2 | 3    | 13.13.13.20 | 0000:0b60:25f3 |

Perform a tagged ping of VLAN 2 from CE1 to CE2 and vice-versa. Also perform a tagged ping of VLAN 3 from CE1 to CE2 and vice-versa.

### VTEP Tunnel Status

```
VTEP-1#show nvo vxlan tunnel
```

```
VxLAN Network tunnel Entries
```

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 1.1.1.1 | 2.2.2.2     | Installed | 00:05:53 | 00:05:53 |

Total number of entries are 1

```
VTEP-2#show nvo vxlan tunnel
```

```
VxLAN Network tunnel Entries
```

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 2.2.2.2 | 1.1.1.1     | Installed | 00:05:46 | 00:05:46 |

Total number of entries are 1

**VTEP ARP Cache**

VTEP-1#sh nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

ARP Timeout : 300 sec Random-Jitter-Max : 640

| VNID | Ip-Addr     | Mac-Addr       | Type           | Age-Out | Retries-Left |
|------|-------------|----------------|----------------|---------|--------------|
| 200  | 13.13.13.10 | 0000.0b60.25f2 | Dynamic Local  | 246     | 2            |
| 200  | 13.13.13.20 | 0000.0b60.25f3 | Dynamic Remote | -----   |              |
| 100  | 12.12.12.20 | 0000.0000.cdcd | Dynamic Remote | -----   |              |
| 100  | 12.12.12.10 | 0000.0000.abab | Dynamic Local  | 246     | 2            |

Total number of entries are 4

VTEP-2#sh nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

ARP Timeout : 300 sec Random-Jitter-Max : 640

| VNID | Ip-Addr     | Mac-Addr       | Type           | Age-Out | Retries-Left |
|------|-------------|----------------|----------------|---------|--------------|
| 200  | 13.13.13.10 | 0000.0b60.25f2 | Dynamic Remote | -----   |              |
| 200  | 13.13.13.20 | 0000.0b60.25f3 | Dynamic Local  | 257     | 2            |
| 100  | 12.12.12.10 | 0000.0000.abab | Dynamic Remote | -----   |              |
| 100  | 12.12.12.20 | 0000.0000.cdcd | Dynamic Local  | 257     | 2            |

Total number of entries are 4

**VTEP MAC Tables**

VTEP-1#show nvo vxlan mac-table

=====

## VxLAN MAC Entries

=====

| VNID           | Interface      | VlanId | Inner-VlanId | Mac-Addr | VTEP-IP/ESI    | Type    |
|----------------|----------------|--------|--------------|----------|----------------|---------|
| Status         | AccessPortDesc |        |              |          |                |         |
| 100            | ----           |        | ----         | ----     | 0000.0000.cdcd | 2.2.2.2 |
| Dynamic Remote | -----          |        | -----        |          |                |         |
| 100            | xe1            |        | 2            | ----     | 0000.0000.abab | 1.1.1.1 |
| Dynamic Local  |                | -----  | -----        |          |                |         |
| 200            | xe2            |        | 3            | ----     | 0000.0b60.25f2 | 1.1.1.1 |
| Dynamic Local  |                | -----  | -----        |          |                |         |
| 200            | ----           |        | ----         | ----     | 0000.0b60.25f3 | 2.2.2.2 |
| Dynamic Remote | -----          |        | -----        |          |                |         |

Total number of entries are : 4

VTEP-2#show nvo vxlan mac-table

=====

## VxLAN-EVPN Configuration

### VxLAN MAC Entries

```

=====
VNID   Interface  VlanId   Inner-VlanId   Mac-Addr       VTEP-Ip/ESI     Type
Status  AccessPortDesc
-----
100    xe1         2        -----
Dynamic Local -----
100    -----   -----   -----
Dynamic Remote -----
200    -----   -----   -----
Dynamic Remote -----
200    xe2         3        -----
Dynamic Local -----
Total number of entries are : 4

```

### VTEP MAC-IP BGP EVPN Entries

VTEP-1#show bgp l2vpn evpn mac-ip

RD[1.1.1.1:1] VRF[vrf\_evpn\_100]:

| ESI     | Eth-Tag | Mac-Address    | IP-Address  | VNID | L3VNID |
|---------|---------|----------------|-------------|------|--------|
| Nexthop | GW-Type |                |             |      |        |
| 0       | 100     | 0000:0000:abab | 12.12.12.10 | 100  | 0      |
| 1.1.1.1 | --      |                |             |      |        |
| 0       | 200     | 0000:0b60:25f2 | 13.13.13.10 | 200  | 0      |
| 1.1.1.1 | --      |                |             |      |        |

RD[2.2.2.2:1]

| ESI     | Eth-Tag | Mac-Address    | IP-Address  | VNID | L3VNID | Nexthop |
|---------|---------|----------------|-------------|------|--------|---------|
| GW-Type |         |                |             |      |        |         |
| 0       | 100     | 0000:0000:cdcd | 12.12.12.20 | 100  |        | 0       |
| 2.2.2.2 | --      |                |             |      |        |         |
| 0       | 200     | 0000:0b60:25f3 | 13.13.13.20 | 200  |        | 0       |
| 2.2.2.2 | --      |                |             |      |        |         |

VTEP-2#show bgp l2vpn evpn mac-ip

RD[1.1.1.1:1]

| ESI     | Eth-Tag | Mac-Address    | IP-Address  | VNID | L3VNID |
|---------|---------|----------------|-------------|------|--------|
| Nexthop | GW-Type |                |             |      |        |
| 0       | 100     | 0000:0000:abab | 12.12.12.10 | 100  | 0      |
| 1.1.1.1 | --      |                |             |      |        |
| 0       | 200     | 0000:0b60:25f2 | 13.13.13.10 | 200  | 0      |
| 1.1.1.1 | --      |                |             |      |        |

RD[2.2.2.2:1] VRF[vrf\_evpn\_100]:

| ESI     | Eth-Tag | Mac-Address    | IP-Address  | VNID | L3VNID |
|---------|---------|----------------|-------------|------|--------|
| Nexthop | GW-Type |                |             |      |        |
| 0       | 100     | 0000:0000:cdcd | 12.12.12.20 | 100  | 0      |
| 2.2.2.2 | --      |                |             |      |        |
| 0       | 100     | 0000:0b60:25f2 | 13.13.13.10 | 100  | 0      |
| 2.2.2.2 | --      |                |             |      |        |

## LAG as Access Port with ECMP on the Network Side

This section contains basic VxLAN EVPN configuration with LAG as an access port and ECMP on the network side.

### Topology

The procedures in this section use the topology in [Figure 3-5](#).

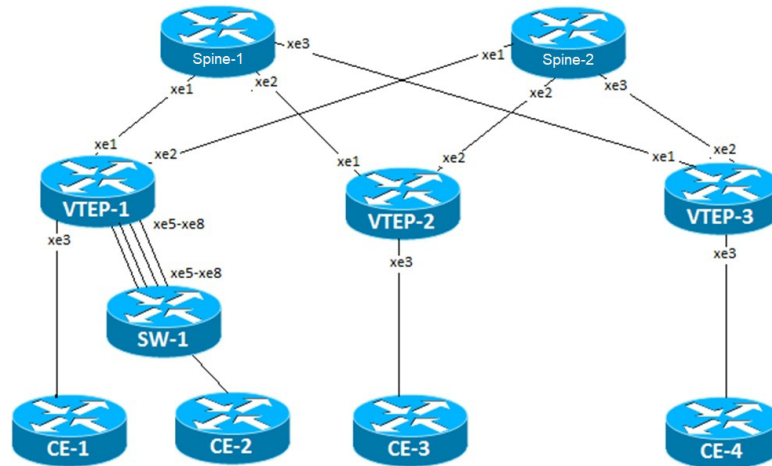


Figure 3-5: VxLAN EVPN with LAG and ECMP

### SW-1

|   |   |
|---|---|
| #configure terminal                             | Enter configure mode  |
| (config)#bridge 1 protocol ieee vlan-bridge     | Configure IEEE vlan bridge  |
| (config)#vlan database                          | Enter into the vlan database                                      |
| (config-vlan)#vlan 2 bridge 1 state enable      | Configure vlan 2 and associate with bridge 1                      |
| (config-vlan)#vlan 3 bridge 1 state enable      | Configure vlan 3 and associate with bridge 1                      |
| (config-vlan)#exit                              | Exit from the vlan database                                       |
| (config)#in xe41                                | Enter interface mode  |
| (config-if)#no shutdown                         | Make interface admin up   |
| (config-if)#switchport                          | Set the interface as Layer2 port                                  |
| (config-if)#bridge-group 1                      | Associate the Interface with bridge-group.                        |
| (config-if)#switchport mode trunk               | Set the switching characteristics of this interface to trunk mode |
| (config-if)#switchport trunk allowed vlan add 2 | Configure the VLANs that should be allowed through this interface |
| (config-if)#switchport trunk allowed vlan add 3 | Configure the VLANs that should be allowed through this interface |
| (config-if)#exit                                | Exit interface mode.  |
| (config)#interface po1                          | Enter interface mode  |
| (config-if)#switchport                          | Set the interface as Layer2 port                                  |
| (config-if)#exit                                | Exit interface mode.  |

## VxLAN-EVPN Configuration

|   |   |
|---|---|
| (config)#in xe29                                | Enter interface mode  |
| (config-if)#switchport                          | Set the interface as Layer2 port                                  |
| (config-if)#channel-group 1 mode active         | Configure the interface to be part of port channel 1              |
| (config-if)#exit                                | Exit interface mode.  |
| (config)#in xe30                                | Enter interface mode  |
| (config-if)#switchport                          | Set the interface as Layer2 port                                  |
| (config-if)#channel-group 1 mode active         | Configure the interface to be part of port channel 1              |
| (config-if)#exit                                | Exit interface mode.  |
| (config)#in xe31                                | Enter interface mode  |
| (config-if)#switchport                          | Set the interface as Layer2 port                                  |
| (config-if)#channel-group 1 mode active         | Configure the interface to be part of port channel 1              |
| (config-if)#exit                                | Exit interface mode.  |
| (config)#in xe32                                | Enter interface mode  |
| (config-if)#switchport                          | Set the interface as Layer2 port                                  |
| (config-if)#channel-group 1 mode active         | Configure the interface to be part of port channel 1              |
| (config-if)#exit                                | Exit interface mode.  |
| (config-if)#inter po1                           | Enter interface mode  |
| (config-if)#bridge-group 1                      | Associate the Interface with bridge-group.                        |
| (config-if)#switchport mode trunk               | Set the switching characteristics of this interface to trunk mode |
| (config-if)#switchport trunk allowed vlan add 2 | Configure the VLANs that should be allowed through this interface |
| (config-if)#switchport trunk allowed vlan add 3 | Configure the VLANs that should be allowed through this interface |
| (config-if)#exit                                | Exit interface mode.  |
| (config)#commit                                 | Commit the configurations   |

### VTEP-1

|   |  |
|---|--|
| #configure terminal                     | Enter configure mode                                 |
| (config)#interface po1                  | Create interface po1                                 |
| (config-if)#switchport                  | Configure the interface as switchport.               |
| (config-if)#exit                        | Exit interface mode                                  |
| (config)#interface xe3                  | Enter interface mode.                                |
| (config-if)#switchport                  | Configure the interface as switchport.               |
| (config-if)#no shutdown                 | Bring the interface into operation                   |
| (config-if)#exit                        | Exit interface mode                                  |
| (config)#interface xe5                  | Enter interface mode                                 |
| (config-if)#switchport                  | Configure the interface as switchport.               |
| (config-if)#channel-group 1 mode active | Configure the interface to be part of port channel 1 |
| (config-if)#no shutdown                 | Bring the interface into operation                   |
| (config-if)#exit                        | Exit interface mode                                  |



|  |  |
|--|--|
| (config)#interface xe6                           | Enter interface mode   |
| (config-if)#switchport                           | Configure the interface as switchport.   |
| (config-if)#channel-group 1 mode active          | Configure the interface to be part of port channel 1   |
| (config-if)#no shutdown                          | Bring the interface into operation   |
| (config-if)#exit                                 | Exit interface mode  |
| (config)#interface xe7                           | Enter interface mode   |
| (config-if)#switchport                           | Configure the interface as switchport.   |
| (config-if)#channel-group 1 mode active          | Configure the interface to be part of port channel 1   |
| (config-if)#no shutdown                          | Bring the interface into operation   |
| (config-if)#exit                                 | Exit interface mode  |
| (config)#interface xe8                           | Enter interface mode   |
| (config-if)#switchport                           | Configure the interface as switchport.   |
| (config-if)#channel-group 1 mode active          | Configure the interface to be part of port channel 1   |
| (config-if)#no shutdown                          | Bring the interface into operation   |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#interface xe1                           | Enter interface mode.  |
| (config-if)#ip address 10.1.1.0/31               | Configure IP address on the interface xe1.   |
| (config-if)#no shutdown                          | Bring the interface into operation   |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#interface xe2                           | Enter interface mode.  |
| (config-if)#ip address 10.1.1.2/31               | Configure IP address on the interface xe2.   |
| (config-if)#no shutdown                          | Bring the interface into operation   |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#interface lo                            | Enter interface mode.  |
| (config-if)#ip address 1.1.1.1/32<br>secondary   | Configure IP address on the interface xe3.   |
| (config-if)#no shutdown                          | Bring the interface into operation   |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#router isis ABC                         | Create an IS-IS routing instance (ABC).  |
| (config-router)#is-type level-1                  | Configure instance as level-1-only routing.  |
| (config-router)#net<br>49.0001.1111.1111.1111.00 | Set a Network Entity Title for this instance, specifying the area address and the system ID. |
| (config-router)#exit                             | Exit router mode.  |
| (config)#interface xe1                           | Enter interface mode.  |
| (config-if)#ip router isis ABC                   | Enable IS-IS routing on an interface (ABC).  |
| (config-if)#isis circuit-type level-1            | Configure instance as level-1-only routing.  |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#interface xe2                           | Enter interface mode.  |
| (config-if)#ip router isis ABC                   | Enable IS-IS routing on an interface (ABC).  |
| (config-if)#isis circuit-type level-1            | Configure instance as level-1-only routing.  |
| (config-if)#exit                                 | Exit interface mode.   |

## VxLAN-EVPN Configuration

|   |  |
|---|--|
| (config)#interface lo   | Enter interface mode.  |
| (config-if)#ip router isis ABC                                      | Enable IS-IS routing on an interface for area 49 (ABC).  |
| (config-if)#isis circuit-type level-1                               | Configure instance as level-1-only routing.  |
| (config-if)#exit  | Exit interface mode.   |
| (config)#mac vrf vrf_evpn_100                                       | Configure a new VRF named <code>vrf_evpn_100</code> .  |
| (config-vrf)#rd 1.1.1.1:1   | Assign the Route Distinguisher value.  |
| (config-vrf)#route-target both 100:1                                | Configure route target to import and export the routes.  |
| (config-vrf)#exit   | Exit VRF mode.   |
| (config)#router bgp 65535   | Define the routing process. The number 65535 specifies the AS number of VTEP1.                                 |
| (config-router)#bgp router-id 1.1.1.1                               | Configure router-id for this BGP process.  |
| (config-router)#neighbor 2.2.2.2 remote-as 65535                    | Define BGP neighbor: 2.2.2.2 is the IP address of the neighbor (VTEP2), and 65535 is the neighbor's AS number. |
| (config-router)# neighbor 2.2.2.2 update-source 1.1.1.1             | Define BGP neighbor: 1.1.1.1 is the peer interface.  |
| (config-router)#neighbor 3.3.3.3 remote-as 65535                    | Define BGP neighbor: 3.3.3.3 is the IP address of the neighbor (VTEP3), and 65535 is the neighbor's AS number. |
| (config-router)# neighbor 3.3.3.3 update-source 1.1.1.1             | Define BGP neighbor: 1.1.1.1 is the peer interface.  |
| (config-router)#address-family l2vpn evpn                           | Configure address-family L2VPN EVPN.   |
| (config-router-af)#neighbor 2.2.2.2 activate                        | Activate the neighbor at VTEP2 in the EVPN address family.   |
| (config-router-af)#neighbor 3.3.3.3 activate                        | Activate the neighbor at VTEP3 in the EVPN address family.   |
| (config-router-af)#exit-adress-family                               | Exit address-family mode.  |
| (config-router)#exit  | Exit router mode.  |
| (config)#hardware-profile filter vxlan enable                       | Enable hardware-profile filter for VxLAN.  |
| (config)#nvo vxlan enable   | Enable VxLAN globally on this VTEP.  |
| (config)#nvo vxlan vtep-ip-global 1.1.1.1                           | Assign a global IP to the VTEP.  |
| (config)#nvo vxlan id 100001 ingress-replication                    | Configure a VNID on this VTEP and enter NVO mode.  |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf_evpn_100 | Configure host-reachability-protocol as BGP-EVPN and associate the VNID with VRF <code>vrf_evpn_100</code> .   |
| (config-nvo)#exit   | Exit NVO mode.   |
| (config)#nvo vxlan access-if port-vlan xe3 2                        | Configure access-port xe3 and map vlan 2   |
| (config-nvo-acc-if)#map vnid 100001                                 | Map VNID 100001 to access-port xe3.  |
| (config-nvo-acc-if)#exit  | Exit NVO access-if mode.   |
| (config)#nvo vxlan access-if port-vlan po1 2                        | Configure access-port po1 and map vlan 2   |
| (config-nvo-acc-if)#map vnid 100001                                 | Map VNID 100001 to access-port po1.  |
| (config-nvo-acc-if)#exit  | Exit NVO access-if mode.   |
| (config)#nvo vxlan id 200001 ingress-replication                    | Configure second VNID on this VTEP and enter NVO mode.   |

|   |  |
|---|--|
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf_evpn_100 | Configure host-reachability-protocol as BGP-EVPN and associate the VNID with VRF <code>vrf_evpn_100</code> . |
| (config-nvo)#exit   | Exit NVO mode.   |
| (config)#nvo vxlan access-if port-vlan xe3 3                        | Configure access-port xe3 and map vlan 3   |
| (config-nvo-acc-if)#map vnid 200001                                 | Map VNID 200001 to access-port xe3.  |
| (config-nvo-acc-if)#exit  | Exit NVO access-if mode.   |
| (config)#nvo vxlan access-if port-vlan po1 3                        | Configure access-port po1 and map vlan 3   |
| (config-nvo-acc-if)#map vnid 200001                                 | Map VNID 200001 to access-port xe3.  |
| (config-nvo-acc-if)#exit  | Exit NVO access-if mode.   |
| (config)#commit   | Commit the configurations  |

## Spine-1

|   |  |
|---|--|
| #configure terminal                             | Enter configure mode.  |
| (config)#interface lo                           | Enter interface mode   |
| (config-if)#ip address 12.12.12.12/32 secondary | Set an IP address on the interface.  |
| (config-if)#no shutdown                         | Bring the interface into operation   |
| (config-if)#exit                                | Exit interface mode.   |
| (config)#interface xe1                          | Enter interface mode.  |
| (config-if)#ip address 10.1.1.1/31              | Configure IP address on the interface xe1.   |
| (config-if)#no shutdown                         | Bring the interface into operation   |
| (config-if)#exit                                | Exit interface mode.   |
| (config)#interface xe2                          | Enter interface mode.  |
| (config-if)#ip address 20.1.1.1/31              | Configure IP address on the interface xe2.   |
| (config-if)#no shutdown                         | Bring the interface into operation   |
| (config-if)#exit                                | Exit interface mode.   |
| (config)#interface xe3                          | Enter interface mode.  |
| (config-if)#ip address 30.1.1.1/31              | Configure IP address on the interface xe3.   |
| (config-if)#no shutdown                         | Bring the interface into operation   |
| (config-if)#exit                                | Exit interface mode.   |
| (config)#router isis ABC                        | Create an IS-IS routing instance (ABC).  |
| (config-router)#is-type level-1                 | Configure instance as level-1-only routing.  |
| (config-router)#net 49.0001.4444.4444.4444.00   | Set a Network Entity Title for this instance, specifying the area address and the system ID. |
| (config-router)#exit                            | Exit router mode.  |
| (config)#interface lo                           | Enter interface mode.  |
| (config-if)#ip router isis ABC                  | Enable IS-IS routing on an interface (ABC).  |
| (config-if)#isis circuit-type level-1           | Configure instance as level-1-only routing.  |
| (config-if)#exit                                | Exit interface mode.   |
| (config)#interface xe1                          | Enter interface mode.  |

## VxLAN-EVPN Configuration

|                                       |   |
|---------------------------------------|---|
| (config-if)#ip router isis ABC        | Enable IS-IS routing on an interface (ABC). |
| (config-if)#isis circuit-type level-1 | Configure instance as level-1-only routing. |
| (config-if)#exit                      | Exit interface mode.                        |
| (config)#interface xe2                | Enter interface mode.                       |
| (config-if)#ip router isis ABC        | Enable IS-IS routing on an interface (ABC). |
| (config-if)#isis circuit-type level-1 | Configure instance as level-1-only routing. |
| (config-if)#exit                      | Exit interface mode.                        |
| (config)#interface xe3                | Enter interface mode.                       |
| (config-if)#ip router isis ABC        | Enable IS-IS routing on an interface (ABC). |
| (config-if)#isis circuit-type level-1 | Configure instance as level-1-only routing. |
| (config-if)#exit                      | Exit interface mode.                        |
| (config)#commit                       | Commit the configurations                   |

## Spine-2

|  |   |
|--|---|
| #configure terminal                                | Enter configure mode.   |
| (config)#interface lo                              | Enter interface mode.   |
| (config-if)#ip address 13.13.13.13/32<br>secondary | Set an IP address on the interface.   |
| (config-if)#no shutdown                            | Bring the interface into operation  |
| (config-if)#exit                                   | Exit interface mode.  |
| (config)#interface xe1                             | Enter interface mode.   |
| (config-if)#ip address 10.1.1.3/31                 | Configure IP address on the interface xe1.  |
| (config-if)#no shutdown                            | Bring the interface into operation  |
| (config-if)#exit                                   | Exit interface mode.  |
| (config)#interface xe2                             | Enter interface mode.   |
| (config-if)#ip address 20.1.1.3/31                 | Configure IP address on the interface xe2.  |
| (config-if)#no shutdown                            | Bring the interface into operation  |
| (config-if)#exit                                   | Exit interface mode.  |
| (config)#interface xe3                             | Enter interface mode.   |
| (config-if)#ip address 30.1.1.3/31                 | Configure IP address on the interface xe3.  |
| (config-if)#no shutdown                            | Bring the interface into operation  |
| (config-if)#exit                                   | Exit interface mode.  |
| (config)#router isis ABC                           | Create an IS-IS routing instance (ABC).   |
| (config-router)#is-type level-1                    | Configure instance as level-1-only routing.   |
| (config-router)#net<br>49.0001.5555.5555.5555.00   | Set a Network Entity Title for this instance, specifying the area<br>address and the system ID. |
| (config-router)#exit                               | Exit router mode.   |
| (config)#interface lo                              | Enter interface mode.   |
| (config-if)#ip router isis ABC                     | Enable IS-IS routing on an interface (ABC).   |
| (config-if)#isis circuit-type level-1              | Configure instance as level-1-only routing.   |
| (config-if)#exit                                   | Exit interface mode.  |

|                                       |   |
|---------------------------------------|---|
| (config)#interface xe1                | Enter interface mode.                       |
| (config-if)#ip router isis ABC        | Enable IS-IS routing on an interface (ABC). |
| (config-if)#isis circuit-type level-1 | Configure instance as level-1-only routing. |
| (config-if)#exit                      | Exit interface mode.                        |
| (config)#interface xe2                | Enter interface mode.                       |
| (config-if)#ip router isis ABC        | Enable IS-IS routing on an interface (ABC). |
| (config-if)#isis circuit-type level-1 | Configure instance as level-1-only routing. |
| (config-if)#exit                      | Exit interface mode.                        |
| (config)#interface xe3                | Enter interface mode.                       |
| (config-if)#ip router isis ABC        | Enable IS-IS routing on an interface (ABC). |
| (config-if)#isis circuit-type level-1 | Configure instance as level-1-only routing. |
| (config-if)#exit                      | Exit interface mode.                        |
| (config)#commit                       | Commit the configurations                   |

## VTEP-2

|  |  |
|--|--|
| #configure terminal                              | Enter configure mode   |
| (config)#interface po1                           | Enter interface mode   |
| (config-if)#switchport                           | Configure the interface as switchport  |
| (config-if)#exit                                 | Exit interface mode  |
| (config)#interface xe3                           | Enter interface mode   |
| (config-if)#switchport                           | Configure the interface as switchport.   |
| (config-if)#no shutdown                          | Bring the interface into operation   |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#interface xe1                           | Enter interface mode.  |
| (config-if)#ip address 20.1.1.0/31               | Configure IP address on the interface xe1.   |
| (config-if)#no shutdown                          | Bring the interface into operation   |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#interface xe2                           | Enter interface mode.  |
| (config-if)#ip address 20.1.1.2/31               | Configure IP address on the interface xe2.   |
| (config-if)#no shutdown                          | Bring the interface into operation   |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#interface lo                            | Enter interface mode.  |
| (config-if)#ip address 2.2.2.2/32<br>secondary   | Configure IP address on the interface xe3.   |
| (config-if)#no shutdown                          | Bring the interface into operation   |
| (config-if)#exit                                 | Exit interface mode.   |
| (config)#router isis ABC                         | Create an IS-IS routing instance (ABC).  |
| (config-router)#is-type level-1                  | Configure instance as level-1-only routing.  |
| (config-router)#net<br>49.0001.2222.2222.2222.00 | Set a Network Entity Title for this instance, specifying the area address and the system ID. |
| (config-router)#exit                             | Exit router mode.  |

## VxLAN-EVPN Configuration

|   |  |
|---|--|
| (config)#interface xe1  | Enter interface mode.  |
| (config-if)#ip router isis ABC                                      | Enable IS-IS routing on an interface (ABC).  |
| (config-if)#isis circuit-type level-1                               | Configure instance as level-1-only routing.  |
| (config-if)#exit  | Exit interface mode.   |
| (config)#interface xe2  | Enter interface mode.  |
| (config-if)#ip router isis ABC                                      | Enable IS-IS routing on an interface (ABC).  |
| (config-if)#isis circuit-type level-1                               | Configure instance as level-1-only routing.  |
| (config-if)#exit  | Exit interface mode.   |
| (config)#interface lo   | Enter interface mode.  |
| (config-if)#ip router isis ABC                                      | Enable IS-IS routing on an interface for area 49 (ABC).  |
| (config-if)#isis circuit-type level-1                               | Configure instance as level-1-only routing.  |
| (config-if)#exit  | Exit interface mode.   |
| (config)#mac vrf vrf_evpn_100                                       | Configure a new VRF named vrf_evpn_100.  |
| (config-vrf)#rd 1.1.1.1:1   | Assign the Route Distinguisher value.  |
| (config-vrf)#route-target both 100:1                                | Configure route target to import and export the routes.  |
| (config-vrf)#exit   | Exit VRF mode.   |
| (config)#router bgp 65535   | Define the routing process. The number 65535 specifies the AS number of VTEP1.                                 |
| (config-router)#neighbor 1.1.1.1 remote-as 65535                    | Define BGP neighbor: 1.1.1.1 is the IP address of the neighbor (VTEP1), and 65535 is the neighbor's AS number. |
| (config-router)#neighbor 1.1.1.1 update-source 2.2.2.2              | Define BGP neighbor: 2.2.2.2 is the peer interface.  |
| (config-router)#neighbor 3.3.3.3 remote-as 65535                    | Define BGP neighbor: 3.3.3.3 is the IP address of the neighbor (VTEP3), and 65535 is the neighbor's AS number. |
| (config-router)#neighbor 3.3.3.3 update-source 2.2.2.2              | Define BGP neighbor: 2.2.2.2 is the peer interface.  |
| (config-router)#address-family l2vpn evpn                           | Configure address-family L2VPN EVPN.   |
| (config-router-af)#neighbor 1.1.1.1 activate                        | Activate the neighbor at VTEP1 in the EVPN address family.   |
| (config-router-af)#neighbor 3.3.3.3 activate                        | Activate the neighbor at VTEP3 in the EVPN address family.   |
| (config-router-af)#exit-adress-family                               | Exit address-family mode.  |
| (config-router)#exit  | Exit router mode.  |
| (config)#hardware-profile filter vxlan enable                       | Enable hardware-profile filter for VxLAN.  |
| (config)#nvo vxlan enable   | Enable VxLAN globally on this VTEP.  |
| (config)#nvo vxlan vtep-ip-global 2.2.2.2                           | Assign a global IP to the VTEP.  |
| (config)#nvo vxlan id 100001 ingress-replication                    | Configure a VNID on this VTEP and enter NVO mode.  |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf_evpn_100 | Configure host-reachability-protocol as BGP-EVPN and associate the VNID with VRF vrf_evpn_100.                 |
| (config-nvo)#exit   | Exit NVO mode.   |
| (config)#nvo vxlan access-if port-vlan xe3 2                        | Configure access-port xe3 and map vlan 2   |
| (config-nvo-acc-if)#map vnid 100001                                 | Map VNID 100001 to access-port xe3.  |

|   |  |
|---|--|
| (config-nvo-acc-if)#exit  | Exit NVO access-if mode.   |
| (config)#nvo vxlan id 200001 ingress-replication                    | Configure second VNID on this VTEP and enter NVO mode.   |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf_evpn_100 | Configure host-reachability-protocol as BGP-EVPN and associate the VNID with VRF <code>vrf_evpn_100</code> . |
| (config-nvo)#exit   | Exit NVO mode.   |
| (config)#nvo vxlan access-if port-vlan xe3 3                        | Configure access-port xe3 and map vlan 3   |
| (config-nvo-acc-if)#map vnid 200001                                 | Map VNID 200001 to access-port xe3.  |
| (config-nvo-acc-if)#exit-address-family                             | Exit NVO access-if mode.   |
| (config)#commit   | Commit the configurations  |

### VTEP-3

|   |  |
|---|--|
| #configure terminal                           | Enter configure mode.  |
| (config)#interface xe3                        | Enter interface mode.  |
| (config-if)#switchport                        | Configure the interface as switchport.   |
| (config-if)#no shutdown                       | Bring the interface into operation   |
| (config-if)#exit                              | Exit interface mode.   |
| (config)#interface xe1                        | Enter interface mode.  |
| (config-if)#ip address 30.1.1.0/31            | Configure IP address on the interface xe1.   |
| (config-if)#no shutdown                       | Bring the interface into operation   |
| (config-if)#exit                              | Exit interface mode.   |
| (config)#interface xe2                        | Enter interface mode.  |
| (config-if)#ip address 30.1.1.2/31            | Configure IP address on the interface xe2.   |
| (config-if)#no shutdown                       | Bring the interface into operation   |
| (config-if)#exit                              | Exit interface mode.   |
| (config)#interface lo                         | Enter interface mode.  |
| (config-if)#ip address 3.3.3.3/32 secondary   | Configure IP address on the loopback interface.  |
| (config-if)#no shutdown                       | Bring the interface into operation   |
| (config-if)#exit                              | Exit interface mode.   |
| (config)#router isis ABC                      | Create an IS-IS routing instance (ABC).  |
| (config-router)#is-type level-1               | Configure instance as level-1-only routing.  |
| (config-router)#net 49.0001.3333.3333.3333.00 | Set a Network Entity Title for this instance, specifying the area address and the system ID. |
| (config-router)#exit                          | Exit router mode.  |
| (config)#interface xe1                        | Enter interface mode.  |
| (config-if)#ip router isis ABC                | Enable IS-IS routing on an interface (ABC).  |
| (config-if)#isis circuit-type level-1         | Configure instance as level-1-only routing.  |
| (config-if)#exit                              | Exit interface mode.   |
| (config)#interface xe2                        | Enter interface mode.  |
| (config-if)#ip router isis ABC                | Enable IS-IS routing on an interface (ABC).  |

## VxLAN-EVPN Configuration

|   |  |
|---|--|
| (config-if)#isis circuit-type level-1                               | Configure instance as level-1-only routing.  |
| (config-if)#exit  | Exit interface mode.   |
| (config)#interface lo   | Enter interface mode.  |
| (config-if)#ip router isis ABC                                      | Enable IS-IS routing on an interface for area 49 (ABC).  |
| (config-if)#isis circuit-type level-1                               | Configure instance as level-1-only routing.  |
| (config-if)#exit  | Exit interface mode.   |
| (config)#mac vrf vrf_evpn_100                                       | Configure a new VRF named <code>vrf_evpn_100</code> .  |
| (config-vrf)#rd 1.1.1.1:1   | Assign the Route Distinguisher value.  |
| (config-vrf)#route-target both 100:1                                | Configure route target to import and export the routes.  |
| (config-vrf)#exit   | Exit VRF mode.   |
| (config)#router bgp 65535   | Define the routing process. The number <code>65535</code> specifies the AS number of VTEP1.  |
| (config-router)#neighbor 1.1.1.1 remote-as 65535                    | Define BGP neighbor: <code>1.1.1.1</code> is the IP address of the neighbor (VTEP1), and <code>65535</code> is the neighbor's AS number. |
| (config-router)#neighbor 1.1.1.1 update-source 3.3.3.3              | Define BGP neighbor: <code>3.3.3.3</code> is the peer interface.   |
| (config-router)#neighbor 2.2.2.2 remote-as 65535                    | Define BGP neighbor: <code>2.2.2.2</code> is the IP address of the neighbor (VTEP3), and <code>65535</code> is the neighbor's AS number. |
| (config-router)#neighbor 2.2.2.2 update-source 3.3.3.3              | Define BGP neighbor: <code>3.3.3.3</code> is the peer interface.   |
| (config-router)#address-family l2vpn evpn                           | Configure address-family L2VPN EVPN.   |
| (config-router-af)#neighbor 1.1.1.1 activate                        | Activate the neighbor at VTEP1 in the EVPN address family.   |
| (config-router-af)#neighbor 2.2.2.2 activate                        | Activate the neighbor at VTEP2 in the EVPN address family.   |
| (config-router-af)#exit-address-family                              | Exit address-family mode.  |
| (config-router)#exit  | Exit router mode.  |
| (config)#hardware-profile filter vxlan enable                       | Enable hardware-profile filter for VxLAN.  |
| (config)#nvo vxlan enable   | Enable VxLAN globally on this VTEP.  |
| (config)#nvo vxlan vtep-ip-global 3.3.3.3                           | Assign a global IP to the VTEP.  |
| (config)#nvo vxlan id 100001 ingress-replication                    | Configure a VNID on this VTEP and enter NVO mode.  |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf_evpn_100 | Configure host-reachability-protocol as BGP-EVPN and associate the VNID with VRF <code>vrf_evpn_100</code> .                             |
| (config-nvo)#exit   | Exit NVO mode.   |
| (config)#nvo vxlan access-if port-vlan xe3 2                        | Configure access-port <code>xe3</code> and map vlan <code>2</code>   |
| (config-nvo-acc-if)#map vnid 100001                                 | Map VNID <code>100001</code> to access-port <code>xe3</code> .   |
| (config-nvo-acc-if)#exit-address-family                             | Exit NVO access-if mode.   |
| (config)#nvo vxlan id 200001 ingress-replication                    | Configure second VNID on this VTEP and enter NVO mode.   |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf_evpn_100 | Configure host-reachability-protocol as BGP-EVPN and associate the VNID with VRF <code>vrf_evpn_100</code>                               |
| (config-nvo)#exit   | Exit NVO mode.   |



|   |  |
|---|--|
| (config)#nvo vxlan access-if port-vlan xe3<br>3 | Configure access-port xe3 and map vlan 3 |
| (config-nvo-acc-if)#map vnid 200001             | Map VNID 200001 to access-port xe3.      |
| (config-nvo-acc-if)#exit                        | Exit NVO access-if mode.                 |
| (config)#commit                                 | Commit the configurations                |

## Validation

CE1, CE2, CE3, and CE4 have hosts configured with MAC addresses, IP addresses, and VLAN identifiers as shown below.

|       |      | VLAN | IP Address  | MAC Address    |
|-------|------|------|-------------|----------------|
| VTEP1 | CE-1 | 2    | 12.12.12.10 | 0000.0000.aaaa |
| VTEP1 | CE-2 | 2    | 12.12.12.20 | 0000.0000.bbbb |
| VTEP2 | CE-3 | 2    | 12.12.12.30 | 0000.0000.cccc |
| VTEP3 | CE-4 | 2    | 12.12.12.40 | 0000.0000.dddd |
| VTEP1 | CE-1 | 3    | 14.14.14.10 | 0000.058e.2181 |
| VTEP1 | CE-2 | 3    | 14.14.14.20 | 0000.058e.2182 |
| VTEP2 | CE-3 | 3    | 14.14.14.30 | 0000.058e.2183 |
| VTEP3 | CE-4 | 3    | 14.14.14.40 | 0000.058e.2184 |

Perform a tagged ping of VLAN 2 from CE1 to CE2, CE3 and CE4 and vice-versa. Also perform a tagged ping of VLAN 3 from CE1 to CE2, CE3 and CE4 and vice-versa.

### VTEP Tunnel Status

```
VTEP1#show nvo vxlan tunnel
```

```
VxLAN Network tunnel Entries
```

```
Source           Destination      Status           Up/Down          Update
```

```
=====
```

```
1.1.1.1          3.3.3.3         Installed        01:25:20         01:25:20
```

```
1.1.1.1          2.2.2.2         Installed        01:35:19         01:35:19
```

```
Total number of entries are 2
```

```
VTEP2#show nvo vxlan tunnel
```

```
VxLAN Network tunnel Entries
```

```
Source           Destination      Status           Up/Down          Update
```

```
=====
```

```
2.2.2.2          1.1.1.1         Installed        01:35:42         01:35:42
```

```
2.2.2.2          3.3.3.3         Installed        01:25:43         01:25:43
```

```
Total number of entries are 2
```

```
VTEP3#show nvo vxlan tunnel
```

```
VxLAN Network tunnel Entries
```

```
Source           Destination      Status           Up/Down          Update
```

## VxLAN-EVPN Configuration

```
=====
3.3.3.3          2.2.2.2          Installed    01:25:35    01:25:35
3.3.3.3          1.1.1.1          Installed    01:25:35    01:25:35
Total number of entries are 2
```

### VTEP ARP Tables

VTEP-1#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

ARP Timeout : 300 sec Random-Jitter-Max : 640

| VNID | Ip-Addr     | Mac-Addr       | Type           | Age-Out | Retries-Left |
|------|-------------|----------------|----------------|---------|--------------|
| 200  | 13.13.13.10 | 0000.0b60.25f2 | Dynamic Local  | 246     | 2            |
| 200  | 13.13.13.20 | 0000.0b60.25f3 | Dynamic Remote | -----   |              |
| 100  | 12.12.12.20 | 0000.0000.cdcd | Dynamic Remote | -----   |              |
| 100  | 12.12.12.10 | 0000.0000.abab | Dynamic Local  | 246     | 2            |

Total number of entries are 4

VTEP-2#sh nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

ARP Timeout : 300 sec Random-Jitter-Max : 640

| VNID | Ip-Addr     | Mac-Addr       | Type           | Age-Out | Retries-Left |
|------|-------------|----------------|----------------|---------|--------------|
| 200  | 13.13.13.10 | 0000.0b60.25f2 | Dynamic Remote | -----   |              |
| 200  | 13.13.13.20 | 0000.0b60.25f3 | Dynamic Local  | 257     | 2            |
| 100  | 12.12.12.10 | 0000.0000.abab | Dynamic Remote | -----   |              |
| 100  | 12.12.12.20 | 0000.0000.cdcd | Dynamic Local  | 257     | 2            |

Total number of entries are 4

VTEP3#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

| VNID   | Ip-Addr     | Mac-Addr       | Type           | Age-Out | Retries-Left |
|--------|-------------|----------------|----------------|---------|--------------|
| 100001 | 12.12.12.30 | 0000.0000.cccc | Dynamic Remote | ----    |              |
| 100001 | 12.12.12.10 | 0000.0000.aaaa | Dynamic Remote | ----    |              |
| 100001 | 12.12.12.20 | 0000.0000.bbbb | Dynamic Remote | ----    |              |
| 100001 | 12.12.12.40 | 0000.0000.dddd | Dynamic Local  | ----    |              |
| 200001 | 14.14.14.20 | 0000.058e.2182 | Dynamic Remote | ----    |              |
| 200001 | 14.14.14.10 | 0000.058e.2181 | Dynamic Remote | ----    |              |
| 200001 | 14.14.14.40 | 0000.058e.2184 | Dynamic Local  | ----    |              |
| 200001 | 14.14.14.30 | 0000.058e.2183 | Dynamic Remote | ----    |              |

Total number of entries are 8

VTEP3#

**VTEP MAC Tables**

```
VTEP1#show nvo vxlan mac-table
```

```
=====
=====
                                VxLAN MAC Entries
=====
=====
```

| VNID | Interface<br>Type      | VlanId | Inner-VlanId<br>Status | Mac-Addr       | VTEP-Ip/ESI<br>AccessPortDesc |
|------|------------------------|--------|------------------------|----------------|-------------------------------|
| 1    | xe1/1<br>Dynamic Local | 1000   | 2000<br>-----          | 0000.339a.9abb | 33.33.33.0<br>-----           |
| 1    | ----<br>Dynamic Remote | ----   | ----<br>-----          | 0000.339a.9397 | 34.34.34.0<br>-----           |

Total number of entries are : 2

```
VTEP2#show nvo vxlan mac-table
```

```
=====
=====
                                VxLAN MAC Entries
=====
=====
```

| VNID | Interface<br>Type      | VlanId | Inner-VlanId<br>Status | Mac-Addr       | VTEP-Ip/ESI<br>AccessPortDesc |
|------|------------------------|--------|------------------------|----------------|-------------------------------|
| 1    | ----<br>Dynamic Remote | ----   | ----<br>-----          | 0000.339a.9abb | 33.33.33.0<br>-----           |
| 1    | xe1/1<br>Dynamic Local | 1000   | 2000<br>-----          | 0000.339a.9397 | 34.34.34.0<br>-----           |

Total number of entries are : 2

**VTEP MAC-IP BGP EVPN Entries**

```
VTEP-1#show bgp l2vpn evpn mac-ip
```

```
RD[1.1.1.1:1] VRF[vrf_evpn_100]:
```

| ESI     | Eth-Tag | Mac-Address    | IP-Address  | VNID | L3VNID |
|---------|---------|----------------|-------------|------|--------|
| NextHop | GW-Type |                |             |      |        |
| 0       | 100     | 0000:0000:abab | 12.12.12.10 | 100  | 0      |
| 1.1.1.1 | --      |                |             |      |        |
| 0       | 200     | 0000:0b60:25f2 | 13.13.13.10 | 200  | 0      |
| 1.1.1.1 | --      |                |             |      |        |

```
RD[2.2.2.2:1]
```

## VxLAN-EVPN Configuration

| ESI<br>GW-Type | Eth-Tag   | Mac-Address    | IP-Address  | VNID | L3VNID | Nexthop |
|----------------|-----------|----------------|-------------|------|--------|---------|
| 0<br>2.2.2.2   | 100<br>-- | 0000:0000:cdcd | 12.12.12.20 | 100  |        | 0       |
| 0<br>2.2.2.2   | 200<br>-- | 0000:0b60:25f3 | 13.13.13.20 | 200  |        | 0       |

VTEP-2#show bgp l2vpn evpn mac-ip

RD[1.1.1.1:1]

| ESI<br>Nexthop | Eth-Tag<br>GW-Type | Mac-Address    | IP-Address  | VNID | L3VNID |
|----------------|--------------------|----------------|-------------|------|--------|
| 0<br>1.1.1.1   | 100<br>--          | 0000:0000:abab | 12.12.12.10 | 100  | 0      |
| 0<br>1.1.1.1   | 200<br>--          | 0000:0b60:25f2 | 13.13.13.10 | 200  | 0      |

RD[2.2.2.2:1] VRF[vrf\_evpn\_100]:

| ESI<br>Nexthop | Eth-Tag<br>GW-Type | Mac-Address    | IP-Address  | VNID | L3VNID |
|----------------|--------------------|----------------|-------------|------|--------|
| 0<br>2.2.2.2   | 100<br>--          | 0000:0000:cdcd | 12.12.12.20 | 100  | 0      |
| 0<br>2.2.2.2   | 100<br>--          | 0000:0b60:25f2 | 13.13.13.10 | 100  | 0      |

VTEP-3#show bgp l2vpn evpn mac-ip

RD[1.1.1.1:1] VRF[vrf\_evpn\_100]:

| ESI<br>VNID | L3VNID | Eth-Tag<br>Nexthop | Mac-Address<br>GW-Type | IP-Address  |
|-------------|--------|--------------------|------------------------|-------------|
| 0<br>100001 | 0      | 100001<br>3.3.3.3  | 0000:0000:dddd<br>--   | --          |
| 0<br>100001 | 0      | 100001<br>3.3.3.3  | 0000:0000:dddd<br>--   | 12.12.12.40 |
| 0<br>200001 | 0      | 200001<br>3.3.3.3  | 0000:058e:2184<br>--   | --          |
| 0<br>200001 | 0      | 200001<br>3.3.3.3  | 0000:058e:2184<br>--   | 14.14.14.40 |

RD[1.1.1.1:1]

| ESI<br>VNID | L3VNID | Eth-Tag<br>Nexthop | Mac-Address<br>GW-Type | IP-Address  |
|-------------|--------|--------------------|------------------------|-------------|
| 0<br>100001 | 0      | 100001<br>1.1.1.1  | 0000:0000:aaaa<br>--   | --          |
| 0<br>100001 | 0      | 100001<br>1.1.1.1  | 0000:0000:aaaa<br>--   | 12.12.12.10 |
| 0<br>100001 | 0      | 100001<br>1.1.1.1  | 0000:0000:bbbb<br>--   | --          |
| 0<br>100001 | 0      | 100001<br>1.1.1.1  | 0000:0000:bbbb<br>--   | 12.12.12.20 |
| 0<br>100001 | 0      | 100001<br>2.2.2.2  | 0000:0000:cccc<br>--   | --          |
| 0<br>100001 | 0      | 100001<br>2.2.2.2  | 0000:0000:cccc<br>--   | 12.12.12.30 |

---

|        |   |         |                            |
|--------|---|---------|----------------------------|
| 0      |   | 200001  | 0000:058e:2181 --          |
| 200001 | 0 | 1.1.1.1 | --                         |
| 0      |   | 200001  | 0000:058e:2181 14.14.14.10 |
| 200001 | 0 | 1.1.1.1 | --                         |
| 0      |   | 200001  | 0000:058e:2182 --          |
| 200001 | 0 | 1.1.1.1 | --                         |
| 0      |   | 200001  | 0000:058e:2182 14.14.14.20 |
| 200001 | 0 | 1.1.1.1 | --                         |
| 0      |   | 200001  | 0000:058e:2183 --          |
| 200001 | 0 | 2.2.2.2 | --                         |
| 0      |   | 200001  | 0000:058e:2183 14.14.14.30 |
| 200001 | 0 | 2.2.2.2 | --                         |



## CHAPTER 4 VxLAN EVPN EVC Configuration

This chapter shows how to configure VxLAN EVPN Ethernet Virtual Circuit (EVC) which embeds the functionality of EVPN-VxLAN access ports to allow EVC frames across VTEPs. With this configuration, customers in the same VLAN can communicate even they are placed across distributed data centers.

### Overview

An EVC represents a logical relationship between Ethernet User Network Interface (UNI) in a provider-based Ethernet service. An EVC represents the service offered and is carried through the provider network. Each EVC is configured by a unique name across the provider network.

An EVC is an end-to-end representation of a single instance of a Layer 2 service that a service provider offers. An EVC embodies the different parameters based on which the service is offered. EVC prevents data transfer between sites that are not part of the same EVC.

EVC is an A-Z circuit that enables you to pass customer VLANs from one port on a node to another port on another node in the network. EVC represents a Carrier Ethernet service and is an entity that provides end-to-end connection between two or more customer end points.

### Topology

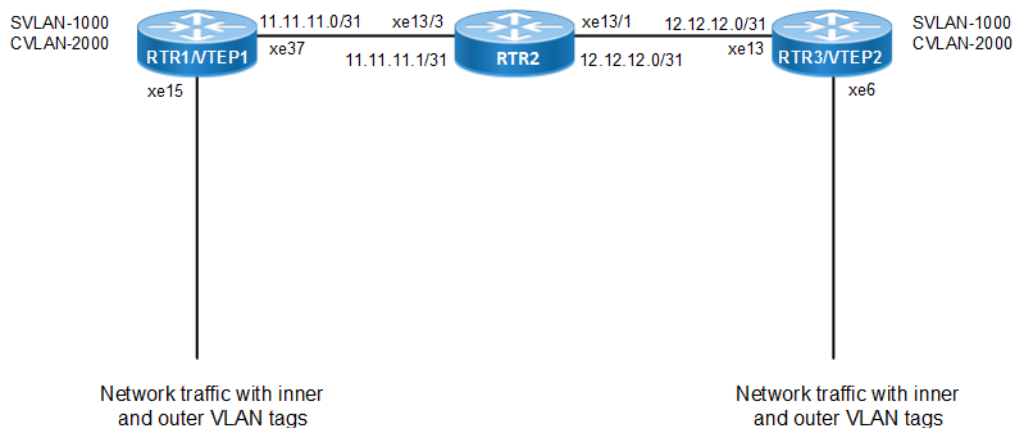


Figure 4-6: VxLAN EVPN EVC

### Configuration

#### RTR1/VTEP1

|  |                                    |
|--|------------------------------------|
| #configure terminal                            | Enter configure mode.              |
| (config)#interface lo                          | Enter interface mode for loopback. |
| (config-if)#ip address 33.33.33.0/31 secondary | Assign secondary IP address.       |

## VxLAN EVPN EVC Configuration

|  |   |
|--|---|
| (config-if)#exit   | Exit interface mode.  |
| (config)#mac vrf vrf1  | Create mac routing/forwarding instance with vrf1 name and enter into VRF mode                                 |
| (config-vrf)# rd 100:11  | Assign RD value   |
| (config-vrf)# route-target export 200:11                         | Assign route-target value for export  |
| (config-vrf)# route-target import 400:11                         | Assign route-target value for import  |
| (config-vrf)#exit  | Exit VRF configuration mode   |
| (config)#interface xe37  | Enter interface mode for xe37   |
| (config-if)#ip address 11.11.11.0/31                             | Assign IP address in /31 mask.  |
| (config-if)#exit   | Exit interface mode.  |
| (config)#interface xe15  | Enter interface mode for xe15   |
| (config-if)#switchport   | Make it L2 interface  |
| (config-if)#exit   | Exit interface mode.  |
| (config)#router bgp 100  | Enter BGP router mode   |
| (config-router)# bgp router-id 1.1.1.1                           | Assign BGP router ID  |
| (config-router)#neighbor 11.11.11.1 remote-as 200                | Specify a neighbor router with peer IP address and remote-as defined  |
| (config-router)#neighbor 11.11.11.1 fall-over bfd                | Configure single-hop BFD session for its BGP peer   |
| (config-router)#address-family ipv4 unicast                      | Enter into ipv4 unicast address family  |
| (config-router-af)#network 33.33.33.0/31                         | Advertise loopback network into BGP for VTEP ID reachability  |
| (config-router-af)#exit-address-family                           | Exit ipv4 unicast address family mode   |
| (config-router)#address-family l2vpn evpn                        | Enter into l2vpn address family mode  |
| (config-router-af)#neighbor 11.11.11.1 activate                  | Activate the peer into address family mode  |
| (config-router-af)#exit-address-family                           | Exit l2vpn address family mode  |
| (config-router)#exit   | Exit BGP router mode  |
| (config)# hardware-profile filter vxlan enable                   | Enable hardware profile for vxlan   |
| (config)#hardware-profile statistics ac-lif enable               | Enable ac-lif for VxLAN access-if port counters   |
| (config)#nvo vxlan enable  | Enable VxLAN  |
| (config)#nvo vxlan vtep-ip-global 33.33.33.0                     | Configure Source vtep-ip-global configuration   |
| (config)#nvo vxlan id 1 ingress-replication inner-vid-disabled   | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf1      | Assign VRF for evpn-bgp to carry EVPN route   |
| (config-nvo)#exit  | Exit VxLAN tenant mode.   |
| (config)#nvo vxlan access-if port-vlan xe15 1000 inner-vlan 2000 | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN) and inner-vlan (CVLAN) mapping                |
| (config-nvo-acc-if)#map vnid 1                                   | Map VxLAN Identified to access-port for VxLAN   |
| (config-nvo-acc-if)#exit   | Exit VxLAN access-interface mode  |



|                 |   |
|-----------------|---|
| (config)#commit | Commit the candidate configuration to the running configuration |
| (config)#exit   | Exit configuration mode   |

**RTR2**

|   |  |
|---|--|
| #configure terminal                               | Enter configure mode.  |
| (config)#interface xe13/3                         | Enter interface mode for xe13/3                                      |
| (config-if)#ip address 11.11.11.1/31              | Assign IP address in /31 mask.                                       |
| (config-if)#exit                                  | Exit interface mode.   |
| (config)#interface xe13/1                         | Enter interface mode for xe13/1                                      |
| (config-if)#ip address 12.12.12.1/31              | Assign IP address in /31 mask.                                       |
| (config-if)#exit                                  | Exit interface mode  |
| (config)#router bgp 200                           | Enter BGP router mode  |
| (config-router)# bgp router-id 2.2.2.2            | Assign BGP router ID   |
| (config-router)#neighbor 11.11.11.0 remote-as 100 | Specify a neighbor router with peer ip address and remote-as defined |
| (config-router)#neighbor 11.11.11.0 fall-over bfd | Configure single-hop BFD session for its BGP peer                    |
| (config-router)#neighbor 12.12.12.0 remote-as 300 | Specify a neighbor router with peer ip address and remote-as defined |
| (config-router)#neighbor 12.12.12.0 fall-over bfd | Configure single-hop BFD session for its BGP peer                    |
| (config-router)#address-family l2vpn evpn         | Enter into l2vpn address family mode                                 |
| (config-router-af)#neighbor 11.11.11.0 activate   | Activate the peer into address family mode                           |
| (config-router-af)#neighbor 12.12.12.0 activate   | Activate the peer into address family mode                           |
| (config-router-af)#exit-address-family            | Exit l2vpn address family mode                                       |
| (config-router)#commit                            | Commit the candidate configuration to the running configuration      |
| (config-router)#exit                              | Exit BGP router mode   |

**RTR3/VTEP2**

|  |   |
|--|---|
| #configure terminal                            | Enter configure mode.   |
| (config)#interface lo                          | Enter interface mode for loopback.  |
| (config-if)#ip address 34.34.34.0/31 secondary | Assign secondary IP address.  |
| (config-if)#exit                               | Exit interface mode.  |
| (config)#mac vrf vrf1                          | Create mac routing/forwarding instance with vrf1 name and enter into vrf mode |
| (config-vrf)#rd 300:11                         | Assign RD value   |
| (config-vrf)#route-target export 400:11        | Assign route-target value for export  |
| (config-vrf)#route-target import 200:11        | Assign route-target value for import  |

## VxLAN EVPN EVC Configuration

|   |   |
|---|---|
| (config-vrf)#exit   | Exit vrf configuration mode   |
| (config)#interface xe13   | Enter interface mode for xe13   |
| (config-if)#ip address 12.12.12.0/31                            | Assign IP address in /31 mask.  |
| (config-if)#exit  | Exit interface mode.  |
| (config)#interface xe6  | Enter interface mode for xe6  |
| (config-if)#switchport  | Make it L2 interface  |
| (config-if)#exit  | Exit interface mode.  |
| (config)#router bgp 300   | Enter BGP router mode   |
| (config-router)# bgp router-id 3.3.3.3                          | Assign BGP router ID  |
| (config-router)#neighbor 12.12.12.1 remote-as 200               | Specify a neighbor router with peer ip address and remote-as defined  |
| (config-router)#neighbor 12.12.12.1 fall-over bfd               | Configure single-hop BFD session for its BGP peer   |
| (config-router)#address-family ipv4 unicast                     | Enter into ipv4 unicast address family  |
| (config-router-af)#network 34.34.34.0/31                        | Advertise loopback network into BGP for VTEP ID reachability  |
| (config-router-af)#exit-address-family                          | Exit ipv4 unicast address family mode   |
| (config-router)#address-family l2vpn evpn                       | Enter into l2vpn address family mode  |
| (config-router-af)#neighbor 12.12.12.1 activate                 | Activate the peer into address family mode  |
| (config-router-af)#exit-address-family                          | Exit l2vpn address family mode  |
| (config-router)#exit  | Exit BGP router mode  |
| (config)# hardware-profile filter vxlan enable                  | Enable hardware profile for vxlan   |
| (config)#hardware-profile statistics ac-lif enable              | Enable ac-lif for VxLAN access-if port counters   |
| (config)#nvo vxlan enable                                       | Enable VxLAN  |
| (config)#nvo vxlan vtep-ip-global 34.34.34.0                    | Configure Source vtep-ip-global configuration   |
| (config)#nvo vxlan id 1 ingress-replication inner-vid-disabled  | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf1     | Assign VRF for evpn-bgp to carry EVPN route   |
| (config-nvo)#exit   | Exit VxLAN tenant mode.   |
| (config)#nvo vxlan access-if port-vlan xe6 1000 inner-vlan 2000 | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN) and inner-vlan (CVLAN) mapping                |
| (config-nvo-acc-if)#map vnid 1                                  | Map VxLAN Identified to access-port for VxLAN   |
| (config-nvo-acc-if)#exit  | Exit VxLAN access-interface mode  |
| (config)#commit   | Commit the candidate configuration to the running configuration   |
| (config)#exit   | Exit configuration mode   |

---

## Validation

---

### Retaining SVLAN and CVLAN tags across Data Centers

#### RTR1/VTEP1

```
VTEP1#show running-config nvo vxlan
!
nvo vxlan enable
!
nvo vxlan vtep-ip-global 33.33.33.0
!
nvo vxlan id 1 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp vrf1
!
nvo vxlan access-if port-vlan xe1/1 1000 inner-vlan 2000
map vnid 1
!
!
```

```
VTEP1#show bgp l2vpn evpn summary
BGP router identifier 1.1.1.1, local AS number 100
BGP table version is 8
2 BGP AS-PATH entries
0 BGP community entries
```

| Neighbor       | V  | AS    | MsgRcv | MsgSen | TblVer       | InQ | OutQ | Up/Dow   |
|----------------|----|-------|--------|--------|--------------|-----|------|----------|
| n State/PfxRcd | AD | MACIP | MCAST  | ESI    | PREFIX-ROUTE |     |      |          |
| 11.11.11.1     | 4  | 200   | 73     | 73     | 8            | 0   | 0    | 00:30:41 |
|                | 2  | 0     | 1      | 1      | 0            | 0   |      |          |

Total number of neighbors 1

Total number of Established sessions 1

```
VTEP1#show bgp l2vpn evpn
BGP table version is 8, local router ID is 1.1.1.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               l - labeled, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]
1 - Ethernet Auto-discovery Route
2 - MAC/IP Route
3 - Inclusive Multicast Route
4 - Ethernet Segment Route
5 - Prefix Route
```

| Network | Next Hop | Metric | LocPrf | Weight | Path |
|---------|----------|--------|--------|--------|------|
|---------|----------|--------|--------|--------|------|

## VxLAN EVPN EVC Configuration

---

```
Peer          Encap

RD[100:11] VRF[vrf1]:
* [2]:[0]:[1]:[48,0000.339a.9397]:[0]:[1]
      34.34.34.0          0          100          0          200
300 i 11.11.11.1          VxLAN
*> [2]:[0]:[1]:[48,0000.339a.9abb]:[0]:[1]
      33.33.33.0          0          100          32768      i  -
-----          VxLAN
*> [3]:[1]:[32,33.33.33.0]
      33.33.33.0          0          100          32768      i  -----
VxLAN
* [3]:[1]:[32,34.34.34.0]
      34.34.34.0          0          100          0          200
300 i 11.11.11.1          VxLAN

RD[300:11]
*> [2]:[0]:[1]:[48,0000.339a.9397]:[0]:[1]
      34.34.34.0          0          100          0          200
300 i 11.11.11.1          VxLAN
*> [3]:[1]:[32,34.34.34.0]
      34.34.34.0          0          100          0          200
300 i 11.11.11.1          VxLAN
```

Total number of prefixes 6

VTEP1#show ip route

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP  
O - OSPF, IA - OSPF inter area  
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
E1 - OSPF external type 1, E2 - OSPF external type 2  
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,  
ia - IS-IS inter area, E - EVPN,  
v - vrf leaked  
\* - candidate default

IP Route Table for VRF "default"

```
C 11.11.11.0/31 is directly connected, xe10/1, 00:36:00
C 33.33.33.0/31 is directly connected, lo, 00:37:33
B 34.34.34.0/31 [20/0] via 11.11.11.1, xe10/1, 00:27:03
C 127.0.0.0/8 is directly connected, lo, 23:14:51
```

Gateway of last resort is not set

VTEP1

VTEP1#show nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port  
AC - Access Port  
(u) - Untagged

```

VNID      VNI-Name      VNI-Type Type Interface      ESI
VLAN DF-Status Src-Addr      Dst-Addr
-----
1         -----      L2      NW      -----
-----      33.33.33.0      34.34.34.0
1         -----      --      AC      xe1/1      --- Single Homed Port ---
1000 -----      -----      -----
Total number of entries are 2

```

```

VTEP1#show nvo vxlan tunnel
VxLAN Network tunnel Entries
Source      Destination      Status      Up/Down      Update
=====
=====
33.33.33.0      34.34.34.0      Installed      00:26:27      00:26:27
Total number of entries are 1
VTEP1#show nvo vxlan mac-table

```

```

=====
=====
VxLAN MAC Entries
=====
=====
VNID      Interface  VlanId Inner-VlanId Mac-Addr      VTEP-Ip/ESI
Type      Status      AccessPortDesc
-----
1         xe1/1      1000   2000      0000.339a.9abb 33.33.33.0
Dynamic Local      -----
1         -----      -----      -----      0000.339a.9397 34.34.34.0
Dynamic Remote      -----
Total number of entries are : 2
VTEP1#

```

**RTR3/VTEP2**

```

#show running-config nvo vxlan
!
nvo vxlan enable
!
nvo vxlan vtep-ip-global 34.34.34.0
!
nvo vxlan id 1 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp vrf1
!

```

## VxLAN EVPN EVC Configuration

---

```
nvo vxlan access-if port-vlan xe6 1000 inner-vlan 2000
map vnid 1
!
```

```
VTEP2#show bgp l2vpn evpn summary
BGP router identifier 3.3.3.3, local AS number 300
BGP table version is 7
2 BGP AS-PATH entries
0 BGP community entries
```

| Neighbor       | V  | AS    | MsgRcv | MsgSen | TblVer       | InQ | OutQ | Up/Dow   |
|----------------|----|-------|--------|--------|--------------|-----|------|----------|
| n State/PfxRcd | AD | MACIP | MCAST  | ESI    | PREFIX-ROUTE |     |      |          |
| 12.12.12.1     | 4  | 200   | 63     | 64     | 7            | 0   | 0    | 00:26:54 |
|                | 2  | 0     | 1      | 1      | 0            | 0   |      |          |

Total number of neighbors 1

Total number of Established sessions 1

```
VTEP2#show bgp l2vpn evpn
BGP table version is 7, local router ID is 3.3.3.3
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               l - labeled, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]
1 - Ethernet Auto-discovery Route
2 - MAC/IP Route
3 - Inclusive Multicast Route
4 - Ethernet Segment Route
5 - Prefix Route
```

| Network    | Next Hop                                | Metric | LocPrf | Weight | Path |
|------------|---|--------|--------|--------|------|
| Peer       | Encap                                   |        |        |        |      |
| RD[100:11] |   |        |        |        |      |
| *>         | [2]:[0]:[1]:[48,0000.339a.9abb]:[0]:[1] |        |        |        |      |
|            | 33.33.33.0                              | 0      | 100    | 0      | 200  |
| 100 i      | 12.12.12.1 VxLAN                        |        |        |        |      |
| *>         | [3]:[1]:[32,33.33.33.0]                 |        |        |        |      |
|            | 33.33.33.0                              | 0      | 100    | 0      | 200  |
| 100 i      | 12.12.12.1 VxLAN                        |        |        |        |      |
|            |   |        |        |        |      |
| *>         | [2]:[0]:[1]:[48,0000.339a.9397]:[0]:[1] |        |        |        |      |
|            | 34.34.34.0                              | 0      | 100    | 32768  | i -  |
| -----      | VxLAN                                   |        |        |        |      |
| *          | [2]:[0]:[1]:[48,0000.339a.9abb]:[0]:[1] |        |        |        |      |
|            | 33.33.33.0                              | 0      | 100    | 0      | 200  |
| 100 i      | 12.12.12.1 VxLAN                        |        |        |        |      |

---

```
*      [3]:[1]:[32,33.33.33.0]
          33.33.33.0          0          100          0          200
100 i  12.12.12.1          VxLAN
*>    [3]:[1]:[32,34.34.34.0]
          34.34.34.0          0          100          32768      i  -
-----          VxLAN
```

Total number of prefixes 6

#show ip route

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP  
 O - OSPF, IA - OSPF inter area  
 N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
 E1 - OSPF external type 1, E2 - OSPF external type 2  
 i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,  
 ia - IS-IS inter area, E - EVPN,  
 v - vrf leaked  
 \* - candidate default

IP Route Table for VRF "default"

```
C      12.12.12.0/31 is directly connected, xe13, 00:28:41
B      33.33.33.0/31 [20/0] via 12.12.12.1, xe13, 00:26:56
C      34.34.34.0/31 is directly connected, lo, 00:29:36
C      127.0.0.0/8 is directly connected, lo, 00:52:46
```

Gateway of last resort is not set

VTEP2#show nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port  
 AC - Access Port  
 (u) - Untagged

| VNID | VNI-Name  | VNI-Type   | Type | Interface  | ESI                       |
|------|-----------|------------|------|------------|---------------------------|
| VLAN | DF-Status | Src-Addr   |      | Dst-Addr   |                           |
| 1    | ----      | L2         | NW   | ----       | -----                     |
| ---- | ----      | 34.34.34.0 |      | 33.33.33.0 |                           |
| 1    | ----      | --         | AC   | xe1/1      | --- Single Homed Port --- |
| 1000 | ----      | ----       |      | ----       |                           |

Total number of entries are 2

VTEP1#show nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source | Destination | Status | Up/Down | Update |
|--------|-------------|--------|---------|--------|
|--------|-------------|--------|---------|--------|

=====  
 =====

## VxLAN EVPN EVC Configuration

```
33.33.33.0      34.34.34.0      Installed      00:26:27      00:26:27
Total number of entries are 1
```

```
VTEP2#show nvo vxlan mac-table
```

```
=====
=====
VxLAN MAC Entries
=====
=====
VNID      Interface  VlanId  Inner-VlanId  Mac-Addr      VTEP-Ip/ESI
      Type                Status                AccessPortDesc
-----
1         ----      ----      ----          0000.339a.9abb 33.33.33.0
      Dynamic Remote          -----
1         xe6       1000     2000          0000.339a.9397 34.34.34.0
      Dynamic Local          -----
```

```
Total number of entries are : 2
#
```

## Popping SVLAN and CVLAN Tag

Use the previous configuration on VTEP1 and perform the configuration below on VTEP2.

### VTEP2

|                                       |   |
|---------------------------------------|---|
| (config)#nvo vxlan access-if port xe6 | Enable port-only mapping for access port                        |
| (config-nvo-acc-if)#map vnid 1        | Map VxLAN Identified to access-port for VxLAN                   |
| (config-nvo-acc-if)#exit              | Exit VxLAN access-interface mode                                |
| (config)#commit                       | Commit the candidate configuration to the running configuration |
| (config)#exit                         | Exit configuration mode   |

### RTR3/VTEP2

```
#show nvo vxlan
VxLAN Information
=====
Codes: NW - Network Port
AC - Access Port
(u) - Untagged
VNID VNI-Name VNI-Type Type Interface ESI
VLAN DF-Status Src-Addr Dst-Addr
-----
1 ---- L2 NW ---- -----
---- ---- 34.34.34.0 33.33.33.0
1 ---- -- AC xe6 --- Single Homed Port ---
```



```
-----
```

```
Total number of entries are 2
```

```
VTEP2#show nvo vxlan mac-table
```

```
=====
=====
VxLAN MAC Entries
=====
=====
VNID      Interface  VlanId Inner-VlanId Mac-Addr      VTEP-IP/ESI
      Type                Status                AccessPortDesc
-----
1         -----  -----  -----  0000.339a.9abb 33.33.33.0
      Dynamic Remote                -----
```

```
Total number of entries are : 1
```

```
#
```

```
VTEP2#show running-config nvo vxlan
```

```
!
```

```
nvo vxlan enable
```

```
!
```

```
nvo vxlan vtep-ip-global 34.34.34.0
```

```
!
```

```
nvo vxlan id 1 ingress-replication inner-vid-disabled
```

```
  vxlan host-reachability-protocol evpn-bgp vrf1
```

```
!
```

```
nvo vxlan access-if port-vlan xe1/1 3000 inner-vlan 2000
```

```
  map vnid 1
```

```
VTEP1#show nvo vxlan tunnel
```

```
VxLAN Network tunnel Entries
```

```
Source          Destination      Status          Up/Down         Update
=====
33.33.33.0      34.34.34.0      Installed       00:26:27       00:26:27
```

```
Total number of entries are 1
```

## Popping and Later Pushing SVLAN Tag

Use the previous configuration on VTEP1 and perform the configuration below on VTEP2.

|  |  |
|--|--|
| (config)#nvo vxlan access-if port-vlan xe6<br>3000 inner-vlan 2000 | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN) and inner-vlan (CVLAN) mapping |
| (config-nvo-acc-if)#map vnid 1                                     | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)#exit   | Exit VxLAN access-interface mode   |

## VxLAN EVPN EVC Configuration

|                 |   |
|-----------------|---|
| (config)#commit | Commit the candidate configuration to the running configuration |
| (config)#exit   | Exit configuration mode   |

### RTR3/VTEP2

```
#show running-config nvo vxlan
!
nvo vxlan enable
!
nvo vxlan vtep-ip-global 34.34.34.0
!
nvo vxlan id 1 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp vrf1
!
nvo vxlan access-if port-vlan xe1/1 3000 inner-vlan 2000
  map vnid 1
!
```

```
#show nvo vxlan
VxLAN Information
```

```
=====
```

```
Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged
```

| VNIID | VNI-Name  | VNI-Type   | Type | Interface  | ESI                       |
|-------|-----------|------------|------|------------|---------------------------|
| VLAN  | DF-Status | Src-Addr   |      | Dst-Addr   |                           |
| 1     | ----      | L2         | NW   | ----       | -----                     |
| ----  | ----      | 34.34.34.0 |      | 33.33.33.0 |                           |
| 1     | ----      | --         | AC   | xe6        | --- Single Homed Port --- |
| 3000  | ----      | ----       | ---- | ----       |                           |

Total number of entries are 2

```
#show nvo vxlan tunnel
```

```
VxLAN Network tunnel Entries
```

| Source     | Destination | Status    | Up/Down  | Update   |
|------------|-------------|-----------|----------|----------|
| 34.34.34.0 | 33.33.33.0  | Installed | 00:06:48 | 00:06:48 |

Total number of entries are 1

```
VTEP2#show nvo vxlan mac-table
```

```
=====
```

```
VxLAN MAC Entries
```

```
=====
```

| VNIID | Interface | VlanId | Inner-VlanId | Mac-Addr | VTEP-IP/ESI    |
|-------|-----------|--------|--------------|----------|----------------|
|       | Type      |        | Status       |          | AccessPortDesc |

---

```
1      ----      ----      ----      0000.339a.9abb 33.33.33.0
      Dynamic Remote      -----      -----
```

Total number of entries are : 1

#



## CHAPTER 5 VxLAN Hybrid Access Port Configuration

This chapter shows how to configure a hybrid access port which is a Layer 2 Port (configured switchport) that is part of both a VxLAN domain and a Layer 2 bridge with different VLANs.

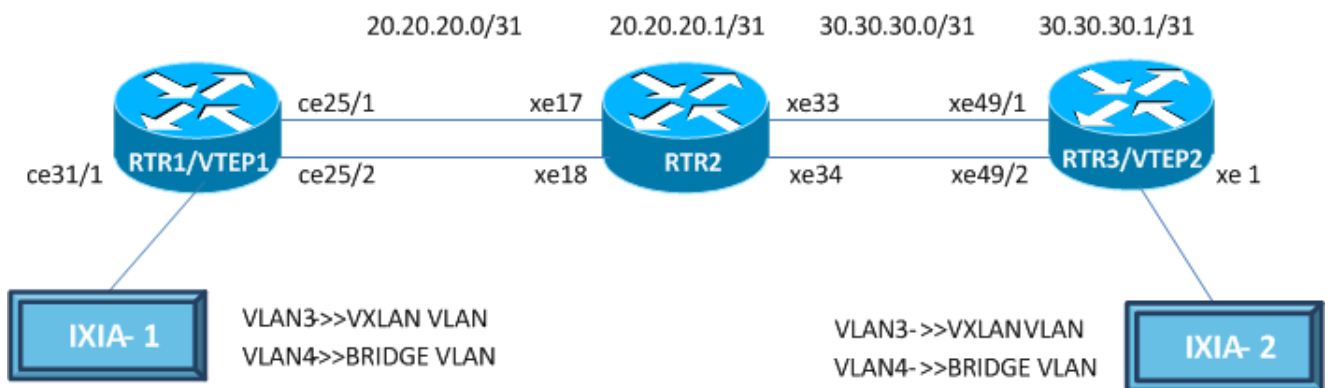
### Overview

A hybrid VxLAN access port is Layer 2 port that is part of regular Layer 2 bridge (RSTP/MSTP/STP) and a VxLAN bridge at the same time. A switch port cannot be a part of VxLAN domain and Layer 2 Bridge if the VxLAN port is created with “port only” mapping. The same VLAN cannot be a part of both a VxLAN domain and a Layer 2 bridge.

If a port is created with “all” VLANS, then the port should not allow VxLAN access-port configurations. If a VxLAN with a specific VLAN is mapped, then configuring VLAN “all” on the same port does not allow that specified VLAN in a Layer 2 bridge. If the VxLAN access-port configurations are removed, then the specified VLAN is added immediately in a Layer 2 bridge.

Ingress traffic with a VxLAN VLAN does not receive Layer 2 traffic or vice-versa. STP states on the Port P1 do not affect VxLAN traffic.

### Topology



#### RTR1/VTEP1

|  |   |
|--|---|
| #configure terminal                                | Enter configure mode.   |
| (config)#interface lo                              | Enter interface mode for loopback.  |
| (config-if)#ip address 10.10.10.10/32<br>secondary | Assign secondary IP address.  |
| (config-if)#exit                                   | Exit interface mode.  |
| (config)#mac vrf vrf12345                          | Create mac routing/forwarding instance with vrf12345 name and enter VRF mode. |
| (config-vrf)#rd 1.1.1.1:1                          | Assign Rd value.  |
| (config-vrf)#route-target both<br>10.10.10.10:10   | Assign route-target both value.   |
| (config-vrf)#exit                                  | Exit VRF configuration mode.  |
| (config)#bridge 32 protocol ieee vlan-bridge       | Configure the ieee vlan-bridge with Id 32.                                    |

## VxLAN Hybrid Access Port Configuration

|  |   |
|--|---|
| (config)#vlan 2-5 bridge 32  | Configure the vlans 2-5 for the configured bridge Id 32.  |
| (config)#interface ce25/1  | Enter interface mode for ce25/1.  |
| (config-if)#ip address 20.20.20.0/31                                   | Assign IP address 20.20.20.0 in /31 mask.   |
| (config-if)#exit   | Exit interface mode.  |
| (config)#interface ce25/2  | Enter interface mode for ce25/2.  |
| (config-if)#switchport   | Make it L2 interface.   |
| (config-if)#bridge-group 32  | Associate the bridge-group 32 to the interface.   |
| (config-if)#switchport mode hybrid                                     | Configure the Hybrid mode.  |
| (config-if)# switchport hybrid allowed vlan add 4 egress-tagged enable | Configure hybrid allowed vlan add 4 to support the created vlan in the L2 Bridge.                         |
| (config-if)#exit   | Exit interface mode.  |
| (config)#interface ce31/1  | Enter interface mode for ce31/1.  |
| (config-if)#switchport   | Make it L2 interface.   |
| (config-if)#bridge-group 32  | Associate the bridge-group 32 to the interface.   |
| (config-if)#switchport mode hybrid                                     | Configure the Hybrid mode.  |
| (config-if)# switchport hybrid allowed vlan add 4 egress-tagged enable | Configure hybrid allowed vlan add 4 to support the created vlan in the L2 Bridge.                         |
| (config-if)#exit   | Exit interface mode.  |
| (config)#router bgp 64512  | Enter BGP router mode.  |
| (config-router)# bgp router-id 1.1.1.1                                 | Assign BGP router ID  |
| (config-router)#neighbor 20.20.20.1 remote-as 64513                    | Specify a neighbor router with peer ip address and remote-as defined.                                     |
| (config-router)#address-family ipv4 unicast                            | Enter into ipv4 unicast address family  |
| (config-router-af)#network 10.10.10.10/32                              | Advertise loopback network into BGP for VTEP ID reachability  |
| (config-router-af)#exit-address-family                                 | Exit ipv4 unicast address family mode   |
| (config-router)#address-family l2vpn evpn                              | Enter l2vpn address family mode.  |
| (config-router-af)#neighbor 20.20.20.1 activate                        | Activate the peer into address family mode.   |
| (config-router-af)#exit-address-family                                 | Exit l2vpn address family mode.   |
| (config-router)#exit   | Exit BGP router mode.   |
| (config)# hardware-profile filter vxlan enable                         | Enable hardware profile for vxlan   |
| (config)#hardware-profile statistics ac-lif enable                     | Enable ac-lif for VxLAN access-if port counters   |
| (config)#nvo vxlan enable  | Enable Vxlan.   |
| (config)#nvo vxlan vtep-ip-global 10.10.10.10                          | Configure the source Vtep-ip.   |
| (config)#nvo vxlan id 16777215 ingress-replication inner-vid-disabled  | Configure Vxlan Network identifier with/without inner-vid-disabled configure and enter Vxlan tenant mode. |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf12345        | Assign VRF for evpn-bgp to carry evpn route.  |
| (config-nvo)#exit  | Exit Vxlan tenant mode.   |
| (config)#nvo vxlan access-if port-vlan ce31/1 3                        | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN) mapping.                                  |

|                                       |   |
|---------------------------------------|---|
| (config-nvo-acc-if)#map vnid 16777215 | Map Vxlan Identifier to access-port.                            |
| (config-nvo-acc-if)#exit              | Exit Vxlan access-interface mode.                               |
| (config)#commit                       | Commit the candidate configuration to the running configuration |

**RTR2**

|   |   |
|---|---|
| #configure terminal   | Enter configure mode.   |
| (config)#bridge 32 protocol ieee vlan-bridge                          | Configure the ieee vlan-bridge with Id 32.  |
| (config)#vlan 2-5 bridge 32   | Configure the vlans 2-5 for the configured bridge Id 32.                          |
| (config)#interface xe17   | Enter interface mode for xe17.  |
| (config-if)#ip address 20.20.20.1/31                                  | Assign IP address 20.20.20.1 in /31 mask.   |
| (config-if)#exit  | Exit interface mode.  |
| (config)#interface xe18   | Enter interface mode for xe18.  |
| (config-if)#switchport  | Make it L2 interface .  |
| (config-if)#bridge-group 32   | Associate the bridge-group 32 to the interface.                                   |
| (config-if)#switchport mode hybrid                                    | Configure the Hybrid mode.  |
| (config-if)#switchport hybrid allowed vlan add 4 egress-tagged enable | Configure hybrid allowed vlan add 4 to support the created vlan in the L2 Bridge. |
| (config-if)#exit  | Exit interface mode.  |
| (config)#interface xe33   | Enter interface mode for xe33.  |
| (config-if)#ip address 30.30.30.0/31                                  | Assign IP address 30.30.30.0 in /31 mask.   |
| (config-if)#exit  | Exit interface mode.  |
| (config)#interface xe34   | Enter interface mode for xe34.  |
| (config-if)#switchport  | Make it L2 interface.   |
| (config-if)#bridge-group 32   | Associate the bridge-group 32 to the interface.                                   |
| (config-if)#switchport mode hybrid                                    | Configure the Hybrid mode.  |
| (config-if)#switchport hybrid allowed vlan add 4 egress-tagged enable | Configure hybrid allowed vlan add 4 to support the created vlan in the L2 Bridge. |
| (config-if)#exit  | Exit interface mode.  |
| (config)#router bgp 64513   | Enter BGP router mode.  |
| (config-router)# bgp router-id 2.2.2.2                                | Assign BGP router ID  |
| (config-router)#neighbor 20.20.20.0 remote-as 64512                   | Specify a neighbor router with peer ip address and remote-as defined.             |
| (config-router)#neighbor 30.30.30.1 remote-as 64514                   | Specify a neighbor router with peer ip address and remote-as defined.             |
| (config-router)#address-family l2vpn evpn                             | Enter l2vpn address family mode.  |
| (config-router-af)#neighbor 20.20.20.0 activate                       | Activate the peer into address family mode.                                       |
| (config-router-af)#neighbor 30.30.30.1 activate                       | Activate the peer into address family mode.                                       |
| (config-router-af)#exit-address-family                                | Exit l2vpn address family mode.   |

|                      |   |
|----------------------|---|
| (config-router)#exit | Exit BGP router mode.   |
| (config)#commit      | Commit the candidate configuration to the running configuration |

**RTR3/VTEP2**

|  |   |
|--|---|
| #configure terminal  | Enter configure mode.   |
| (config)#interface lo  | Enter interface mode for loopback.  |
| (config-if)#ip address 40.40.40.40/32<br>secondary                       | Assign secondary IP address.  |
| (config-if)#exit   | Exit interface mode.  |
| (config)#mac vrf vrf12345  | Create mac routing/forwarding instance with vrf12345 name and enter VRF mode.     |
| (config-vrf)#rd 2.2.2.2:2  | Assign Rd value.  |
| (config-vrf)#route-target both<br>10.10.10.10:10                         | Assign route-target both value.   |
| (config-vrf)#exit  | Exit VRF configuration mode.  |
| (config)#bridge 32 protocol ieee vlan-bridge                             | Configure the ieee vlan-bridge with Id 32.  |
| (config)#vlan 2-5 bridge 32  | Configure the vlans 2-5 for the configured bridge Id 32.                          |
| (config)#interface xe 49/1   | Enter interface mode for xe49/1.  |
| (config-if)#ip address 30.30.30.1/31                                     | Assign Ip address 30.30.30.1 in /31 mask.   |
| (config-if)#exit   | Exit interface mode.  |
| (config)#interface xe49/2  | Enter interface mode for xe49/2.  |
| (config-if)#switchport   | Make it L2 interface .  |
| (config-if)#bridge-group 32  | Associate the bridge-group 32 to the interface.                                   |
| (config-if)#switchport mode hybrid                                       | Configure the Hybrid mode.  |
| (config-if)#switchport hybrid allowed vlan<br>add 4 egress-tagged enable | Configure hybrid allowed vlan add 4 to support the created vlan in the L2 Bridge. |
| (config-if)#exit   | Exit interface mode.  |
| (config)#interface xe1   | Enter interface mode for xe1.   |
| (config-if)#switchport   | Make it L2 interface .  |
| (config-if)#bridge-group 32  | Associate the bridge-group 32 to the interface.                                   |
| (config-if)#switchport mode hybrid                                       | Configure the Hybrid mode.  |
| (config-if)#switchport hybrid allowed vlan<br>add 4 egress-tagged enable | Configure hybrid allowed vlan add 4 to support the created vlan in the L2 Bridge. |
| (config-if)#exit   | Exit interface mode.  |
| (config)#router bgp 64514  | Enter BGP router mode.  |
| (config-router)# bgp router-id 3.3.3.3                                   | Assign BGP router ID  |
| (config-router)#neighbor 30.30.30.0 remote-<br>as 64513                  | Specify a neighbor router with peer IP address and remote-as defined.             |
| (config-router)#address-family ipv4 unicast                              | Enter into ipv4 unicast address family  |
| (config-router-af)#network 40.40.40.40/32                                | Advertise loopback network into BGP for VTEP ID reachability                      |
| (config-router-af)#exit-address-family                                   | Exit ipv4 unicast address family mode   |
| (config-router)#address-family l2vpn evpn                                | Enter l2vpn address family mode.  |



|   |   |
|---|---|
| (config-router-af)#neighbor 30.30.30.0 activate                       | Activate the peer into address family mode.   |
| (config-router-af)#exit-address-family                                | Exit I2vpn address family mode.   |
| (config-router)#exit  | Exit BGP router mode.   |
| (config)# hardware-profile filter vxlan enable                        | Enable hardware profile for vxlan   |
| (config)#hardware-profile statistics ac-lif enable                    | Enable ac-lif for VxLAN access-if port counters   |
| (config)#nvo vxlan enable   | Enable Vxlan.   |
| (config)#nvo vxlan vtep-ip-global 40.40.40.40                         | Configure the source Vtep-ip.   |
| (config)#nvo vxlan id 16777215 ingress-replication inner-vid-disabled | Configure Vxlan Network identifier with/without inner-vid-disabled configure and enter Vxlan tenant mode. |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf12345       | Assign VRF for evpn-bgp to carry evpn route.  |
| (config-nvo)#exit   | Exit Vxlan tenant mode.   |
| (config)#nvo vxlan access-if port-vlan xe1 3                          | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN) mapping.                                  |
| (config-nvo-acc-if)#map vnid 16777215                                 | Map Vxlan Identifier to access-port.  |
| (config-nvo-acc-if)#exit  | Exit Vxlan access-interface mode.   |
| (config)#commit   | Commit the candidate configuration to the running configuration   |

## Validation

### VTEP1

```
#show running-config nvo vxlan
!
nvo vxlan enable
!
nvo vxlan vtep-ip-global 10.10.10.10
!
nvo vxlan id 16777215 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp vrf12345
!
nvo vxlan access-if port-vlan ce31/1 3
  map vnid 16777215
!
```

```
VTEP1#show nvo vxlan
VxLAN Information
=====
Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged
```

## VxLAN Hybrid Access Port Configuration

```

VNID      VNI-Name      VNI-Type Type Interface      ESI      VLAN DF-
Status Src-Addr      Dst-Addr
-----
16777215 ----          L2      NW      ----          -----  ---- --
--      10.10.10.10    40.40.40.40
16777215 ----          --      AC      ce31/1        --- Single Homed Port ---  3    -
-----
Total number of entries are 2

```

VTEP1#show nvo vxlan vnid 16777215

VxLAN Information

=====

Codes: NW - Network Port  
AC - Access Port  
(u) - Untagged

```

VNID      VNI-Name      VNI-Type Type Interface      ESI      VLAN DF-
Status Src-Addr      Dst-Addr
-----
16777215 ----          L2      NW      ----          -----  ---- --
--      10.10.10.10    40.40.40.40
16777215 ----          --      AC      ce31/1        --- Single Homed Port ---  3    -
-----
Total number of entries are 2!

```

VTEP1#show ip route

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP

O - OSPF, IA - OSPF inter area  
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
E1 - OSPF external type 1, E2 - OSPF external type 2  
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,  
ia - IS-IS inter area, E - EVPN,  
v - vrf leaked  
\* - candidate default

IP Route Table for VRF "default"

```

C      10.10.10.10/32 is directly connected, lo, 01:15:55
C      20.20.20.0/31 is directly connected, xe10/1, 01:07:53
B      40.40.40.40/32 [20/0] via 20.20.20.1, xe10/1, 00:42:54
C      127.0.0.0/8 is directly connected, lo, 1d05h02m

```

Gateway of last resort is not set

VTEP1#show nvo vxlan tunnel

VxLAN Network tunnel Entries

```

Source      Destination      Status      Up/Down      Update
=====
33.33.33.0    34.34.34.0      Installed    00:26:27     00:26:27

```

Total number of entries are 1

```
VTEP1#show bgp l2vpn evpn summary
BGP router identifier 10.10.10.2, local AS number 64512
BGP table version is 10
2 BGP AS-PATH entries
0 BGP community entries
```

| Neighbor   | AD | MACIP | V     | AS    | MsgRcv       | MsgSen | TblVer | InQ | OutQ | Up/Down  | State/ |
|------------|----|-------|-------|-------|--------------|--------|--------|-----|------|----------|--------|
| PfxRcd     |    |       | MCAST | ESI   | PREFIX-ROUTE |        |        |     |      |          |        |
| 20.20.20.1 |    |       | 4     | 64513 | 108          | 109    | 10     | 0   | 0    | 00:48:14 |        |
| 3          | 0  | 2     | 1     | 0     | 0            |        |        |     |      |          |        |

Total number of neighbors 1

Total number of Established sessions 1

```
VTEP1#show bgp l2vpn evpn
BGP table version is 4, local router ID is 10.10.10.10
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               l - labeled, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]
1 - Ethernet Auto-discovery Route
2 - MAC/IP Route
3 - Inclusive Multicast Route
4 - Ethernet Segment Route
5 - Prefix Route
```

| Network  | Next Hop    | Metric | LocPrf | Weight | Path  | Peer  |
|--|-------------|--------|--------|--------|-------|-------|
| Encap  |             |        |        |        |       |       |
| RD[1.1.1.1:1] VRF[vrf12345]:                             |             |        |        |        |       |       |
| * [2]:[0]:[16777215]:[48,0000.0744.4433]:[0]:[16777215]  | 40.40.40.40 | 0      | 100    | 0      | 64513 | 64514 |
| i 20.20.20.1   | VxLAN       |        |        |        |       |       |
| *> [2]:[0]:[16777215]:[48,0000.2222.2222]:[0]:[16777215] | 10.10.10.10 | 0      | 100    | 32768  | i     | ----- |
| -- VxLAN   |             |        |        |        |       |       |
| *> [3]:[16777215]:[32,10.10.10.10]                       | 10.10.10.10 | 0      | 100    | 32768  | i     | ----- |
| -- VxLAN   |             |        |        |        |       |       |
| * [3]:[16777215]:[32,40.40.40.40]                        | 40.40.40.40 | 0      | 100    | 0      | 64513 | 64514 |
| i 20.20.20.1   | VxLAN       |        |        |        |       |       |
| RD[2.2.2.2:2]  |             |        |        |        |       |       |
| *> [2]:[0]:[16777215]:[48,0000.0744.4433]:[0]:[16777215] | 40.40.40.40 | 0      | 100    | 0      | 64513 | 64514 |
| i 20.20.20.1   | VxLAN       |        |        |        |       |       |

## VxLAN Hybrid Access Port Configuration

```
*> [3]:[16777215]:[32,40.40.40.40]
      40.40.40.40          0          100          0          64513 64514
i 20.20.20.1      VxLAN
```

Total number of prefixes 6

VTEP1#show nvo vxlan mac-table

```
=====
=====
```

### VxLAN MAC Entries

```
=====
=====
```

| VNID Type        | Interface    | VlanId Status | Inner-VlanId | Mac-Addr AccessPortDesc | VTEP-Ip/ESI |
|------------------|--------------|---------------|--------------|-------------------------|-------------|
| 16777215 Dynamic | ce31/1 Local | 3 -----       | ----         | 0000.2222.2222          | 10.10.10.10 |
| 16777215 Dynamic | ----- Remote | -----         | ----         | 0000.0744.4433          | 40.40.40.40 |

Total number of entries are : 2

VTEP1#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

```
=====
```

| VNID | Ip-Addr | Mac-Addr | Type | Age-Out | Retries-Left |
|------|---------|----------|------|---------|--------------|
|------|---------|----------|------|---------|--------------|

Total number of entries are 0

#show vlan brief

| Bridge | VLAN ID | Name     | State  | H/W Status | Member ports             |
|--------|---------|----------|--------|------------|--------------------------|
|        |         |          |        |            | (u)-Untagged, (t)-Tagged |
| 32     | 1       | default  | ACTIVE | Success    | ce25/2 (u) ce31/1 (u)    |
| 32     | 2       | VLAN0002 | ACTIVE | Success    |                          |
| 32     | 3       | VLAN0003 | ACTIVE | Success    |                          |
| 32     | 4       | VLAN0004 | ACTIVE | Success    | ce25/2 (t) ce31/1 (t)    |
| 32     | 5       | VLAN0005 | ACTIVE | Success    |                          |

## RTR2

RTR2#show ip route

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP

O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,

ia - IS-IS inter area, E - EVPN,

v - vrf leaked

\* - candidate default

```
IP Route Table for VRF "default"
B    10.10.10.10/32 [20/0] via 20.20.20.0, xe17, 00:29:48
C    20.20.20.0/31 is directly connected, xe17, 02:33:29
C    30.30.30.0/31 is directly connected, xe33, 02:31:56
B    40.40.40.40/32 [20/0] via 30.30.30.1, xe33, 02:23:26
C    127.0.0.0/8 is directly connected, lo, 21:17:41
```

Gateway of last resort is not set

```
RTR2#show bgp l2vpn evpn summary
BGP router identifier 11.11.11.1, local AS number 64513
BGP table version is 10
2 BGP AS-PATH entries
0 BGP community entries
```

| Neighbor<br>PfxRcd | AD | MACIP | V<br>MCAST | AS    | MsgRcv<br>ESI | MsgSen<br>PREFIX-ROUTE | TblVer | InQ | OutQ | Up/Down  | State/ |
|--------------------|----|-------|------------|-------|---------------|------------------------|--------|-----|------|----------|--------|
| 20.20.20.0         |    |       | 4          | 64512 | 111           | 112                    | 10     | 0   | 0    | 00:49:36 |        |
| 3                  | 0  | 2     | 1          | 0     | 0             |                        |        |     |      |          |        |
| 30.30.30.1         |    |       | 4          | 64514 | 101           | 103                    | 10     | 0   | 0    | 00:45:10 |        |
| 3                  | 0  | 2     | 1          | 0     | 0             |                        |        |     |      |          |        |

Total number of neighbors 2

Total number of Established sessions 2

## VTEP2

```
VTEP2#show running-config nvo vxlan
!
nvo vxlan enable
!
nvo vxlan vtep-ip-global 40.40.40.40
!
nvo vxlan id 16777215 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp vrf12345
!
nvo vxlan access-if port-vlan xe1 3
map vnid 16777215
!
```

```
VTEP2#show nvo vxlan
```

VxLAN Information

=====

```
Codes: NW - Network Port
AC - Access Port
(u) - Untagged
```

| VNID | VNI-Name | VNI-Type | Type | Interface | ESI | VLAN | DF-Status | Src-Addr | Dst-Addr |
|------|----------|----------|------|-----------|-----|------|-----------|----------|----------|
|------|----------|----------|------|-----------|-----|------|-----------|----------|----------|

## VxLAN Hybrid Access Port Configuration

```
16777215 ----- L2 NW -----
-- 40.40.40.40 10.10.10.10
16777215 ----- -- AC xe1 --- Single Homed Port --- 3 -----
-----
```

Total number of entries are 2

VTEP2#show ip route

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP

O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,

ia - IS-IS inter area, E - EVPN,

v - vrf leaked

\* - candidate default

IP Route Table for VRF "default"

B 10.10.10.10/32 [20/0] via 30.30.30.0, xe11/1, 00:27:32

C 30.30.30.0/31 is directly connected, xe11/1, 00:30:00

C 40.40.40.40/32 is directly connected, lo, 00:31:00

C 127.0.0.0/8 is directly connected, lo, 06:25:00

Gateway of last resort is not set

VTEP2#show nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source      | Destination | Status    | Up/Down  | Update   |
|-------------|-------------|-----------|----------|----------|
| 40.40.40.40 | 10.10.10.10 | Installed | 00:14:40 | 00:14:40 |

Total number of entries are 1

VTEP2#show bgp l2vpn evpn summary

BGP router identifier 33.33.33.33, local AS number 64514

BGP table version is 8

2 BGP AS-PATH entries

0 BGP community entries

| Neighbor   | V  | AS    | MsgRcv | MsgSen | TblVer       | InQ | OutQ | Up/Down | State/     |
|------------|----|-------|--------|--------|--------------|-----|------|---------|------------|
| PfxRcd     | AD | MACIP | MCAST  | ESI    | PREFIX-ROUTE |     |      |         |            |
| 30.30.30.0 |    |       | 4      | 64513  | 267          | 270 | 8    | 0       | 0 02:09:07 |
| 2          | 0  | 1     | 1      | 0      | 0            |     |      |         |            |

Total number of neighbors 1

Total number of Established sessions 1

```
VTEP2#show bgp l2vpn evpn
BGP table version is 8, local router ID is 40.40.40.40
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               l - labeled, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]
1 - Ethernet Auto-discovery Route
2 - MAC/IP Route
3 - Inclusive Multicast Route
4 - Ethernet Segment Route
5 - Prefix Route
```

| Network  | Next Hop    | Metric | LocPrf | Weight | Path  | Peer  |
|--|-------------|--------|--------|--------|-------|-------|
| Encap  |             |        |        |        |       |       |
| RD[1.1.1.1:1]  |             |        |        |        |       |       |
| *> [2]:[0]:[16777215]:[48,0000.2222.2222]:[0]:[16777215] | 10.10.10.10 | 0      | 100    | 0      | 64513 | 64512 |
| i 30.30.30.0   | VxLAN       |        |        |        |       |       |
| *> [3]:[16777215]:[32,10.10.10.10]                       | 10.10.10.10 | 0      | 100    | 0      | 64513 | 64512 |
| i 30.30.30.0   | VxLAN       |        |        |        |       |       |
| RD[2.2.2.2:2] VRF[vrf12345]:                             |             |        |        |        |       |       |
| *> [2]:[0]:[16777215]:[48,0000.0744.4433]:[0]:[16777215] | 40.40.40.40 | 0      | 100    | 32768  | i     | ----- |
| -- VxLAN   |             |        |        |        |       |       |
| * [2]:[0]:[16777215]:[48,0000.2222.2222]:[0]:[16777215]  | 10.10.10.10 | 0      | 100    | 0      | 64513 | 64512 |
| i 30.30.30.0   | VxLAN       |        |        |        |       |       |
| * [3]:[16777215]:[32,10.10.10.10]                        | 10.10.10.10 | 0      | 100    | 0      | 64513 | 64512 |
| i 30.30.30.0   | VxLAN       |        |        |        |       |       |
| *> [3]:[16777215]:[32,40.40.40.40]                       | 40.40.40.40 | 0      | 100    | 32768  | i     | ----- |
| -- VxLAN   |             |        |        |        |       |       |

Total number of prefixes 6

```
VTEP2#show nvo vxlan mac-table
```

```
=====
VxLAN MAC Entries
=====
```

| VNID Type | Interface | VlanId Status | Inner-VlanId | Mac-Addr AccessPortDesc | VTEP-Ip/ESI |
|-----------|-----------|---------------|--------------|-------------------------|-------------|
| -----     |           |               |              |                         |             |

## VxLAN Hybrid Access Port Configuration

---

```
16777215 ----      ----  ----      0000.2222.2222 10.10.10.10
Dynamic Remote      -----
16777215 xe1       3      ----      0000.0744.4433 40.40.40.40
Dynamic Local      -----
```

Total number of entries are : 2

VTEP2#show vlan brief

| Bridge | VLAN ID | Name     | State  | H/W Status | Member ports<br>(u)-Untagged, (t)-Tagged |
|--------|---------|----------|--------|------------|--|
| 32     | 1       | default  | ACTIVE | Success    | xe1(u) xe49/2(u)                         |
| 32     | 2       | VLAN0002 | ACTIVE | Success    |  |
| 32     | 3       | VLAN0003 | ACTIVE | Success    |  |
| 32     | 4       | VLAN0004 | ACTIVE | Success    | xe1(t) xe49/2(t)                         |
| 32     | 5       | VLAN0005 | ACTIVE | Success    |  |

VTEP2#



---

## CHAPTER 6 VxLAN Multi-Homing Configuration

---

This chapter contains the configurations for VxLAN Multi-homing feature.

---

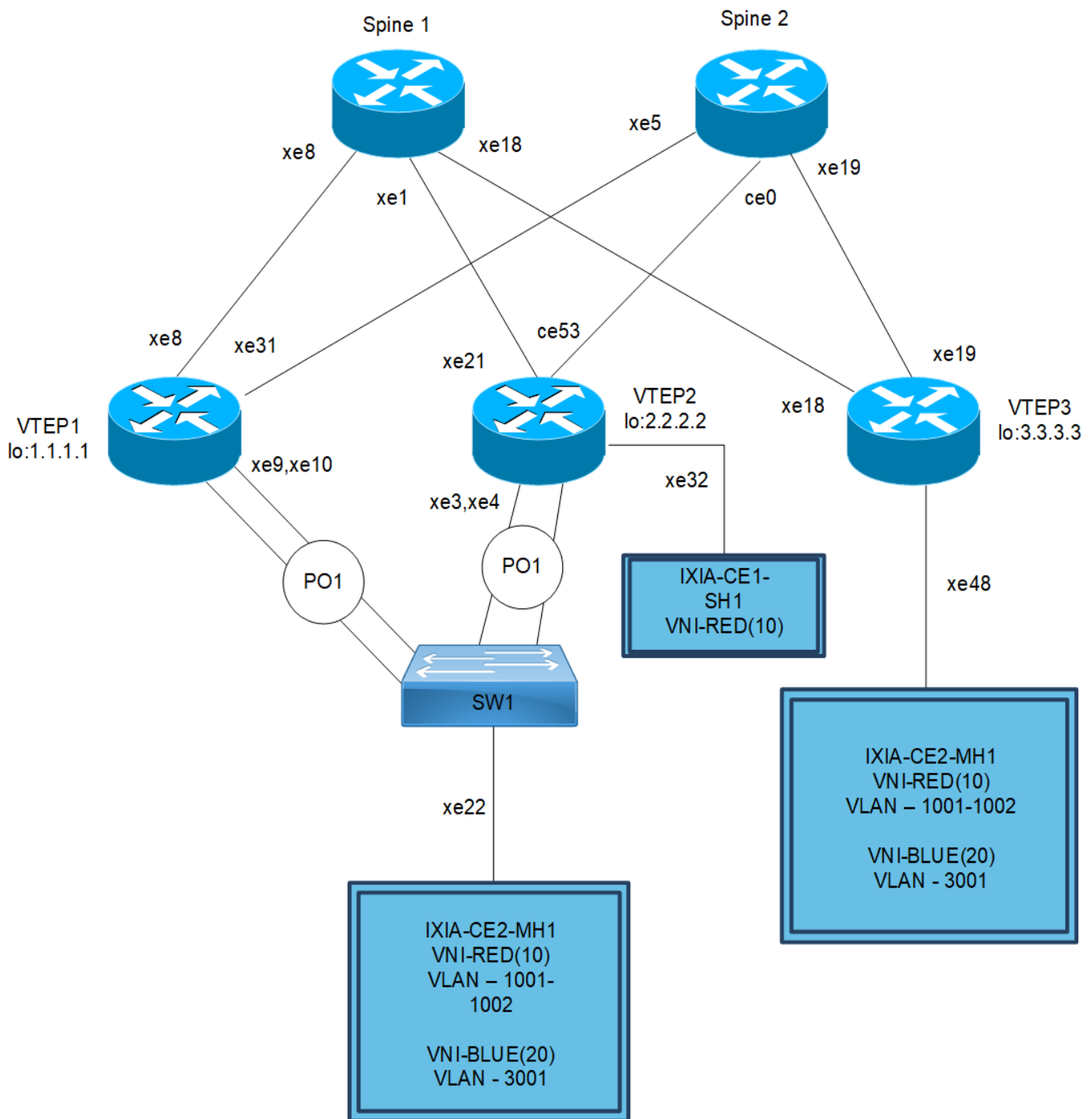
### Overview

VxLAN EVPN Multi-homing features enables to connect a CE/Host node to two VTEPs with all-active redundancy mode. A redundant VTEP device can provide network service to the customer site as soon as a failure is detected. The failure can be link or node failure. If one VTEP goes down, other will forward the entire traffic.

Below are Multi-homing concepts:

- Ethernet Segment: Set of links which connect host/CE to two active-active multi-homed VTEP (only two VTEPs are supported) which appears as LACP link for host.
- Ethernet Segment Identifier: Ethernet Segment Identifier (ESI) which is a 10 octet-value, which can be configured in two ways, system MAC is configured as esi in case of Dynamic LAG and 10-octet ESI format configuration is used on physical interface ES.
- Ethernet Segment Route (ES route): When a multi-homed CE is configured as an VxLAN access-port, Ethernet segment route is sent. The main purpose of this route is to discover other VTEPs which share the ES and to perform DF election.
- Ethernet A-D route per ESI: This route is used for Fast Convergence and Split Horizon.
- Ethernet A-D route per EVI: This route is used for load sharing between DF and NON-DF by the remote VTEPs

## Topology



**Figure 6-7: VxLAN-Multihoming**

Note: Enable VxLAN MUTIHOMING before executing any configurations.

---

## VxLAN-EVPN MH Configuration

### ESI can be configured in below two ways

#### Ethernet Segment through Dynamic LAG interface

|   |   |
|---|---|
| #configure terminal                                       | Enter Configure mode.   |
| (config)#interface po1                                    | Enter Interface mode for po1                                    |
| (config-if)#switchport                                    | Make it L2 interface  |
| (config-if)#evpn multi-homed system-mac<br>8899.4400.6745 | Configure system mac as ESI value for LAG (po1) interface       |
| (config-if)#exit  | Exit Interface mode.  |
| (config)#commit   | Commit the candidate configuration to the running configuration |

OR

#### Ethernet Segment through Physical or Static LAG interface

|   |   |
|---|---|
| #configure terminal   | Enter Configure mode.   |
| (config)#interface xe41   | Enter Interface mode for xe41   |
| (config-if)#switchport  | Make it L2 interface  |
| (config-if)# evpn multi-homed esi<br>00:01:02:03:04:05:06:07:08 | Configure 9-octet ESI value for xe41 interface (in static config, out of 10-octet ESI value, first octet is reserved) |
| (config-if)#exit  | Exit Interface mode.  |
| (config)#commit   | Commit the candidate configuration to the running configuration   |

---

## VTEP1

(Multi-homed group1) – Part of both Multi-homed with po1 (MH1)

### Hardware Profile and Generic Configuration

|  |   |
|--|---|
| #configure terminal                                    | Enter Configure mode.   |
| (config)#hardware-profile filter vxlan<br>enable       | Enable hardware-profile filter for VxLAN.   |
| (config)#hardware-profile filter vxlan-mh<br>enable    | Enable hardware-profile filter for VxLAN multi-homing.                                |
| (config)#hardware-profile filter egress-ipv4<br>enable | Enable hardware-profile filter for egress IPv4.                                       |
| (config)#evpn vxlan multihoming enable                 | Enable Multihoming, save configs and reboot the board for multihoming to be effective |
| (config)#hardware-profile statistics ac-lif<br>enable  | Enable ac-lif for VxLAN access-if port counters                                       |

|                     |   |
|---------------------|---|
| (config)#qos enable | Enabling QoS  |
| (config)#commit     | Commit the candidate configuration to the running configuration |

## Interface and Loopback Configuration

|   |   |
|---|---|
| (config)#interface po1                                  | Enter Interface mode for po1 (MH1)                              |
| (config-if)#switchport                                  | Make it L2 interface  |
| (config-if)# evpn multi-homed system-mac 0000.0000.1111 | Configure system MAC as ESI value for LAG (po1) interface       |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe9                                  | Enter Interface mode for xe9                                    |
| (config-if)#channel-group 1 mode active                 | Make it member port of po1                                      |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe10                                 | Enter Interface mode for xe10                                   |
| (config-if)#channel-group 1 mode active                 | Make it member port of po1                                      |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.               |
| (config)#interface lo                                   | Enter Interface mode for lo                                     |
| (config-if)#ip address 1.1.1.1/32 secondary             | Configure loopback ip address as 1.1.1.1 for VTEP1              |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe8                                  | Enter Interface mode for xe8                                    |
| (config-if)#ip address 10.10.10.1/24                    | Configure IP address as 10.10.10.1 on network side of Spine1    |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe31                                 | Enter Interface mode for xe31                                   |
| (config-if)#ip address 20.20.20.1/24                    | Configure IP address as 20.20.20.1 on network side of Spine2    |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.               |
| (config)#commit   | Commit the candidate configuration to the running configuration |

## OSPF Configuration

|  |   |
|--|---|
| (config)#router ospf 100                           | Enter into router OSPF mode                                     |
| (config-router)#ospf router-id 1.1.1.1             | Configure router-id as 1.1.1.1 (lo ip address)                  |
| (config-router)#network 1.1.1.1/32 area 0.0.0.0    | Add 1.1.1.1 (lo IP address) network into area 0                 |
| (config-router)#network 10.10.10.0/24 area 0.0.0.0 | Add 10.10.10.0 (Spine1) network into area 0                     |
| (config-router)#network 20.20.20.0/24 area 0.0.0.0 | Add 20.20.20.0 (Spine2) network into area 0                     |
| (config-router)#bfd all-interfaces                 | Enabling BFD on all OSPF interface for fast convergence         |
| (config-if)#exit                                   | Exit Interface mode and return to Configure mode.               |
| (config)#commit                                    | Commit the candidate configuration to the running configuration |

## BGP Configuration

|   |  |
|---|--|
| (config)#router bgp 500                                   | Enter into Router BGP mode   |
| (config-router)#bgp router-id 1.1.1.1                     | Configure router-id as 1.1.1.1 (lo IP address)                       |
| (config-router)#neighbor 2.2.2.2 remote-as 500            | Specify a VTEP2 loopback IP address and remote-as defined            |
| (config-router)#neighbor 2.2.2.2 update-source lo         | Configure update as loopback for VTEP2                               |
| (config-router)#neighbor 2.2.2.2 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP2 |
| (config-router)#neighbor 3.3.3.3 remote-as 500            | Specify a VTEP3 loopback IP address and remote-as defined            |
| (config-router)#neighbor 3.3.3.3 update-source lo         | Configure update as loopback for VTEP3                               |
| (config-router)#neighbor 3.3.3.3 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP3 |
| (config-router)#address-family ipv4 unicast               | Enter into ipv4 unicast address family mode                          |
| (config-router-af)#network 1.1.1.1/32                     | Advertise loopback network into BGP for VTEP ID reachability         |
| (config-router-af)#neighbor 2.2.2.2 activate              | Activate 2.2.2.2 (VTEP2) into ipv4 unicast address family mode       |
| (config-router-af)#neighbor 3.3.3.3 activate              | Activate 3.3.3.3 (VTEP2) into ipv4 unicast address family mode       |
| (config-router-af)#exit-address-family                    | Exit from ipv4 unicast address family mode                           |
| (config-router)#address-family l2vpn evpn                 | Enter into L2VPN EVPN address family mode                            |
| (config-router-af)#neighbor 2.2.2.2 activate              | Activate 2.2.2.2 (VTEP2) into L2VPN evpn address family mode         |
| (config-router-af)#neighbor 3.3.3.3 activate              | Activate 3.3.3.3 (VTEP3) into L2VPN evpn address family mode         |
| (config-router-af)#exit-address-family                    | Exit from L2VPN address family mode                                  |
| (config-router)#exit                                      | Exit from Router BGP mode and enter into config mode                 |
| (config)#commit   | Commit the candidate configuration to the running configuration      |

## VRF Configuration

|  |   |
|--|---|
| (config)#mac vrf VRF1                          | Create mac routing/forwarding instance with VRF1 name and enter into VRF mode                 |
| (config-vrf)#rd 1.1.1.1:11                     | Assign RD value   |
| (config-vrf)#route-target both 9.9.9.9:100     | Assign route-target value for same for import and export. Should be same on all node for VRF1 |
| (config-vrf)#exit                              | Exit from VRF mode  |
| (config)#mac vrf VRF2                          | Create MAC routing/forwarding instance with VRF1 name and enter into VRF mode                 |
| (config-vrf)#rd 1.1.1.1:21                     | Assign RD value   |
| (config-vrf)#route-target both 90.90.90.90:100 | Assign route-target value for same for import and export                                      |

## VxLAN Multi-Homing Configuration

---

|                                |   |
|--------------------------------|---|
| <code>(config-vrf)#exit</code> | Exit from VRF mode  |
| <code>(config)#commit</code>   | Commit the candidate configuration to the running configuration |

---

## VxLAN Configuration

|  |   |
|--|---|
| <code>(config)#nvo vxlan enable</code>                                       | Enable VxLAN  |
| <code>(config)#evpn esi hold-time 60</code>                                  | Configure ESI hold time to allow tunnel to come up at the time of VxLAN initialization before making the ESI up |
| <code>(config)#nvo vxlan vtep-ip-global 1.1.1.1</code>                       | Configure Source VTEP-IP-global configuration   |
| <code>(config)#nvo vxlan id 10 ingress-replication inner-vid-disabled</code> | Configure VxLAN Network identifier with/without inner-VID-disabled configure and enter into VxLAN tenant mode   |
| <code>(config-nvo)#vxlan host-reachability-protocol evpn-bgp VRF1</code>     | Assign VRF for EVPN-BGP to carry EVPN route   |
| <code>(config-nvo)#vni-name VNI-RED</code>                                   | Configure VNI-name as VNI-RED   |
| <code>(config-nvo)#exit</code>   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| <code>(config)#nvo vxlan id 20 ingress-replication inner-vid-disabled</code> | Configure VxLAN Network identifier with/without inner-VID-disabled configure and enter into VxLAN tenant mode   |
| <code>(config-nvo)#vxlan host-reachability-protocol evpn-bgp VRF2</code>     | Assign VRF for EVPN-BGP to carry EVPN route   |
| <code>(config-nvo)#vni-name VNI-BLUE</code>                                  | Configure VNI-name as VNI-BLUE  |
| <code>(config-nvo)#exit</code>   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| <code>(config)#nvo vxlan access-if port-vlan po1 1001</code>                 | Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port                        |
| <code>(config-nvo-acc-if)#map vni-name VNI-RED</code>                        | Map VxLAN Identified to access-port for VxLAN   |
| <code>(config-nvo-acc-if)#exit</code>  | Exit from VxLAN access-interface mode and enter into configuration mode   |
| <code>(config)#nvo vxlan access-if port-vlan po1 1002</code>                 | Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port                        |
| <code>(config-nvo-acc-if)#map vni-name VNI-RED</code>                        | Map VxLAN Identified to access-port for VxLAN   |
| <code>(config-nvo-acc-if)#exit</code>  | Exit from VxLAN access-interface mode and enter into configuration mode   |
| <code>(config)#nvo vxlan access-if port-vlan po1 3001</code>                 | Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port                        |
| <code>(config-nvo-acc-if)#map vni-name VNI-BLUE</code>                       | Map VxLAN Identified to access-port for VxLAN   |
| <code>(config-nvo-acc-if)#exit</code>  | Exit from VxLAN access-interface mode and enter into configuration mode   |
| <code>(config)#commit</code>   | Commit the candidate configuration to the running configuration   |
| <code>(config)#exit</code>   | Exit from configuration mode  |

---

## VTEP2

(Multi-homed group1) – Part of both Multi-homed with po1 (MH1). And it has xe32 as single home access-if port (SH2)

---

## Hardware Profile and Generic Configuration

|   |   |
|---|---|
| #configure terminal                                 | Enter Configure mode.   |
| (config)#hardware-profile filter vxlan enable       | Enable hardware-profile filter for VxLAN.   |
| (config)#hardware-profile filter vxlan-mh enable    | Enable hardware-profile filter for VxLAN multi-homing.                                |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4.                                       |
| (config)#evpn vxlan multihoming enable              | Enable Multihoming, save configs and reboot the board for multihoming to be effective |
| (config)#hardware-profile statistics ac-lif enable  | Enable ac-lif for VxLAN access-if port counters                                       |
| (config)#qos enable                                 | Enabling QoS  |
| (config)#commit                                     | Commit the candidate configuration to the running configuration                       |

## Interface and Loopback Configuration

|   |   |
|---|---|
| (config)#interface po1                                  | Enter Interface mode for po1 (MH1)                              |
| (config-if)#switchport                                  | Make it L2 interface  |
| (config-if)# evpn multi-homed system-mac 0000.0000.1111 | Configure system MAC as ESI value for LAG (po1) interface       |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe3                                  | Enter Interface mode for xe3                                    |
| (config-if)#channel-group 1 mode active                 | Make it member port of po1                                      |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe4                                  | Enter Interface mode for xe4                                    |
| (config-if)#channel-group 1 mode active                 | Make it member port of po1                                      |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe32                                 | Enter Interface mode for xe32 (SH2)                             |
| (config-if)#switchport                                  | Make it L2 interface  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.               |
| (config)#interface lo                                   | Enter Interface mode for lo                                     |
| (config-if)#ip address 2.2.2.2/32 secondary             | Configure loopback IP address as 2.2.2.2 for VTEP2              |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe21                                 | Enter Interface mode for xe21                                   |
| (config-if)#ip address 30.30.30.1/24                    | Configure IP address as 30.30.30.1 on network side of Spine1    |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.               |
| (config)#interface ce53                                 | Enter Interface mode for ce53                                   |
| (config-if)#ip address 40.40.40.1/24                    | Configure IP address as 40.40.40.1 on network side of Spine2    |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.               |
| (config)#commit   | Commit the candidate configuration to the running configuration |

**OSPF Configuration**

|  |   |
|--|---|
| (config)#router ospf 100                           | Enter into router OSPF mode                                     |
| (config-router)#ospf router-id 2.2.2.2             | Configure router-id as 2.2.2.2 (lo IP address)                  |
| (config-router)#network 2.2.2.2/32 area 0.0.0.0    | Add 2.2.2.2 (lo IP address) network into area 0                 |
| (config-router)#network 30.30.30.0/24 area 0.0.0.0 | Add 30.30.30.0 (Spine1) network into area 0                     |
| (config-router)#network 40.40.40.0/24 area 0.0.0.0 | Add 40.40.40.0 (Spine2) network into area 0                     |
| (config-router)#bfd all-interfaces                 | Enabling BFD on all OSPF interface for fast convergence         |
| (config-if)#exit                                   | Exit Interface mode and return to Configure mode.               |
| (config)#commit                                    | Commit the candidate configuration to the running configuration |

**BGP Configuration**

|   |  |
|---|--|
| (config)#router bgp 500                                   | Enter into Router BGP mode   |
| (config-router)#bgp router-id 2.2.2.2                     | Configure router-id as 2.2.2.2 (lo IP address)                       |
| (config-router)#neighbor 1.1.1.1 remote-as 500            | Specify a VTEP1 loopback IP address and remote-as defined            |
| (config-router)#neighbor 1.1.1.1 update-source lo         | Configure update as loopback for VTEP1                               |
| (config-router)#neighbor 1.1.1.1 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP1 |
| (config-router)#neighbor 3.3.3.3 remote-as 500            | Specify a VTEP3 loopback IP address and remote-as defined            |
| (config-router)#neighbor 3.3.3.3 update-source lo         | Configure update as loopback for VTEP3                               |
| (config-router)#neighbor 3.3.3.3 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP3 |
| (config-router)#address-family ipv4 unicast               | Enter into ipv4 unicast address family mode                          |
| (config-router-af)#network 2.2.2.2/32                     | Advertise loopback network into BGP for VTEP ID reachability         |
| (config-router-af)#neighbor 1.1.1.1 activate              | Activate 1.1.1.1 (VTEP2) into ipv4 unicast address family mode       |
| (config-router-af)#neighbor 3.3.3.3 activate              | Activate 3.3.3.3 (VTEP2) into ipv4 unicast address family mode       |
| (config-router-af)#exit-address-family                    | Exit from ipv4 unicast address family mode                           |
| (config-router)#address-family l2vpn evpn                 | Enter into L2VPN EVPN address family mode                            |
| (config-router-af)#neighbor 1.1.1.1 activate              | Activate 1.1.1.1(VTEP1) into L2VPN evpn address family mode          |
| (config-router-af)#neighbor 3.3.3.3 activate              | Activate 3.3.3.3(VTEP3) into L2VPN evpn address family mode          |
| (config-router-af)#exit-address-family                    | Exit from L2VPN address family mode                                  |
| (config-router)#exit                                      | Exit from Router BGP mode and enter into config mode                 |
| (config)#commit   | Commit the candidate configuration to the running configuration      |



## VRF Configuration

|  |   |
|--|---|
| (config)# mac vrf VRF1                         | Create mac routing/forwarding instance with VRF1 name and enter into VRF mode                 |
| (config-vrf)#rd 2.2.2.2:11                     | Assign RD value   |
| (config-vrf)#route-target both 9.9.9.9:100     | Assign route-target value for same for import and export. Should be same on all node for VRF1 |
| (config-vrf)#exit                              | Exit from VRF mode  |
| (config)#mac vrf VRF2                          | Create MAC routing/forwarding instance with VRF1 name and enter into VRF mode                 |
| (config-vrf)#rd 2.2.2.2:21                     | Assign RD value   |
| (config-vrf)#route-target both 90.90.90.90:100 | Assign route-target value for same for import and export                                      |
| (config-vrf)#exit                              | Exit from VRF mode  |
| (config)#commit                                | Commit the candidate configuration to the running configuration                               |

## VxLAN Configuration

|   |   |
|---|---|
| (config)#nvo vxlan enable                                       | Enable VxLAN  |
| (config)#evpn esi hold-time 60                                  | Configure ESI hold time to allow tunnel to come up at the time of VxLAN initialization before making the ESI up |
| (config)#nvo vxlan vtep-ip-global 2.2.2.2                       | Configure Source VTEP-IP-global configuration   |
| (config)#nvo vxlan id 10 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-VID-disabled configure and enter into VxLAN tenant mode   |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp VRF1     | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)#vni-name VNI-RED                                   | Configure VNI-name as VNI-RED   |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 20 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-VID-disabled configure and enter into VxLAN tenant mode   |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp VRF2     | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)#vni-name VNI-BLUE                                  | Configure VNI-name as VNI-BLUE  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan access-if port-vlan po1 1001                 | Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port                        |
| (config-nvo-acc-if)#map vni-name VNI-RED                        | Map VxLAN Identified to access-port for VxLAN   |
| (config-nvo-acc-if)#exit  | Exit from VxLAN access-interface mode and enter into configuration mode   |
| (config)#nvo vxlan access-if port-vlan po1 1002                 | Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port                        |
| (config-nvo-acc-if)#map vni-name VNI-RED                        | Map VxLAN Identified to access-port for VxLAN   |
| (config-nvo-acc-if)#exit  | Exit from VxLAN access-interface mode and enter into configuration mode   |

## VxLAN Multi-Homing Configuration

|   |  |
|---|--|
| (config)#nvo vxlan access-if port-vlan po1 3001 | Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port |
| (config-nvo-acc-if)#map vni-name VNI-BLUE       | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)#exit                        | Exit from VxLAN access-interface mode and enter into configuration mode                  |
| (config)#nvo vxlan access-if port xe32          | Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port |
| (config-nvo-acc-if)#map vni-name VNI-RED        | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)#exit                        | Exit from VxLAN access-interface mode and enter into configuration mode                  |
| (config)#exit                                   | Exit from configuration mode   |
| (config)#commit                                 | Commit the candidate configuration to the running configuration                          |

## VTEP3

It has xe48 as Single home access-if port (SH2)

### Hardware Profile and Generic Configuration

|   |   |
|---|---|
| #configure terminal                                 | Enter Configure mode.   |
| (config)#hardware-profile filter vxlan enable       | Enable hardware-profile filter for VxLAN.   |
| (config)#hardware-profile filter vxlan-mh enable    | Enable hardware-profile filter for VxLAN multi-homing.                                |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4.                                       |
| (config)#evpn vxlan multihoming enable              | Enable Multihoming, save configs and reboot the board for multihoming to be effective |
| (config)#hardware-profile statistics ac-lif enable  | Enable ac-lif for VxLAN access-if port counters                                       |
| (config)#qos enable                                 | Enabling QoS  |
| (config)#commit                                     | Commit the candidate configuration to the running configuration                       |

### Interface and loopback configuration

|   |  |
|---|--|
| (config)#interface xe48                     | Enter Interface mode for xe48 (SH3)                          |
| (config-if)#switchport                      | Make it L2 interface   |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.            |
| (config)#interface lo                       | Enter Interface mode for lo                                  |
| (config-if)#ip address 3.3.3.3/32 secondary | Configure loopback IP address as 3.3.3.3 for VTEP3           |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.            |
| (config)#interface xe18                     | Enter Interface mode for xe18                                |
| (config-if)#ip address 50.50.50.1/24        | Configure IP address as 50.50.50.1 on network side of Spine1 |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.            |

|                                      |   |
|--------------------------------------|---|
| (config)#interface xe19              | Enter Interface mode for xe19                                   |
| (config-if)#ip address 60.60.60.1/24 | Configure IP address as 60.60.60.1 on network side of Spine2    |
| (config-if)#exit                     | Exit Interface mode and return to Configure mode.               |
| (config)#commit                      | Commit the candidate configuration to the running configuration |

## OSPF Configuration

|  |   |
|--|---|
| (config)#router ospf 100                           | Enter into router OSPF mode                                     |
| (config-router)#ospf router-id 3.3.3.3             | Configure router-ID as 3.3.3.3 (lo IP address)                  |
| (config-router)#network 3.3.3.3/32 area 0.0.0.0    | Add 3.3.3.3 (lo IP address) network into area 0                 |
| (config-router)#network 50.50.50.0/24 area 0.0.0.0 | Add 50.50.50.0 (Spine1) network into area 0                     |
| (config-router)#network 60.60.60.0/24 area 0.0.0.0 | Add 60.60.60.0 (Spine2) network into area 0                     |
| (config-router)#bfd all-interfaces                 | Enabling BFD on all OSPF interface for fast convergence         |
| (config-if)#exit                                   | Exit Interface mode and return to Configure mode.               |
| (config)#commit                                    | Commit the candidate configuration to the running configuration |

## BGP Configuration

|   |  |
|---|--|
| (config)#router bgp 500                                   | Enter into Router BGP mode   |
| (config-router)#bgp router-id 3.3.3.3                     | Configure router-ID as 3.3.3.3 (lo ip address)                       |
| (config-router)#neighbor 1.1.1.1 remote-as 500            | Specify a VTEP1 loopback IP address and remote-as defined            |
| (config-router)#neighbor 1.1.1.1 update-source lo         | Configure update as loopback for VTEP1                               |
| (config-router)#neighbor 1.1.1.1 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP1 |
| (config-router)#neighbor 2.2.2.2 remote-as 500            | Specify a VTEP2 loopback IP address and remote-as defined            |
| (config-router)#neighbor 2.2.2.2 update-source lo         | Configure update as loopback for VTEP2                               |
| (config-router)#neighbor 2.2.2.2 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP3 |
| (config-router)#address-family ipv4 unicast               | Enter into ipv4 unicast address family mode                          |
| (config-router-af)#network 3.3.3.3/32                     | Advertise loopback network into BGP for VTEP ID reachability         |
| (config-router-af)#neighbor 1.1.1.1 activate              | Activate 1.1.1.1 (VTEP2) into ipv4 unicast address family mode       |
| (config-router-af)#neighbor 2.2.2.2 activate              | Activate 2.2.2.2 (VTEP2) into ipv4 unicast address family mode       |
| (config-router-af)#exit-address-family                    | Exit from ipv4 unicast address family mode                           |
| (config-router)#address-family l2vpn evpn                 | Enter into L2VPN EVPN address family mode                            |
| (config-router-af)#neighbor 1.1.1.1 activate              | Activate 1.1.1.1 (VTEP1) into L2VPN evpn address family mode         |

## VxLAN Multi-Homing Configuration

|   |   |
|---|---|
| <code>(config-router-af)#neighbor 2.2.2.2 activate</code> | Activate 2.2.2.2 (VTEP2) into L2VPN evpn address family mode    |
| <code>(config-router-af)#exit-address-family</code>       | Exit from L2VPN address family mode                             |
| <code>(config-router)#exit</code>                         | Exit from Router BGP mode and enter into config mode            |
| <code>(config)#commit</code>                              | Commit the candidate configuration to the running configuration |

## VRF Configuration

|   |   |
|---|---|
| <code>(config)# mac vrf VRF1</code>                         | Create MAC routing/forwarding instance with VRF1 name and enter into VRF mode                 |
| <code>(config-vrf)#rd 3.3.3.3:11</code>                     | Assign RD value   |
| <code>(config-vrf)#route-target both 9.9.9.9:100</code>     | Assign route-target value for same for import and export. Should be same on all node for VRF1 |
| <code>(config-vrf)#exit</code>                              | Exit from VRF mode  |
| <code>(config)#mac vrf VRF2</code>                          | Create MAC routing/forwarding instance with VRF2 name and enter into VRF mode                 |
| <code>(config-vrf)#rd 3.3.3.3:21</code>                     | Assign RD value   |
| <code>(config-vrf)#route-target both 90.90.90.90:100</code> | Assign route-target value for same for import and export                                      |
| <code>(config-vrf)#exit</code>                              | Exit from VRF   |
| <code>(config)#commit</code>                                | Commit the candidate configuration to the running configuration                               |

## VxLAN Configuration

|  |   |
|--|---|
| <code>(config)#nvo vxlan enable</code>                                       | Enable VxLAN  |
| <code>(config)#nvo vxlan vtep-ip-global 3.3.3.3</code>                       | Configure Source VTEP-IP-global configuration   |
| <code>(config)#nvo vxlan id 10 ingress-replication inner-vid-disabled</code> | Configure VxLAN Network identifier with/without inner-VID-disabled configure and enter into VxLAN tenant mode |
| <code>(config-nvo)#vxlan host-reachability-protocol evpn-bgp VRF1</code>     | Assign VRF for EVPN-BGP to carry EVPN route   |
| <code>(config-nvo)#vni-name VNI-RED</code>                                   | Configure VNI-name as VNI-RED   |
| <code>(config-nvo)#exit</code>   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| <code>(config)#nvo vxlan id 20 ingress-replication inner-vid-disabled</code> | Configure VxLAN Network identifier with/without inner-VID-disabled configure and enter into VxLAN tenant mode |
| <code>(config-nvo)#vxlan host-reachability-protocol evpn-bgp VRF2</code>     | Assign VRF for EVPN-BGP to carry EVPN route   |
| <code>(config-nvo)#vni-name VNI-BLUE</code>                                  | Configure VNI-name as VNI-BLUE  |
| <code>(config-nvo)#exit</code>   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| <code>(config)#nvo vxlan access-if port-vlan xe48 1001</code>                | Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port                      |
| <code>(config-nvo-acc-if)#map vni-name VNI-RED</code>                        | Map VxLAN Identified to access-port for VxLAN   |
| <code>(config-nvo-acc-if)#exit</code>  | Exit from VxLAN access-interface mode and enter into configuration mode                                       |

|  |  |
|--|--|
| (config)#nvo vxlan access-if port-vlan xe48 1002 | Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port |
| (config-nvo-acc-if)#map vni-name VNI-RED         | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)#exit                         | Exit from VxLAN access-interface mode and enter into configuration mode                  |
| (config)#nvo vxlan access-if port-vlan xe48 3001 | Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port |
| (config-nvo-acc-if)#map vni-name VNI-BLUE        | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)#exit                         | Exit from VxLAN access-interface mode and enter into configuration mode                  |
| (config)#commit                                  | Commit the candidate configuration to the running configuration                          |
| (config)#exit                                    | Exit from configuration mode   |

## Switch (CE2)

### Multihomed to 2-VTEPs (VTEP1 and VTEP2)

|  |  |
|--|--|
| #configure terminal  | Enter Configure mode.                                      |
| (config)#bridge 1 protocol ieee vlan-bridge  | Configure IEEE VLAN bridge                                 |
| (config)#vlan 1001-1002 bridge 1 state enable                                      | Configure VLANs from 1001-1002 and associate with bridge 1 |
| (config)#vlan 3001 bridge 1 state enable   | Configure VLANs from 3001 and associate with bridge 1      |
| (config)#interface xe22  | Enter Interface mode for xe22                              |
| (config-if)#switchport   | Make xe22 as L2 port by configuring switchport             |
| (config-if)#bridge-group 1   | Associate xe22 to bridge 1                                 |
| (config-if)#switchport mode hybrid   | Configure xe22 as hybrid port                              |
| (config-if)#switchport hybrid allowed vlan add 1001-1002,3001 egress-tagged enable | Allow 1001-1002 and 3001 configured VLANs on xe22          |
| (config-if)#exit   | Exit Interface mode and return to Configure mode.          |
| (config)#interface po1   | Enter Interface mode for po1                               |
| (config-if)#switchport   | Make po1 as L2 port by configuring switchport              |
| (config-if)#bridge-group 1   | Associate po1 to bridge 1                                  |
| (config-if)#switchport mode hybrid   | Configure po1 as hybrid port                               |
| (config-if)#switchport hybrid allowed vlan add 1001-1002,3001 egress-tagged enable | Allow 1001-1002 and 3001 configured VLANs on po1           |
| (config-if)#exit   | Exit Interface mode and return to Configure mode.          |
| (config)#interface xe3   | Enter Interface mode for xe3                               |
| (config-if)#channel-group 1 mode active  | Make it member port of po1                                 |
| (config-if)#exit   | Exit Interface mode and return to Configure mode.          |
| (config)#interface xe4   | Enter Interface mode for xe4                               |
| (config-if)#channel-group 1 mode active  | Make it member port of po1                                 |
| (config-if)#exit   | Exit from configuration mode                               |
| (config)#interface xe9   | Enter Interface mode for xe9                               |

|   |   |
|---|---|
| (config-if)#channel-group 1 mode active | Make it member port of po1                                      |
| (config)#interface xe10                 | Enter Interface mode for xe10                                   |
| (config-if)#channel-group 1 mode active | Make it member port of po1                                      |
| (config-if)#exit                        | Exit Interface mode and return to Configure mode.               |
| (config)#commit                         | Commit the candidate configuration to the running configuration |
| (config)#exit                           | Exit from configuration mode                                    |

## Spine 1

Spine node where all VTEPs are connected

### Generic Configuration

|                     |   |
|---------------------|---|
| #configure terminal | Enter Configure mode.   |
| (config)#qos enable | Enabling QoS  |
| (config)#commit     | Commit the candidate configuration to the running configuration |

### Interface and Loopback Configuration

|   |   |
|---|---|
| (config)#interface lo                           | Enter Interface mode for lo                                     |
| (config-if)#ip address 11.11.11.11/32 secondary | Configure loopback IP address as 11.11.11.11 for Spine1         |
| (config-if)#exit                                | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe8                          | Enter Interface mode for xe8                                    |
| (config-if)#ip address 10.10.10.2/24            | Configure IP address as 10.10.10.2 on network side of VTEP1     |
| (config-if)#exit                                | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe1                          | Enter Interface mode for xe1                                    |
| (config-if)#ip address 30.30.30.2/24            | Configure IP address as 30.30.30.2 on network side of VTEP2     |
| (config-if)#exit                                | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe18                         | Enter Interface mode for xe18                                   |
| (config-if)#ip address 50.50.50.2/24            | Configure IP address as 50.50.50.2 on network side of VTEP3     |
| (config-if)#exit                                | Exit Interface mode and return to Configure mode.               |
| (config)#commit                                 | Commit the candidate configuration to the running configuration |

### OSPF configuration

|   |   |
|---|---|
| (config)#router ospf 100                            | Enter into router OSPF mode                         |
| (config-router)#ospf router-id 11.11.11.11          | Configure router-ID as 11.11.11.11 (lo IP address)  |
| (config-router)#network 11.11.11.11/32 area 0.0.0.0 | Add 11.11.11.11 (lo IP address) network into area 0 |

|  |   |
|--|---|
| (config-router)#network 10.10.10.0/24 area 0.0.0.0 | Add 10.10.10.0 (VTEP1) network into area 0                      |
| (config-router)#network 30.30.30.0/24 area 0.0.0.0 | Add 30.30.30.0 (VTEP2) network into area 0                      |
| (config-router)#network 50.50.50.0/24 area 0.0.0.0 | Add 50.50.50.0 (VTEP3) network into area 0                      |
| (config-router)#bfd all-interfaces                 | Enabling BFD on all OSPF interface for fast convergence         |
| (config-router)#exit                               | Exit Interface mode and return to Configure mode.               |
| (config)#commit                                    | Commit the candidate configuration to the running configuration |

## Spine 2

Spine node where all VTEPs are connected

### Generic configuration

|                     |   |
|---------------------|---|
| #configure terminal | Enter Configure mode.   |
| (config)#qos enable | Enabling QoS  |
| (config)#commit     | Commit the candidate configuration to the running configuration |

### Interface and loopback configuration

|   |   |
|---|---|
| (config)#interface lo                           | Enter Interface mode for lo                                     |
| (config-if)#ip address 22.22.22.22/32 secondary | Configure loopback IP address as 22.22.22.22 for Spine2         |
| (config-if)#exit                                | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe5                          | Enter Interface mode for xe5                                    |
| (config-if)#ip address 20.20.20.2/24            | Configure IP address as 20.20.20.2 on network side of VTEP1     |
| (config-if)#exit                                | Exit Interface mode and return to Configure mode.               |
| (config)#interface ce0                          | Enter Interface mode for ce0                                    |
| (config-if)#ip address 40.40.40.2/24            | Configure IP address as 40.40.40.2 on network side of VTEP2     |
| (config-if)#exit                                | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe19                         | Enter Interface mode for xe19                                   |
| (config-if)#ip address 60.60.60.2/24            | Configure IP address as 60.60.60.2 on network side of VTEP3     |
| (config-if)#exit                                | Exit Interface mode and return to Configure mode.               |
| (config)#commit                                 | Commit the candidate configuration to the running configuration |

## OSPF configuration

|   |   |
|---|---|
| (config)#router ospf 100                            | Enter into router OSPF mode                                     |
| (config-router)#ospf router-id 22.22.22.22          | Configure router-id as 11.11.11.11 (lo IP address)              |
| (config-router)#network 22.22.22.22/32 area 0.0.0.0 | Add 22.22.22.22 (lo IP address) network into area 0             |
| (config-router)#network 20.20.20.0/24 area 0.0.0.0  | Add 20.20.20.0 (VTEP1) network into area 0                      |
| (config-router)#network 40.40.40.0/24 area 0.0.0.0  | Add 40.40.40.0 (VTEP2) network into area 0                      |
| (config-router)#network 60.60.60.0/24 area 0.0.0.0  | Add 60.60.60.0 (VTEP3) network into area 0                      |
| (config-router)#bfd all-interfaces                  | Enabling BFD on all OSPF interface for fast convergence         |
| (config-router)#exit                                | Exit Interface mode and return to Configure mode.               |
| (config)#commit                                     | Commit the candidate configuration to the running configuration |

## Validation

### VTEP1

```
VTEP1#show nvo vxlan
VxLAN Information
=====
```

```
Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged
```

| VNIID | VNI-Name | VNI-Type | Type | Interface | ESI                           | VLAN | DF-Status | Src-Addr | Dst-Addr |
|-------|----------|----------|------|-----------|-------------------------------|------|-----------|----------|----------|
| 10    | VNI-RED  | L2       | NW   | ----      | ----                          | ---- | ----      | 1.1.1.1  | 3.3.3.3  |
| 10    | VNI-RED  | L2       | NW   | ----      | ----                          | ---- | ----      | 1.1.1.1  | 2.2.2.2  |
| 10    | VNI-RED  | --       | AC   | po1       | 00:00:00:00:00:11:11:00:00:00 | 1001 | NON-DF    | ----     | ----     |
| 10    | VNI-RED  | --       | AC   | po1       | 00:00:00:00:00:11:11:00:00:00 | 1002 | DF        | ----     | ----     |
| 20    | VNI-BLUE | L2       | NW   | ----      | ----                          | ---- | ----      | 1.1.1.1  | 3.3.3.3  |
| 20    | VNI-BLUE | L2       | NW   | ----      | ----                          | ---- | ----      | 1.1.1.1  | 2.2.2.2  |
| 20    | VNI-BLUE | --       | AC   | po1       | 00:00:00:00:00:11:11:00:00:00 | 3001 | NON-DF    | ----     | ----     |

Total number of entries are 7

```
VTEP1#show nvo vxlan access-if brief
```

| Interface | Vlan | Inner<br>vlan | Ifindex | Vnid | Admin<br>status | Link<br>status |
|-----------|------|---------------|---------|------|-----------------|----------------|
| po1       | 1002 | ---           | 500001  | 10   | up              | up             |
| po1       | 1001 | ---           | 500000  | 10   | up              | up             |
| po1       | 3001 | ---           | 500002  | 20   | up              | up             |

Total number of entries are 3

```
VTEP1#show bgp l2vpn evpn summary
BGP router identifier 1.1.1.1, local AS number 500
BGP table version is 6
1 BGP AS-PATH entries
0 BGP community entries
```



| Neighbor<br>PREFIX-ROUTE | V | AS  | MsgRcv | MsgSen | TblVer | InQ | OutQ | Up/Down  | State/PfxRcd | AD | MACIP | MCAST | ESI |   |
|--------------------------|---|-----|--------|--------|--------|-----|------|----------|--------------|----|-------|-------|-----|---|
| 2.2.2.2                  | 4 | 500 | 161    | 163    | 5      | 0   | 0    | 01:05:15 | 6            | 3  | 0     | 2     | 1   | 0 |
| 3.3.3.3                  | 4 | 500 | 157    | 161    | 5      | 0   | 0    | 01:05:07 | 2            | 0  | 0     | 2     | 0   | 0 |

Total number of neighbors 2

Total number of Established sessions 2

VTEP1#show nvo vxlan tunnel  
VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 1.1.1.1 | 3.3.3.3     | Installed | 00:31:11 | 00:31:11 |
| 1.1.1.1 | 2.2.2.2     | Installed | 01:05:25 | 00:31:11 |

Total number of entries are 2

VTEP1#show bgp l2vpn evpn multihoming es-route

RD[1.1.1.1:1] VRF[evpn-gvrf-1]:

| ESI                           | PE IP-Address | Nexthop IP | Encap |
|-------------------------------|---------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 1.1.1.1       | 1.1.1.1    | VxLAN |
| 00:00:00:00:00:11:11:00:00:00 | 2.2.2.2       | 2.2.2.2    | VxLAN |

RD[2.2.2.2:1]

| ESI                           | PE IP-Address | Nexthop IP | Encap |
|-------------------------------|---------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 2.2.2.2       | 2.2.2.2    | VxLAN |

VTEP1#show bgp l2vpn evpn multihoming ethernet-ad-per-es

RD[1.1.1.1:1] VRF[evpn-gvrf-1]:

| ESI                           | Eth-Tag    | VNID/LABEL | Nexthop IP | Encap |
|-------------------------------|------------|------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 4294967295 | 0          | 1.1.1.1    | VxLAN |

RD[1.1.1.1:11] VRF[VRF1]:

| ESI                           | Eth-Tag    | VNID/LABEL | Nexthop IP | Encap |
|-------------------------------|------------|------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 4294967295 | 0          | 2.2.2.2    | VxLAN |

RD[1.1.1.1:21] VRF[VRF2]:

| ESI                           | Eth-Tag    | VNID/LABEL | Nexthop IP | Encap |
|-------------------------------|------------|------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 4294967295 | 0          | 2.2.2.2    | VxLAN |

RD[2.2.2.2:1]

| ESI                           | Eth-Tag    | VNID/LABEL | Nexthop IP | Encap |
|-------------------------------|------------|------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 4294967295 | 0          | 2.2.2.2    | VxLAN |

VTEP1#show bgp l2vpn evpn multihoming ethernet-ad-per-evi

RD[1.1.1.1:11] VRF[VRF1]:

| ESI                           | Eth-Tag | VNID/LABEL | Nexthop IP | Encap |
|-------------------------------|---------|------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 10      | 10         | 2.2.2.2    | VxLAN |
| 00:00:00:00:00:11:11:00:00:00 | 10      | 10         | 1.1.1.1    | VxLAN |

## VxLAN Multi-Homing Configuration

```
RD[1.1.1.1:21] VRF[VRF2]:
ESI                               Eth-Tag  VNID/LABEL  Nexthop IP  Encap
00:00:00:00:00:11:11:00:00:00  20      20          2.2.2.2     VxLAN
00:00:00:00:00:11:11:00:00:00  20      20          1.1.1.1     VxLAN
```

```
RD[2.2.2.2:11]
ESI                               Eth-Tag  VNID/LABEL  Nexthop IP  Encap
00:00:00:00:00:11:11:00:00:00  10      10          2.2.2.2     VxLAN
```

```
RD[2.2.2.2:21]
ESI                               Eth-Tag  VNID/LABEL  Nexthop IP  Encap
00:00:00:00:00:11:11:00:00:00  20      20          2.2.2.2     VxLAN
```

```
VTEP1#show bgp l2vpn evpn
BGP table version is 6, local router ID is 1.1.1.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               l - labeled, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]
1 - Ethernet Auto-discovery Route
2 - MAC/IP Route
3 - Inclusive Multicast Route
4 - Ethernet Segment Route
5 - Prefix Route
```

| Network  | Next Hop | Metric | LocPrf | Weight | Path | Peer    | Encap |
|--|----------|--------|--------|--------|------|---------|-------|
| RD[1.1.1.1:1] VRF[evpn-gvrf-1]:                          |          |        |        |        |      |         |       |
| *> [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0]  | 1.1.1.1  | 0      | 100    | 32768  | i    | -----   | VxLAN |
| *> [4]:[00:00:00:00:00:11:11:00:00:00]:[32,1.1.1.1]      | 1.1.1.1  | 0      | 100    | 32768  | i    | -----   | VxLAN |
| * i [4]:[00:00:00:00:00:11:11:00:00:00]:[32,2.2.2.2]     | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| RD[1.1.1.1:11] VRF[VRF1]:                                |          |        |        |        |      |         |       |
| * i [1]:[00:00:00:00:00:11:11:00:00:00]:[10]:[10]        | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *> [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0]  | 1.1.1.1  | 0      | 100    | 32768  | i    | -----   | VxLAN |
| * i [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0] | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *> [3]:[10]:[32,1.1.1.1]                                 | 1.1.1.1  | 0      | 100    | 32768  | i    | -----   | VxLAN |
| * i [3]:[10]:[32,2.2.2.2]                                | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| * i [3]:[10]:[32,3.3.3.3]                                | 3.3.3.3  | 0      | 100    | 0      | i    | 3.3.3.3 | VxLAN |
| RD[1.1.1.1:21] VRF[VRF2]:                                |          |        |        |        |      |         |       |
| * i [1]:[00:00:00:00:00:11:11:00:00:00]:[20]:[20]        | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *> [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0]  | 1.1.1.1  | 0      | 100    | 32768  | i    | -----   | VxLAN |
| * i [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0] | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *> [3]:[20]:[32,1.1.1.1]                                 | 1.1.1.1  | 0      | 100    | 32768  | i    | -----   | VxLAN |

```

* i [3]:[20]:[32,2.2.2.2]
      2.2.2.2          0          100          0          i 2.2.2.2          VxLAN
* i [3]:[20]:[32,3.3.3.3]
      3.3.3.3          0          100          0          i 3.3.3.3          VxLAN

RD[2.2.2.2:1]
*>i [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0]
      2.2.2.2          0          100          0          i 2.2.2.2          VxLAN
*>i [4]:[00:00:00:00:00:11:11:00:00:00]:[32,2.2.2.2]
      2.2.2.2          0          100          0          i 2.2.2.2          VxLAN

RD[2.2.2.2:11]
*>i [1]:[00:00:00:00:00:11:11:00:00:00]:[10]:[10]
      2.2.2.2          0          100          0          i 2.2.2.2          VxLAN
*>i [3]:[10]:[32,2.2.2.2]
      2.2.2.2          0          100          0          i 2.2.2.2          VxLAN

RD[2.2.2.2:21]
*>i [1]:[00:00:00:00:00:11:11:00:00:00]:[20]:[20]
      2.2.2.2          0          100          0          i 2.2.2.2          VxLAN
*>i [3]:[20]:[32,2.2.2.2]
      2.2.2.2          0          100          0          i 2.2.2.2          VxLAN

RD[3.3.3.3:11]
*>i [3]:[10]:[32,3.3.3.3]
      3.3.3.3          0          100          0          i 3.3.3.3          VxLAN

RD[3.3.3.3:21]
*>i [3]:[20]:[32,3.3.3.3]
      3.3.3.3          0          100          0          i 3.3.3.3          VxLAN

```

Total number of prefixes 21

**VTEP2**

```

VTEP2#show nvo vxlan
VxLAN Information
=====

```

```

Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged

```

| VNID | VNI-Name | VNI-Type | Type | Interface | ESI                           | VLAN              | DF-Status | Src-Addr | Dst-Addr |
|------|----------|----------|------|-----------|-------------------------------|-------------------|-----------|----------|----------|
| 10   | VNI-RED  | L2       | NW   | ----      | ----                          | ----              | ----      | 2.2.2.2  | 1.1.1.1  |
| 10   | VNI-RED  | L2       | NW   | ----      | ----                          | ----              | ----      | 2.2.2.2  | 3.3.3.3  |
| 10   | VNI-RED  | --       | AC   | xe32      | ---                           | Single Homed Port | ---       | ----     | ----     |
| 10   | VNI-RED  | --       | AC   | po1       | 00:00:00:00:00:11:11:00:00:00 | 1001              | DF        | ----     | ----     |
| 10   | VNI-RED  | --       | AC   | po1       | 00:00:00:00:00:11:11:00:00:00 | 1002              | NON-DF    | ----     | ----     |
| 20   | VNI-BLUE | L2       | NW   | ----      | ----                          | ----              | ----      | 2.2.2.2  | 1.1.1.1  |
| 20   | VNI-BLUE | L2       | NW   | ----      | ----                          | ----              | ----      | 2.2.2.2  | 3.3.3.3  |
| 20   | VNI-BLUE | --       | AC   | po1       | 00:00:00:00:00:11:11:00:00:00 | 3001              | DF        | ----     | ----     |

Total number of entries are 8

```

VTEP2#show nvo vxlan access-if
% Incomplete command.

```

```

VTEP2#show nvo vxlan access-if brief

```

```

Inner                               Admin   Link

```

## VxLAN Multi-Homing Configuration

```

Interface  Vlan  vlan  Ifindex  Vnid      status  status
-----
xe32      ---   ---   500004   10        up      up
po1       1002  ---   500001   10        up      up
po1       1001  ---   500000   10        up      up
po1       3001  ---   500002   20        up      up

```

Total number of entries are 4

```

VTEP2#show bgp l2vpn evpn summary
BGP router identifier 2.2.2.2, local AS number 500
BGP table version is 4
1 BGP AS-PATH entries
0 BGP community entries

```

| Neighbor<br>PREFIX-ROUTE | V | AS  | MsgRcv | MsgSen | TblVer | InQ | OutQ | Up/Down  | State/PfxRcd | AD | MACIP | MCAST | ESI |   |
|--------------------------|---|-----|--------|--------|--------|-----|------|----------|--------------|----|-------|-------|-----|---|
| 1.1.1.1                  | 4 | 500 | 172    | 171    | 4      | 0   | 0    | 01:09:28 | 6            | 3  | 0     | 2     | 1   | 0 |
| 3.3.3.3                  | 4 | 500 | 165    | 173    | 4      | 0   | 0    | 01:09:29 | 2            | 0  | 0     | 2     | 0   | 0 |

Total number of neighbors 2

Total number of Established sessions 2

```

VTEP2#show nvo vxlan tunnel
VxLAN Network tunnel Entries

```

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 2.2.2.2 | 1.1.1.1     | Installed | 01:09:38 | 00:35:24 |
| 2.2.2.2 | 3.3.3.3     | Installed | 01:09:39 | 01:09:39 |

Total number of entries are 2

```

VTEP2#show bgp l2vpn evpn multihoming es-route

```

```

RD[1.1.1.1:1]
ESI
00:00:00:00:00:11:11:00:00:00 PE IP-Address 1.1.1.1 Nexthop IP 1.1.1.1 Encap VxLAN

```

```

RD[2.2.2.2:1] VRF[evpn-gvrf-1]:
ESI
00:00:00:00:00:11:11:00:00:00 PE IP-Address 1.1.1.1 Nexthop IP 1.1.1.1 Encap VxLAN
00:00:00:00:00:11:11:00:00:00 PE IP-Address 2.2.2.2 Nexthop IP 2.2.2.2 Encap VxLAN

```

```

VTEP2#show bgp l2vpn evpn multihoming ethernet-ad-per-es

```

```

RD[1.1.1.1:1]
ESI
00:00:00:00:00:11:11:00:00:00 Eth-Tag 4294967295 VNID/LABEL 0 Nexthop IP 1.1.1.1 Encap VxLAN

```

```

RD[2.2.2.2:1] VRF[evpn-gvrf-1]:
ESI
00:00:00:00:00:11:11:00:00:00 Eth-Tag 4294967295 VNID/LABEL 0 Nexthop IP 2.2.2.2 Encap VxLAN

```

```

RD[2.2.2.2:11] VRF[VRF1]:
ESI
00:00:00:00:00:11:11:00:00:00 Eth-Tag 4294967295 VNID/LABEL 0 Nexthop IP 1.1.1.1 Encap VxLAN

```

```

RD[2.2.2.2:21] VRF[VRF2]:
ESI
Eth-Tag VNID/LABEL Nexthop IP Encap

```

```
00:00:00:00:00:11:11:00:00:00 4294967295 0 1.1.1.1 VxLAN
```

```
VTEP2#show bgp l2vpn evpn multihoming ethernet-ad-per-evi
```

```
RD[1.1.1.1:11]
```

| ESI                           | Eth-Tag | VNID/LABEL | Nexthop IP | Encap |
|-------------------------------|---------|------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 10      | 10         | 1.1.1.1    | VxLAN |

```
RD[1.1.1.1:21]
```

| ESI                           | Eth-Tag | VNID/LABEL | Nexthop IP | Encap |
|-------------------------------|---------|------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 20      | 20         | 1.1.1.1    | VxLAN |

```
RD[2.2.2.2:11] VRF[VRF1]:
```

| ESI                           | Eth-Tag | VNID/LABEL | Nexthop IP | Encap |
|-------------------------------|---------|------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 10      | 10         | 2.2.2.2    | VxLAN |
| 00:00:00:00:00:11:11:00:00:00 | 10      | 10         | 1.1.1.1    | VxLAN |

```
RD[2.2.2.2:21] VRF[VRF2]:
```

| ESI                           | Eth-Tag | VNID/LABEL | Nexthop IP | Encap |
|-------------------------------|---------|------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 20      | 20         | 2.2.2.2    | VxLAN |
| 00:00:00:00:00:11:11:00:00:00 | 20      | 20         | 1.1.1.1    | VxLAN |

```
VTEP2# show bgp l2vpn evpn
```

```
BGP table version is 4, local router ID is 2.2.2.2
```

```
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,  
l - labeled, S Stale
```

```
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]
```

```
1 - Ethernet Auto-discovery Route  
2 - MAC/IP Route  
3 - Inclusive Multicast Route  
4 - Ethernet Segment Route  
5 - Prefix Route
```

| Network  | Next Hop | Metric | LocPrf | Weight | Path | Peer    | Encap |
|--|----------|--------|--------|--------|------|---------|-------|
| RD[1.1.1.1:1]  |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0] | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [4]:[00:00:00:00:00:11:11:00:00:00]:[32,1.1.1.1]     | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[1.1.1.1:11]   |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:11:11:00:00:00]:[10]:[10]        | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [3]:[10]:[32,1.1.1.1]                                | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[1.1.1.1:21]   |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:11:11:00:00:00]:[20]:[20]        | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [3]:[20]:[32,1.1.1.1]                                | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |

```
RD[2.2.2.2:1] VRF[evpn-gvrf-1]:
```

## VxLAN Multi-Homing Configuration

```

*> [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0]
      2.2.2.2          0          100          32768      i      -----      VxLAN
* i [4]:[00:00:00:00:00:11:11:00:00:00]:[32,1.1.1.1]
      1.1.1.1          0          100          0          i      1.1.1.1      VxLAN
*> [4]:[00:00:00:00:00:11:11:00:00:00]:[32,2.2.2.2]
      2.2.2.2          0          100          32768      i      -----      VxLAN

RD[2.2.2.2:11] VRF[VRF1]:
*> [1]:[00:00:00:00:00:11:11:00:00:00]:[10]:[10]
      2.2.2.2          0          100          32768      i      -----      VxLAN
* i [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0]
      1.1.1.1          0          100          0          i      1.1.1.1      VxLAN
* i [3]:[10]:[32,1.1.1.1]
      1.1.1.1          0          100          0          i      1.1.1.1      VxLAN
*> [3]:[10]:[32,2.2.2.2]
      2.2.2.2          0          100          32768      i      -----      VxLAN
* i [3]:[10]:[32,3.3.3.3]
      3.3.3.3          0          100          0          i      3.3.3.3      VxLAN

RD[2.2.2.2:21] VRF[VRF2]:
*> [1]:[00:00:00:00:00:11:11:00:00:00]:[20]:[20]
      2.2.2.2          0          100          32768      i      -----      VxLAN
* i [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0]
      1.1.1.1          0          100          0          i      1.1.1.1      VxLAN
* i [3]:[20]:[32,1.1.1.1]
      1.1.1.1          0          100          0          i      1.1.1.1      VxLAN
*> [3]:[20]:[32,2.2.2.2]
      2.2.2.2          0          100          32768      i      -----      VxLAN
* i [3]:[20]:[32,3.3.3.3]
      3.3.3.3          0          100          0          i      3.3.3.3      VxLAN

RD[3.3.3.3:11]
*>i [3]:[10]:[32,3.3.3.3]
      3.3.3.3          0          100          0          i      3.3.3.3      VxLAN

RD[3.3.3.3:21]
*>i [3]:[20]:[32,3.3.3.3]
      3.3.3.3          0          100          0          i      3.3.3.3      VxLAN

```

Total number of prefixes 21

### VTEP3

```
VTEP3# show nvo vxlan
```

```
VxLAN Information
```

```
=====
```

```

Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged

```

| VNID | VNI-Name | VNI-Type | Type | Interface | ESI  | VLAN              | DF-Status | Src-Addr | Dst-Addr |
|------|----------|----------|------|-----------|------|-------------------|-----------|----------|----------|
| 10   | VNI-RED  | L2       | NW   | ----      | ---- | ----              | ----      | 3.3.3.3  | 2.2.2.2  |
| 10   | VNI-RED  | L2       | NW   | ----      | ---- | ----              | ----      | 3.3.3.3  | 1.1.1.1  |
| 10   | VNI-RED  | --       | AC   | xe48      | ---  | Single Homed Port | ---       | ----     | ----     |
| 10   | VNI-RED  | --       | AC   | xe48      | ---  | Single Homed Port | ---       | ----     | ----     |
| 20   | VNI-BLUE | L2       | NW   | ----      | ---- | ----              | ----      | 3.3.3.3  | 2.2.2.2  |
| 20   | VNI-BLUE | L2       | NW   | ----      | ---- | ----              | ----      | 3.3.3.3  | 1.1.1.1  |
| 20   | VNI-BLUE | --       | AC   | xe48      | ---  | Single Homed Port | ---       | ----     | ----     |

Total number of entries are 7

VTEP3#show nvo vxlan access-if brief

| Interface | Vlan | Inner<br>vlan | Ifindex | Vnid | Admin<br>status | Link<br>status |
|-----------|------|---------------|---------|------|-----------------|----------------|
| xe48      | 1002 | ---           | 500001  | 10   | up              | up             |
| xe48      | 1001 | ---           | 500000  | 10   | up              | up             |
| xe48      | 3001 | ---           | 500002  | 20   | up              | up             |

Total number of entries are 3

VTEP3#show bgp l2vpn evpn summary  
 BGP router identifier 3.3.3.3, local AS number 500  
 BGP table version is 4  
 1 BGP AS-PATH entries  
 0 BGP community entries

| Neighbor<br>PREFIX-ROUTE | V | AS  | MsgRcv | MsgSen | TblVer | InQ | OutQ | Up/Down  | State/PfxRcd | AD | MACIP | MCAST | ESI |   |
|--------------------------|---|-----|--------|--------|--------|-----|------|----------|--------------|----|-------|-------|-----|---|
| 1.1.1.1                  | 4 | 500 | 177    | 173    | 3      | 0   | 0    | 01:11:49 | 6            | 3  | 0     | 2     | 1   | 0 |
| 2.2.2.2                  | 4 | 500 | 177    | 171    | 2      | 0   | 0    | 01:11:59 | 6            | 3  | 0     | 2     | 1   | 0 |

Total number of neighbors 2

Total number of Established sessions 2

VTEP3#show nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 3.3.3.3 | 2.2.2.2     | Installed | 01:12:10 | 01:12:10 |
| 3.3.3.3 | 1.1.1.1     | Installed | 01:12:00 | 01:12:00 |

Total number of entries are 2

VTEP3#show bgp l2vpn evpn multihoming es-route

RD[1.1.1.1:1]

| ESI                           | PE IP-Address | Nexthop IP | Encap |
|-------------------------------|---------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 1.1.1.1       | 1.1.1.1    | VxLAN |

RD[2.2.2.2:1]

| ESI                           | PE IP-Address | Nexthop IP | Encap |
|-------------------------------|---------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 2.2.2.2       | 2.2.2.2    | VxLAN |

VTEP3#show bgp l2vpn evpn multihoming ethernet-ad-per-es

RD[1.1.1.1:1]

| ESI                           | Eth-Tag    | VNID/LABEL | Nexthop IP | Encap |
|-------------------------------|------------|------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 4294967295 | 0          | 1.1.1.1    | VxLAN |

RD[2.2.2.2:1]

| ESI                           | Eth-Tag    | VNID/LABEL | Nexthop IP | Encap |
|-------------------------------|------------|------------|------------|-------|
| 00:00:00:00:00:11:11:00:00:00 | 4294967295 | 0          | 2.2.2.2    | VxLAN |

## VxLAN Multi-Homing Configuration

---

```
RD[3.3.3.3:11] VRF[VRF1]:
ESI                Eth-Tag    VNID/LABEL    Nexthop IP    Encap
00:00:00:00:00:11:11:00:00:00  4294967295  0              2.2.2.2      VxLAN
00:00:00:00:00:11:11:00:00:00  4294967295  0              1.1.1.1      VxLAN
```

```
RD[3.3.3.3:21] VRF[VRF2]:
ESI                Eth-Tag    VNID/LABEL    Nexthop IP    Encap
00:00:00:00:00:11:11:00:00:00  4294967295  0              2.2.2.2      VxLAN
00:00:00:00:00:11:11:00:00:00  4294967295  0              1.1.1.1      VxLAN
```

```
VTEP3#show bgp l2vpn evpn multihoming ethernet-ad-per-evi
```

```
RD[1.1.1.1:11]
ESI                Eth-Tag    VNID/LABEL    Nexthop IP    Encap
00:00:00:00:00:11:11:00:00:00  10          10            1.1.1.1      VxLAN
```

```
RD[1.1.1.1:21]
ESI                Eth-Tag    VNID/LABEL    Nexthop IP    Encap
00:00:00:00:00:11:11:00:00:00  20          20            1.1.1.1      VxLAN
```

```
RD[2.2.2.2:11]
ESI                Eth-Tag    VNID/LABEL    Nexthop IP    Encap
00:00:00:00:00:11:11:00:00:00  10          10            2.2.2.2      VxLAN
```

```
RD[2.2.2.2:21]
ESI                Eth-Tag    VNID/LABEL    Nexthop IP    Encap
00:00:00:00:00:11:11:00:00:00  20          20            2.2.2.2      VxLAN
```

```
RD[3.3.3.3:11] VRF[VRF1]:
ESI                Eth-Tag    VNID/LABEL    Nexthop IP    Encap
00:00:00:00:00:11:11:00:00:00  10          10            2.2.2.2      VxLAN
00:00:00:00:00:11:11:00:00:00  10          10            1.1.1.1      VxLAN
```

```
RD[3.3.3.3:21] VRF[VRF2]:
ESI                Eth-Tag    VNID/LABEL    Nexthop IP    Encap
00:00:00:00:00:11:11:00:00:00  20          20            2.2.2.2      VxLAN
00:00:00:00:00:11:11:00:00:00  20          20            1.1.1.1      VxLAN
```

```
VTEP3#show bgp l2vpn evpn
BGP table version is 4, local router ID is 3.3.3.3
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               l - labeled, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]
1 - Ethernet Auto-discovery Route
2 - MAC/IP Route
3 - Inclusive Multicast Route
4 - Ethernet Segment Route
5 - Prefix Route
```



| Network  | Next Hop | Metric | LocPrf | Weight | Path | Peer    | Encap |
|--|----------|--------|--------|--------|------|---------|-------|
| RD[1.1.1.1:1]  |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0] | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [4]:[00:00:00:00:00:11:11:00:00:00]:[32,1.1.1.1]     | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[1.1.1.1:11]   |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:11:11:00:00:00]:[10]:[10]        | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [3]:[10]:[32,1.1.1.1]                                | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[1.1.1.1:21]   |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:11:11:00:00:00]:[20]:[20]        | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [3]:[20]:[32,1.1.1.1]                                | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[2.2.2.2:1]  |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0] | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *>i [4]:[00:00:00:00:00:11:11:00:00:00]:[32,2.2.2.2]     | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| RD[2.2.2.2:11]   |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:11:11:00:00:00]:[10]:[10]        | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *>i [3]:[10]:[32,2.2.2.2]                                | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| RD[2.2.2.2:21]   |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:11:11:00:00:00]:[20]:[20]        | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *>i [3]:[20]:[32,2.2.2.2]                                | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| RD[3.3.3.3:11] VRF[VRF1]:                                |          |        |        |        |      |         |       |
| * i [1]:[00:00:00:00:00:11:11:00:00:00]:[10]:[10]        | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| * i  | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| * i [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0] | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| * i  | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| * i [3]:[10]:[32,1.1.1.1]                                | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| * i [3]:[10]:[32,2.2.2.2]                                | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *> [3]:[10]:[32,3.3.3.3]                                 | 3.3.3.3  | 0      | 100    | 32768  | i    | -----   | VxLAN |
| RD[3.3.3.3:21] VRF[VRF2]:                                |          |        |        |        |      |         |       |
| * i [1]:[00:00:00:00:00:11:11:00:00:00]:[20]:[20]        | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| * i  | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| * i [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0] | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| * i  | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |

## VxLAN Multi-Homing Configuration

```
* i [3]:[20]:[32,1.1.1.1]
      1.1.1.1          0      100      0      i 1.1.1.1      VxLAN
* i [3]:[20]:[32,2.2.2.2]
      2.2.2.2          0      100      0      i 2.2.2.2      VxLAN
*> [3]:[20]:[32,3.3.3.3]
      3.3.3.3          0      100      32768  i -----      VxLAN
```

Total number of prefixes 22

---

## Static MAC-IP Advertise through Single Home and Multihomed VTEPs

Advertise static MAC IPv4 from MH1 and SH3.

MH1-VTEPs: VTEP1 & VTEP2- same MAC should be configured on both VTEPs under po access-port, configs should be symmetric between MH VTEPs

SH3-VTEP: VTEP3

---

### VTEP1 (MH1)

|   |   |
|---|---|
| #configure terminal                                   | Enter Configure mode.   |
| (config)# nvo vxlan access-if port-vlan po1 1001      | Enter into VxLAN MH po1 access-port with VLAN 1001              |
| (config-nvo-acc-if)# mac 0000.1111.1001 ip 11.11.10.1 | Configure static MAC IP   |
| (config-nvo-acc-if)#exit                              | Exit from VxLAN access-port config mode                         |
| (config)#commit                                       | Commit the candidate configuration to the running configuration |
| (config)#exit   | Exit from configuration mode                                    |

---

### VTEP2 (MH1)

|   |   |
|---|---|
| #configure terminal                                   | Enter Configure mode.   |
| (config)#nvo vxlan access-if port-vlan po1 1001       | Enter into VxLAN MH po1 access-port with vlan 1001              |
| (config-nvo-acc-if)# mac 0000.1111.1001 ip 11.11.10.1 | Configure static MAC IP   |
| (config-nvo-acc-if)#exit                              | Exit from VxLAN access-port config mode                         |
| (config)#commit                                       | Commit the candidate configuration to the running configuration |
| (config)#exit   | Exit from configuration mode                                    |

## VTEP3 (SH)

|  |   |
|--|---|
| #configure terminal                                  | Enter Configure mode.   |
| (config)# nvo vxlan access-if port-vlan xe48 1001    | Enter into single-homed access-port - xe48 with VLAN 1001       |
| (config-nvo-acc-if)#mac 0000.3333.1001 ip 11.11.10.2 | Configure static MAC IP   |
| (config-nvo-acc-if)#exit                             | Exit from VxLAN access-port config mode                         |
| (config)#commit                                      | Commit the candidate configuration to the running configuration |
| (config)#exit  | Exit from configuration mode                                    |

## Validation

Verify MAC-table in MH VTEPs and Single Home VTEP, MAC will be advertised through ESI value which is advertised from VTEP1 and VTEP2 and VTEP IP from SH VTEP VTEP3.

Verify ARP-cache table in all VTEPs, VTEP1 and VTEP2 will learn VTEP3 IP.

Any ARP request comes for 11.11.10.2, VTEP1/VTEP2 will do proxy-ARP.

## VTEP1

```
VTEP1#show nvo vxlan mac-table
```

```
=====
```

VxLAN MAC Entries

```
=====
```

| VNID | Interface | VlanId | Inner-VlanId | Mac-Addr       | VTEP-IP/ESI                   | Type          | Status | AccessPortDesc |
|------|-----------|--------|--------------|----------------|-------------------------------|---------------|--------|----------------|
| 10   | po1       | 1001   | ----         | 0000.1111.1001 | 00:00:00:00:00:11:11:00:00:00 | Static Local  | -----  | -----          |
| 10   | ----      | ----   | ----         | 0000.3333.1001 | 3.3.3.3                       | Static Remote | -----  | -----          |

Total number of entries are : 2

```
VTEP1#show nvo vxlan arp-cache
```

```
VxLAN ARP-CACHE Information
```

```
=====
```

| VNID | Ip-Addr    | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|------------|----------------|---------------|---------|--------------|
| 10   | 11.11.10.1 | 0000.1111.1001 | Static Local  | ----    |              |
| 10   | 11.11.10.2 | 0000.3333.1001 | Static Remote | ----    |              |

Total number of entries are 2

## VTEP2

```
VTEP2#show nvo vxlan mac-table
```

```
=====
```

VxLAN MAC Entries

```
=====
```

| VNID | Interface | VlanId | Inner-VlanId | Mac-Addr       | VTEP-IP/ESI                   | Type          | Status | AccessPortDesc |
|------|-----------|--------|--------------|----------------|-------------------------------|---------------|--------|----------------|
| 10   | po1       | 1001   | ----         | 0000.1111.1001 | 00:00:00:00:00:11:11:00:00:00 | Static Local  | -----  | -----          |
| 10   | ----      | ----   | ----         | 0000.3333.1001 | 3.3.3.3                       | Static Remote | -----  | -----          |

Total number of entries are : 2

VTEP2#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

```
=====
```

| VNID | Ip-Addr    | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|------------|----------------|---------------|---------|--------------|
| 10   | 11.11.10.1 | 0000.1111.1001 | Static Local  | ----    |              |
| 10   | 11.11.10.2 | 0000.3333.1001 | Static Remote | ----    |              |

Total number of entries are 2

### VTEP3

VTEP3#show nvo vxlan mac-table

```
=====
```

VxLAN MAC Entries

```
=====
```

| VNID | Interface | VlanId | Inner-VlanId | Mac-Addr       | VTEP-IP/ESI                   | Type          | Status | AccessPortDesc |
|------|-----------|--------|--------------|----------------|-------------------------------|---------------|--------|----------------|
| 10   | ----      | 1001   | ----         | 0000.1111.1001 | 00:00:00:00:00:11:11:00:00:00 | Static Remote | -----  | -----          |
| 10   | xe48      | 1001   | ----         | 0000.3333.1001 | 3.3.3.3                       | Static Local  | -----  | -----          |

Total number of entries are : 2

VTEP3#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

```
=====
```

| VNID | Ip-Addr    | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|------------|----------------|---------------|---------|--------------|
| 10   | 11.11.10.1 | 0000.1111.1001 | Static Remote | ----    |              |
| 10   | 11.11.10.2 | 0000.3333.1001 | Static Local  | ----    |              |

Total number of entries are 2

---

## Dynamic MAC Advertise through Single Home and Multihomed VTEPs

Advertise 2 MAC's through CE1 connected IXIA, dynamic MAC entries and verify MAC-table in all VTEPs.

One MAC will be dynamic local in VTEP1 and same will be remote in VTEP2 and other be dynamic local in VTEP2 and same will be remote in VTEP1.

Both MAC's will be in remote in VTEP3.

---

### VTEP1

VTEP1#show nvo vxlan mac-table

```
=====
```

VxLAN MAC Entries

```
=====
```

| VNID | Interface | VlanId | Inner-VlanId | Mac-Addr       | VTEP-IP/ESI                   | Type           | Status | AccessPortDesc |
|------|-----------|--------|--------------|----------------|-------------------------------|----------------|--------|----------------|
| 10   | po1       | 1001   | ----         | 0000.1111.1002 | 00:00:00:00:00:11:11:00:00:00 | Dynamic Local  | -----  | -----          |
| 10   | ----      | 1002   | ----         | 0000.1111.1003 | 00:00:00:00:00:11:11:00:00:00 | Dynamic Remote | -----  | -----          |

Total number of entries are : 2

VTEP1#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

```

=====
VNID      Ip-Addr      Mac-Addr      Type      Age-Out      Retries-Left
-----
10        21.21.21.1   0000.1111.1002 Dynamic Local ----
10        31.1.31.1    0000.1111.1003 Dynamic Remote ----
Total number of entries are 2

```

## VTEP2

```
VTEP2#show nvo vxlan mac-table
```

```

=====
                                  VxLAN MAC Entries
=====
VNID      Interface VlanId Inner-VlanId Mac-Addr      VTEP-IP/ESI      Type      Status      AccessPortDesc
-----
10        ----      1001      ----      0000.1111.1002 00:00:00:00:00:11:11:00:00:00 Dynamic Remote -----
10        po1       1002      ----      0000.1111.1003 00:00:00:00:00:11:11:00:00:00 Dynamic Local  -----

```

```
Total number of entries are : 2
```

```
VTEP2#show nvo vxla arp-cache
```

```
VxLAN ARP-CACHE Information
```

```

=====
VNID      Ip-Addr      Mac-Addr      Type      Age-Out      Retries-Left
-----
10        21.21.21.1   0000.1111.1002 Dynamic Remote ----
10        31.1.31.1    0000.1111.1003 Dynamic Local  ----
Total number of entries are 2

```

## VTEP3

```
VTEP3#show nvo vxlan mac-table
```

```

=====
                                  VxLAN MAC Entries
=====
VNID      Interface VlanId Inner-VlanId Mac-Addr      VTEP-IP/ESI      Type      Status      AccessPortDesc
-----
10        ----      1001      ----      0000.1111.1002 00:00:00:00:00:11:11:00:00:00 Dynamic Remote -----
10        ----      1002      ----      0000.1111.1003 00:00:00:00:00:11:11:00:00:00 Dynamic Remote -----

```

```
Total number of entries are : 2
```

```
VTEP3#show nvo vxlan arp-cache
```

```
VxLAN ARP-CACHE Information
```

```

=====
VNID      Ip-Addr      Mac-Addr      Type      Age-Out      Retries-Left
-----
10        21.21.21.1   0000.1111.1002 Dynamic Remote ----
10        31.1.31.1    0000.1111.1003 Dynamic Remote ----
Total number of entries are 2

```

Note:

- When VTEP1 tunnel goes down, then traffic from VTEP3 will use VTEP2 for forwarding. But Traffic from Switch to VTEP1 will be lost in VTEP1 itself.

- When DUT is rebooted, access-if will be in hold down state until ESI hold timer value expiry. After ESI hold timer expiry, access-if port will be up and started learning.
- MAC Hold timer will not be applicable on ESI interface, because of mass-withdraw requirement.
- A CE can connect to maximum two nodes for multihoming, more than two nodes in a multihoming group is not supported.
- All configuration (shutdown, disable learning, disable arp/nd cache, disable arp/nd flood, map vnid, qos profiles, encapsulation) on a multihomed access port should be same on both VTEPs sharing the ESI for multihoming functionalities to work properly.
- Multiple ESI values are supported on same VTEP.

## CHAPTER 7 VxLAN Quality of Service Configuration

---

This chapter contains the configurations for VxLAN Quality of Service (QoS).

---

### Overview

VxLAN enables multiple tenants to operate in a data center. Each tenant is assigned a priority group to prioritize their traffic. Cloud carriers want to use quality of service to differentiate different applications.

Data center networks are being increasingly used by telecommunications operators as well as by enterprises. Currently these networks are organized as one large Layer 2 network in a single building. In some cases, such a network is extended geographically using Virtual Local Area Network (VLAN) technologies as an even larger Layer 2 network connecting the virtual machines (VM), each with its own MAC address.

Multiple tenants might want their own isolated network domain. In a data center hosting multiple tenants, each tenant may independently assign MAC addresses and VLAN IDs and this might lead to duplication.

Cloud carriers wish to categorize the traffic based on the application such as voice, video, etc. Based on the type of the application different traffic classes may be identified and different priority levels can be assigned to each. To do so, quality of service marking is needed in VxLAN.

This chapter shows how to mark packet headers with the VxLAN tunnel end point (VTEP) when the frames are introduced by the virtual machines. The (re)marking /setting of QoS field DSCP/TOS in the VxLAN IP header is done with the two modes which are set globally.

Two commands support L2 VxLAN QoS:

- `qos profile dscp-encap`: Use this command to create new profiles or to update "default" profiles for `dscp-dscpEncap` and Queue to DSCP value. This profile will be mapped to `nvo vxlan tunnel` at the egress direction of the VTEP. Default Qos profile `dscp-encap` would take preference than default qos profile `queue-color-to dscp` when no user-defined qos profile is configured on the `nvo vxlan tunnel` mode.
- `l2 queue dscp`: Use this command to configure or update user defined mapping for queue to dscp for egress L2 Traffic over VxLAN tunnel.

## Topology

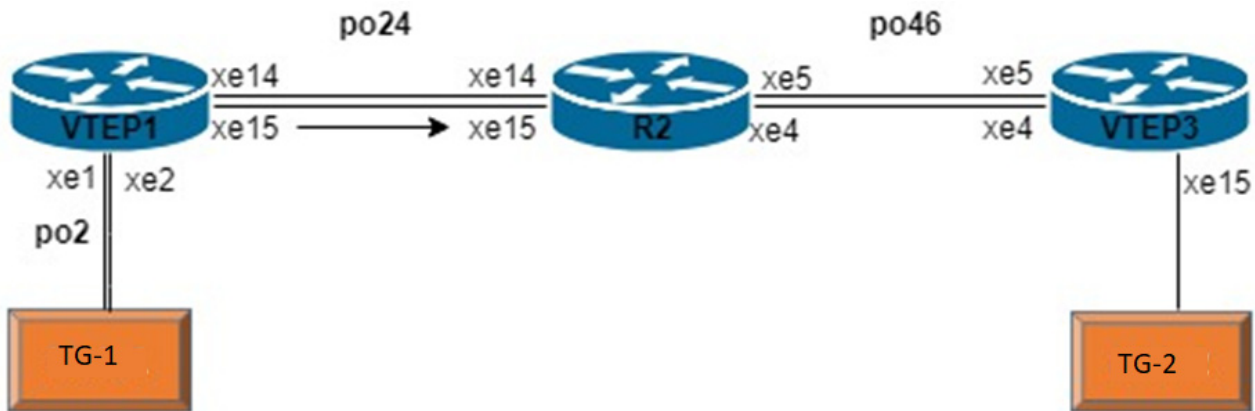


Figure 7-8: VxLAN QoS

## COS-DSCP

### RTR1/VTEP1

|  |   |
|--|---|
| VTEP1#configure terminal                               | Enter Configure mode.   |
| VTEP1(config)#mac vrf vrf1                             | Create mac routing/forwarding instance with vrf1 name and enter into vrf mode   |
| VTEP1(config-vrf)#rd 1.1.1.1:11                        | Assign RD value   |
| VTEP1(config-vrf)#route-target both 10.10.10.10:100    | Assign route-target value for import/export   |
| VTEP1(config-vrf)#exit                                 | Exit form vrf mode  |
| VTEP1(config)#hardware-profile filter vxlan enable     | Enable hardware profile for vxlan   |
| VTEP1(config)#qos enable                               | Enable qos  |
| VTEP1(config)#qos profile cos-to-queue COS-QUE         | Create qos profile for mapping traffic towards tunnel from access-if.   |
| VTEP1(config-ingress-cos-map)#cos 2 queue 3            | Configure particular COS value to the queue value for configured profile.   |
| VTEP1(config-ingress-cos-map)#exit                     | Exit from qos profile config mode   |
| VTEP1(config)#qos profile queue-color-to-dscp QUE-DSCP | Create qos profile for attaching in vxlan tunnel egress.  |
| OR   |   |
| VTEP1(config)#qos profile dscp-encap DSCP-ENCAP        | Either one of the qos profile CLI can be configured. Functionality of queue-color-to-dscp and dscp-encap qos profiles remains the same. |



|  |   |
|--|---|
| VTEP1(config-egress-dscp-map)#queue 3 dscp 16          | Configure particular queue value to the dscp value for configured profile.  |
| OR   |   |
| VTEP1(config-egress-dscp-encap-map)#12 queue 3 dscp 16 | Either one of the qos profile CLI can be configured. Functionality of queue-color-to-dscp and dscp-encap qos profiles remains the same. |
| VTEP1(config-egress-dscp-encap-map)#exit               | Exit from qos profile config mode   |
| VTEP1(config)#interface po2                            | Create a port channel po2   |
| VTEP1(config-if)#switchport                            | Configure port as switchport  |
| VTEP1(config-if)#load-interval 30                      | Set load-interval   |
| VTEP1(config-if)#interface po24                        | Create a port channel po24  |
| VTEP1(config-if)#load-interval 30                      | Configure port as switchport  |
| VTEP1(config-if)#ip address 24.1.1.1/30                | Set load-interval   |
| VTEP1(config-if)#interface lo                          | Enter in to loopback interface  |
| VTEP1(config-if)#ip address 1.1.1.1/32 secondary       | Configure ip address  |
| VTEP1(config-if)#interface xe1                         | Enter in to interface mode  |
| VTEP1(config-if)#channel-group 2 mode active           | Map to channel-group  |
| VTEP1(config-if)#interface xe2                         | Enter in to interface mode  |
| VTEP1(config-if)#channel-group 2 mode active           | Map to channel-group  |
| VTEP1(config-if)#interface xe14                        | Enter in to interface mode  |
| VTEP1(config-if)#channel-group 24 mode active          | Map to channel-group  |
| VTEP1(config-if)#interface xe15                        | Enter in to interface mode  |
| VTEP1(config-if)#channel-group 24 mode active          | Map to channel-group  |
| VTEP1(config-if)#router ospf 1                         | Create ospf instance  |
| VTEP1(config-router)#ospf router-id 1.1.1.1            | Configure ospf router-id  |
| VTEP1(config-router)#network 1.1.1.1/32 area 0.0.0.0   | Configure loopback network address in to ospf   |
| VTEP1(config-router)#network 24.1.1.0/30 area 0.0.0.0  | Configure network address in to ospf  |
| VTEP1(config-router)#router bgp 100                    | Enter into Router BGP mode  |
| VTEP1(config-router)#neighbor 6.6.6.6 remote-as 100    | Specify a neighbor router with peer ip address and remote-as defined  |
| VTEP1(config-router)#neighbor 6.6.6.6 update-source lo | Specify the neighbor to use loopback address as source  |
| VTEP1(config-router)#address-family l2vpn evpn         | Enter into l2vpn evpn address-family  |
| VTEP1(config-router-af)#neighbor 6.6.6.6 activate      | Activate the neighbor to address-family   |
| VTEP1(config-router)#nvo vxlan vtep-ip-global 1.1.1.1  | Configure Source vtep-ip-global configuration   |

## VxLAN Quality of Service Configuration

|  |  |
|--|--|
| VTEP1(config)#nvo vxlan tunnel qos-map-mode cos-dscp egress QUE-DSCP<br>OR<br>VTEP1(config)#nvo vxlan tunnel qos-map-mode cos-dscp egress DSCP-ENCAP | Configure the mapping qos profile in to vxlan tunnel egress<br><br>Configure the mapping qos profile in to vxlan tunnel egress |
| VTEP1(config)#nvo vxlan id 1 in-gress-replication inner-vid-disabled   | Create vnid 1 and disable inner-vid  |
| VTEP1(config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf1   | Assign vrf for evpn-bgp to carry EVPN route  |
| VTEP1(config-nvo)#nvo vxlan access-if port-vlan po2 1001   | Create vxlan access-if with vlan 1001  |
| VTEP1(config-nvo-acc-if)#no shutdown   | No shut the vxlan access-if  |
| VTEP1(config-nvo-acc-if)#map vnid 1  | Map vnid to the vxlan access-if  |
| VTEP1(config-nvo-acc-if)#map qos-profile cos-to-queue COS-QUE  | Map qos profile for vxlan access-if ingress traffic from CE  |
| VTEP1(config-nvo-acc-if)#exit  | Exit from VxLAN access-interface mode and enter into configuration mode.   |
| VTEP1(config)#commit   | Commit the candidate configuration to the running configuration  |

## RTR2

|   |   |
|---|---|
| R2#configure terminal                             | Enter Configure mode.                               |
| R2(config)#interface po24                         | Create port channel                                 |
| R2(config-if)#load-interval 30                    | Set load-interval                                   |
| R2(config-if)#ip address 24.1.1.2/30              | Assign ip address                                   |
| R2(config-if)#interface po46                      | Create port channel                                 |
| R2(config-if)#load-interval 30                    | Set load-interval                                   |
| R2(config-if)#ip address 46.1.1.1/30              | Assign ip address                                   |
| R2(config-if)#interface lo                        | Enter in to loopback interface                      |
| R2(config-if)#ip address 4.4.4.4/32 secondary     | Assign secondary ip address                         |
| R2(config-if)#interface xe4                       | Enter into interface mode                           |
| R2(config-if)#channel-group 46 mode active        | Map port channel to the interface                   |
| R2(config-if)#interface xe5                       | Enter into interface mode                           |
| R2(config-if)#channel-group 46 mode active        | Map port channel to the interface                   |
| R2(config-if)#interface xe14                      | Enter into interface mode                           |
| R2(config-if)#channel-group 24 mode active        | Map port channel to the interface                   |
| R2(config-if)#interface xe15                      | Enter into interface mode                           |
| R2(config-if)#channel-group 24 mode active        | Map port channel to the interface                   |
| R2(config-if)#router ospf 1                       | Create ospf instance                                |
| R2(config-router)#ospf router-id 4.4.4.4          | Configure ospf router-id                            |
| R2(config-router)#network 4.4.4.4/32 area 0.0.0.0 | Configure ospf network address with respective area |

|  |   |
|--|---|
| R2(config-router)#network 24.1.1.0/30 area 0.0.0.0 | Configure ospf network address with respective area             |
| R2(config-router)#network 46.1.1.0/30 area 0.0.0.0 | Configure ospf network address with respective area             |
| R2(config-router)#exit                             | Exit from router mode.  |
| R2(config)#commit                                  | Commit the candidate configuration to the running configuration |

**RTR3/VTEP2**

|   |   |
|---|---|
| VTEP3#configure terminal  | Enter Configuration mode  |
| VTEP3(config)#mac vrf vrf1                                      | Create mac routing/forwarding instance with vrf1 name and enter into vrf mode |
| VTEP3(config-vrf)#rd 6.6.6.6:11                                 | Assign RD value   |
| VTEP3(config-vrf)#route-target both 10.10.10.10:100             | Assign route-target value for import/export                                   |
| VTEP1(config-vrf)#exit  | Exit from vrf mode  |
| VTEP1(config)#hardware-profile filter vxlan enable              | Enable hardware profile for vxlan   |
| VTEP3(config)#qos enable  | Enable QOS  |
| VTEP3(config)#qos statistics                                    | Enable QOS statistics   |
| VTEP3(config)#qos profile queue-color-to-cos QUE-COS            | Create qos profile for mapping incoming traffic from tunnel to access-if.     |
| VTEP3(config-egress-cos-map)#queue 4 cos 5                      | Configure particular queue value to the cos value for configured profile.     |
| VTEP3(config-egress-cos-map)#qos profile dscp-to-queue DSCP-QUE | Create qos profile for attaching in vxlan tunnel ingress.                     |
| VTEP3(config-ingress-dscp-map)#dscp 16 queue 4                  | Configure particular dscp value to the queue value for configured profile.    |
| VTEP3(config-egress-dscp-map)#interface po46                    | Create port channel   |
| VTEP3(config-if)#load-interval 30                               | Set load interval   |
| VTEP3(config-if)#ip address 46.1.1.2/30                         | Assign ip address   |
| VTEP3(config-if)#interface lo                                   | Enter into loopback interface   |
| VTEP3(config-if)#ip address 6.6.6.6/32 secondary                | Assign secondary ip address   |
| VTEP3(config-if)#interface xe4                                  | Enter into interface mode   |
| VTEP3(config-if)#channel-group 46 mode active                   | Map channel group into the interface  |
| VTEP3(config-if)#interface xe5                                  | Enter into interface mode   |
| VTEP3(config-if)#channel-group 46 mode active                   | Map channel group into the interface  |
| VTEP3(config-if)#interface xe15                                 | Enter into interface mode   |
| VTEP3(config-if)#switchport                                     | Make interface as L2 port   |
| VTEP3(config-if)#load-interval 30                               | Set load interval   |
| VTEP3(config-if)#router ospf 1                                  | Create ospf instance  |

|   |   |
|---|---|
| VTEP3(config-router)#ospf router-id 6.6.6.6                           | Configure ospf router-id  |
| VTEP3(config-router)#network 6.6.6.6/32 area 0.0.0.0                  | Configure ospf network address with respective area                     |
| VTEP3(config-router)#network 46.1.1.0/30 area 0.0.0.0                 | Configure ospf network address with respective area                     |
| VTEP3(config-router)#router bgp 100                                   | Enter into Router BGP mode  |
| VTEP3(config-router)#neighbor 1.1.1.1 remote-as 100                   | Specify a neighbor router with peer ip address and remote-as defined    |
| VTEP3(config-router)#neighbor 1.1.1.1 update-source lo                | Specify the neighbor to use loopback address as source                  |
| VTEP3(config-router)#address-family l2vpn evpn                        | Enter into l2vpn evpn address-family                                    |
| VTEP3(config-router-af)#neighbor 1.1.1.1 activate                     | Activate the neighbor to address-family                                 |
| VTEP3(config)#nvo vxlan vtep-ip-global 6.6.6.6                        | Configure Source vtep-ip-global configuration                           |
| VTEP3(config)#nvo vxlan tunnel qos-map-mode cos-dscp ingress DSCP-QUE | Configure the mapping qos profile in to vxlan tunnel ingress            |
| VTEP3(config)#nvo vxlan id 1 ingress-replication inner-vid-disabled   | Create vnid 1 and disable inner-vid                                     |
| VTEP3(config-nvo)#vxlan host-reachability-protocol evpn-bgp vrf1      | Assign vrf for evpn-bgp to carry EVPN route                             |
| VTEP3(config-nvo)#nvo vxlan access-if port-vlan xe15 1000             | Create vxlan access-if with vlan 1000                                   |
| VTEP3(config-nvo-acc-if)#no shutdown                                  | No shut the vxlan access-if   |
| VTEP3(config-nvo-acc-if)#map vnid 1                                   | Map vnid to the vxlan access-if   |
| VTEP3(config-nvo-acc-if)#map qos-profile queue-color-to-cos QUE-COS   | Map qos profile for vxlan access-if egress traffic to CE                |
| VTEP3(config-nvo-acc-if)#exit   | Exit from VxLAN access-interface mode and enter into configuration mode |
| VTEP3(config)#commit  | Commit the candidate configuration to the running configuration         |

## Validation

As per the qos configuration, when L2 traffic with cos value 2 sent to VTEP1 access-if, the packets forwarded to queue 3 and packets in queue 3 are mapped with dscp value 16 while egress out of tunnel. At VTEP2, when packets with dscp value 16 ingress at tunnel, it is forwarded to queue 4 and packets of queue 4 are remarked with cos value 5.

### RTR1/VTEP1

```
VTEP1#sh run nvo vxlan
!
nvo vxlan enable
!
nvo vxlan vtep-ip-global 1.1.1.1
!
nvo vxlan tunnel qos-map-mode cos-dscp egress QUE-DSCP (OR DSCP-ENCAP)
```

```

!
nvo vxlan id 1 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp vrf1
!
nvo vxlan access-if port-vlan po2 1001
  map vnid 1
  map qos-profile cos-to-queue COS-QUE
!
VTEP1#show run qos
qos enable
!
qos profile cos-to-queue COS-QUE
  cos 2 queue 3
!
qos profile queue-color-to-dscp QUE-DSCP
  queue 3 color all dscp 16
!
                                OR
VTEP1#show run qos
qos enable
!
qos profile cos-to-queue COS-QUE
  cos 2 queue 3
!
qos profile dscp-encap DSCP-ENCAP
  12 queue 3 dscp 16
!

```

```

VTEP1#sh int xe14 count queue-stats
E - Egress, I - Ingress, Q-Size is in bytes
+-----+-----+-----+-----+-----+
+-----+
| Queue/Class-map | Q-Size | Tx pkts | Tx bytes | Dropped pkts |
Dropped bytes |
+-----+-----+-----+-----+-----+
+-----+
q0          (E) 12517376 0          0          0          0
q1          (E) 12517376 0          0          0          0
q2          (E) 12517376 0          0          0          0
q3          (E) 12517376 205284588 188040683524 0          0
q4          (E) 12517376 0          0          0          0
q5          (E) 12517376 0          0          0          0
q6          (E) 12517376 0          0          0          0
q7          (E) 12517376 7518       1007412    0          0

```

```

VTEP1#sh int xe15 count queue-stats
E - Egress, I - Ingress, Q-Size is in bytes
+-----+-----+-----+-----+-----+
+-----+
| Queue/Class-map | Q-Size | Tx pkts | Tx bytes | Dropped pkts |
Dropped bytes |
+-----+-----+-----+-----+-----+

```

## VxLAN Quality of Service Configuration

```

+-----+-----+-----+-----+-----+
+-----+
q0      (E) 12517376 0          0          0          0
q1      (E) 12517376 0          0          0          0
q2      (E) 12517376 0          0          0          0
q3      (E) 12517376 205624494 188352040168 0          0
q4      (E) 12517376 0          0          0          0
q5      (E) 12517376 0          0          0          0
q6      (E) 12517376 0          0          0          0
q7      (E) 12517376 9006      1136741    0          0
  
```

VTEP1#

VTEP1#show nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port  
 AC - Access Port  
 (u) - Untagged

| VNID     | VNI-Name | VNI-Type | Type | Interface                  | ESI   | VLAN  | DF-Status |
|----------|----------|----------|------|----------------------------|-------|-------|-----------|
| Src-Addr | Dst-Addr |          |      |                            |       |       |           |
| 1        | -----    | L2       | NW   | -----                      | ----- | ----- | -----     |
| 1.1.1.1  | 6.6.6.6  |          |      |                            |       |       |           |
| 1        | -----    | AC       | po2  | --- Single Hommed port --- | 1001  | ----- | -----     |
| -----    |          |          |      |                            |       |       |           |

Total number of entries are 3

VTEP1#show nvo vxlan mac-table

=====

### VxLAN MAC Entries

| VNID    | Interface | VlanId | Inner-VlanId | Mac-Addr       | VTEP-Ip/ESI |
|---------|-----------|--------|--------------|----------------|-------------|
| Type    |           | Status |              | AccessPortDesc |             |
| 1       | po2       | 1001   | -----        | 0000.2000.9991 | 1.1.1.1     |
| Dynamic | Local     | -----  |              | -----          |             |

Total number of entries are : 1

VTEP1#show nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 1.1.1.1 | 6.6.6.6     | Installed | 00:11:29 | 00:11:29 |

Total number of entries are 2

VTEP1#

**RTR3/VTEP3**

```
VTEP3#show run nvo vxlan
!
nvo vxlan enable
!
nvo vxlan vtep-ip-global 6.6.6.6
!
nvo vxlan tunnel qos-map-mode cos-dscp ingress DSCP-QUE
!
nvo vxlan id 1 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp vrfl
!
nvo vxlan access-if port-vlan xe15 1000
  map vnid 1
  map qos-profile queue-color-to-cos QUE-COS
!
!
VTEP3#sh run qos
qos enable
qos statistics
!
qos profile queue-color-to-cos QUE-COS
  queue 4 color all cos 5
!
qos profile dscp-to-queue DSCP-QUE
  dscp 16 queue 4
!
VTEP3#show nvo vxlan mac-table
```

```
=====
=====
                                     VxLAN MAC Entries
=====
=====
```

| VNID<br>Type        | Interface | VlanId<br>Status | Inner-VlanId | Mac-Addr<br>AccessPortDesc | VTEP-Ip/ESI |
|---------------------|-----------|------------------|--------------|----------------------------|-------------|
| 1<br>Dynamic Remote | ----      | -----            | ----         | 0000.2000.9991<br>-----    | 1.1.1.1     |

Total number of entries are : 1

```
VTEP3#show nvo vxlan tunnel
VxLAN Network tunnel Entries
```

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 6.6.6.6 | 1.1.1.1     | Installed | 00:09:39 | 00:09:39 |

Total number of entries are 2

# VxLAN Quality of Service Configuration

```
VTEP3#sh nvo vxlan
```

```
VxLAN Information
```

```
=====
```

```
Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged
```

```
VNID      VNI-Name      VNI-Type Type Interface ESI          VLAN DF-Status
Src-Addr      Dst-Addr
```

```
-----
1         ----         L2      NW      ----      ----      ----      ----
6.6.6.6         1.1.1.1
1         ----         AC   xe15      --- Single Hommed port --- 1000 ----      ----
-----
```

```
Total number of entries are 3
```

```
VTEP3#
```

```
VTEP3#show int xe15 count queue-stats
```

```
E - Egress, I - Ingress, Q-Size is in bytes
```

```
+-----+-----+-----+-----+-----+-----+
+-----+
| Queue/Class-map | Q-Size | Tx pkts | Tx bytes | Dropped pkts |
Dropped bytes |
+-----+-----+-----+-----+-----+-----+
q0                (E) 12517376 0          0          0          0
q1                (E) 12517376 0          0          0          0
q2                (E) 12517376 0          0          0          0
q3                (E) 12517376 0          0          0          0
q4                (E) 12517376 37895872 36455829826 0          0
q5                (E) 12517376 0          0          0          0
q6                (E) 12517376 0          0          0          0
q7                (E) 12517376 0          0          0          0
```

```
VTEP3#
```



# CHAPTER 8 VxLAN Tunnel Over SVI

This chapter contains the configurations for VxLAN Tunnel Over SVI.

## Overview

VxLAN EVPN solution is envisioned to simplify the topology and configurations in Data Centers (DC). In Data Centers, CLOS topology was used, which makes network side pure L3 and uses EBGp as IGP.

VxLAN solution is required for Service Providers (SP) as well to run few of the services or all services in their network over VxLAN. When they choose to run few services over VxLAN, then on the network side there will be a need to run VxLAN over SVI.

## Topology

The Topology shown below contains the 3 VTEPS i.e VTEP1 ,VTEP2 and VTEP3 and 3 core nodes P1 ,P2 and P3. Vxlan tunnel will be established between VTEPS over SVI interfaces. OSPF as IGP will be running between VTEPS and the core node to provide the end to end connectivity. Switch is connected between host and VTEP-1, VTEP-2 via dynamic LAG.

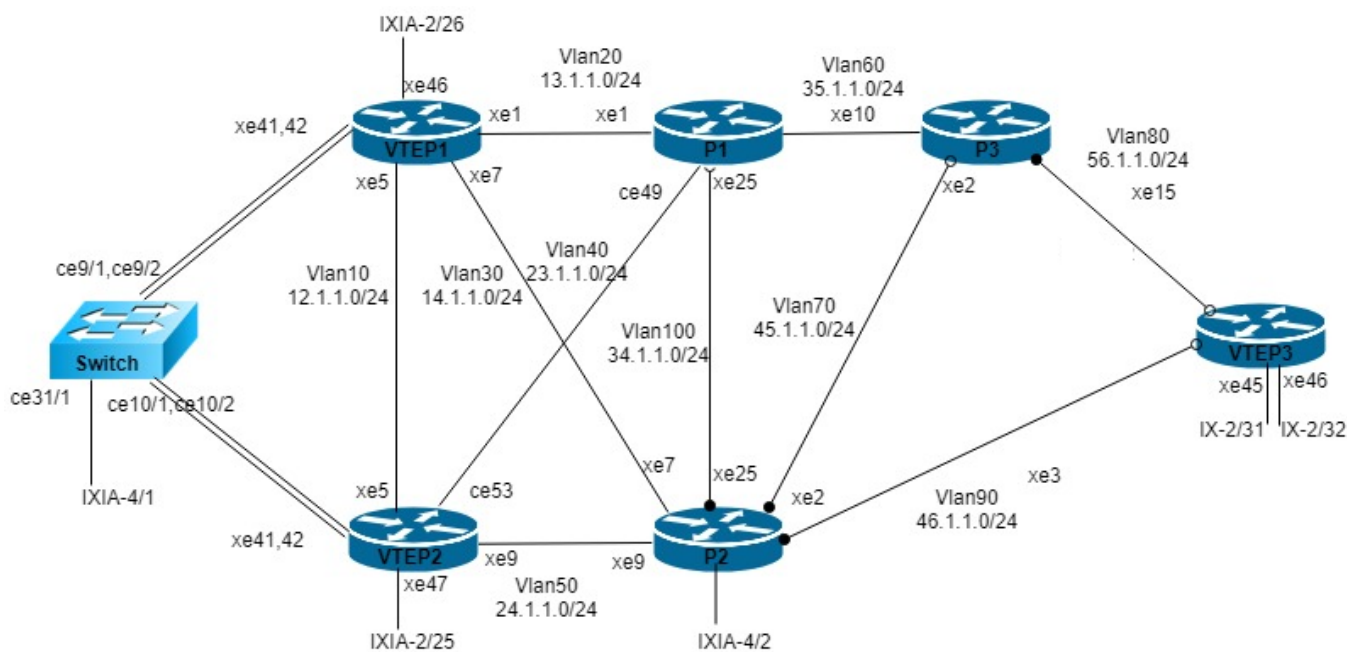


Figure 8-9: VxLAN over SVI

### RTR1/VTEP1

|                              |                              |
|------------------------------|------------------------------|
| VTEP1#configure terminal     | Enter configuration terminal |
| VTEP1(config)#hostname VTEP1 | Configure hostname           |

## VxLAN Tunnel Over SVI

|  |   |
|--|---|
| VTEP1(config)#mac vrf vrf1                                   | Configure mac vrf vrf1                            |
| VTEP1(config-vrf)# rd 1.1.1.1:11                             | Configure RD for vrf1                             |
| VTEP1(config-vrf)# route-target both 10.10.10.10:100         | Configure RT for vrf1                             |
| VTEP1(config-vrf)#mac vrf vrf2                               | Configure mac vrf vrf2                            |
| VTEP1(config-vrf)# rd 1.1.1.1:12                             | Configure RD for vrf2                             |
| VTEP1(config-vrf)# route-target both 10.10.10.10:102         | Configure RT for vrf2                             |
| VTEP1(config-vrf)#bfd interval 3 minrx 3 multiplier 3        | Configure bfd interval globally                   |
| VTEP1(config)#hardware-profile filter egress-ipv4 enable     | Enable hardware filter for egress ipv4            |
| VTEP1(config)#hardware-profile filter vxlan enable           | Enable vxlan in hardware                          |
| VTEP1(config)# hardware-profile filter vxlan-mh enable       | Enable vxlan-mh in hardware                       |
| VTEP1(config)#hardware-profile statistics ac-lif enable      | Enable ac-lif for enabling vxlan counters         |
| VTEP1(config)#evpn vxlan multihoming enable                  | Enable evpn vxlan multihoming                     |
| VTEP1(config)#nvo vxlan enable                               | Enable vxlan                                      |
| VTEP1(config)#qos enable                                     | Enable qos  |
| VTEP1(config)#qos statistics                                 | Enable qos statistics                             |
| VTEP1(config)#bridge 1 protocol ieee vlan-bridge             | Configure IEEE vlan bridge                        |
| VTEP1(config)#no bridge 1 spanning-tree enable               | Disable spanning tree in bridge 1 globally        |
| VTEP1(config)#no igmp snooping                               | Disable igmp snooping messages globally           |
| VTEP1(config)#vlan database                                  | Enter into the vlan database                      |
| VTEP1(config-vlan)# vlan 10-200 bridge 1 state enable        | Configure vlan 10-200 and associate with bridge 1 |
| VTEP1(config-vlan)# vlan 4000 bridge 1 state enable          | Configure vlan 4000 and associate with bridge 1   |
| VTEP1(config-vlan)#interface po1                             | Enter interface mode                              |
| VTEP1(config-if)# switchport                                 | Set the interface as Layer2 port                  |
| VTEP1(config-if)# load-interval 30                           | Configure load period in multiple of 30 seconds   |
| VTEP1(config-if)# evpn multi-homed system-mac aa22.3344.5566 | Configure evpn system-mac                         |
| VTEP1(config-if)#interface lo                                | Enter lo interface mode                           |
| VTEP1(config-if)# ip address 1.1.1.1/32 secondary            | Assign loopback ip                                |
| VTEP1(config-if)#interface vlan1.10                          | Specify interface vlan1.10 to be configured.      |
| VTEP1(config-if)# ip address 12.1.1.1/24                     | Assign ip address                                 |
| VTEP1(config-if)# ip ospf cost 1                             | Change ospf cost of the link                      |
| VTEP1(config-if)#interface vlan1.20                          | Specify interface vlan1.20 to be configured.      |
| VTEP1(config-if)# ip address 13.1.1.1/24                     | Assign ip address                                 |

|   |   |
|---|---|
| VTEP1(config-if)# ip ospf cost 1                          | Change ospf cost of the link  |
| VTEP1(config-if)#interface vlan1.30                       | Specify interface vlan1.30 to be configured.                          |
| VTEP1(config-if)# ip address 14.1.1.1/24                  | Assign ip address   |
| VTEP1(config-if)# ip ospf cost 1                          | Change ospf cost of the link  |
| VTEP1(config-if)#interface xe1                            | Enter interface mode  |
| VTEP1(config-if)# switchport                              | Set the interface as Layer2 port                                      |
| VTEP1(config-if)# bridge-group 1 spanning-tree disable    | Associate the interface with bridge group 1 and disable spanning tree |
| VTEP1(config-if)# switchport mode trunk                   | Set the switching characteristics of this interface to trunk mode.    |
| VTEP1(config-if)# switchport trunk allowed vlan add 20,29 | Enable VLAN's allowed on this interface.                              |
| VTEP1(config-if)# switchport trunk native vlan 29         | Configure native vlan   |
| VTEP1(config-if)# load-interval 30                        | Configure load period in multiple of 30 seconds                       |
| VTEP1(config-if)# spanning-tree edgeport                  | Set the port as an edge-port to enable rapid transitions              |
| VTEP1(config-if)#interface xe5                            | Enter interface mode  |
| VTEP1(config-if)# switchport                              | Set the interface as Layer2 port                                      |
| VTEP1(config-if)# bridge-group 1 spanning-tree disable    | Associate the interface with bridge group 1 and disable spanning tree |
| VTEP1(config-if)# switchport mode trunk                   | Set the switching characteristics of this interface to trunk mode.    |
| VTEP1(config-if)# switchport trunk allowed vlan add 10,19 | Enable VLAN's allowed on this interface.                              |
| VTEP1(config-if)# switchport trunk native vlan 19         | Configure native vlan   |
| VTEP1(config-if)# load-interval 30                        | Configure load period in multiple of 30 seconds                       |
| VTEP1(config-if)# spanning-tree edgeport                  | Set the port as an edge-port to enable rapid transitions              |
| VTEP1(config-if)#interface xe7                            | Enter interface mode  |
| VTEP1(config-if)# switchport                              | Set the interface as Layer2 port                                      |
| VTEP1(config-if)# bridge-group 1 spanning-tree disable    | Associate the interface with bridge group 1 and disable spanning tree |
| VTEP1(config-if)# switchport mode trunk                   | Set the switching characteristics of this interface to trunk mode.    |
| VTEP1(config-if)# switchport trunk allowed vlan add 30,39 | Enable VLAN's allowed on this interface.                              |
| VTEP1(config-if)# switchport trunk native vlan 39         | Configure native vlan   |
| VTEP1(config-if)# load-interval 30                        | Configure load period in multiple of 30 seconds                       |
| VTEP1(config-if)# spanning-tree edgeport                  | Set the port as an edge-port to enable rapid transitions              |
| VTEP1(config-if)#interface xe41                           | Enter interface mode  |
| VTEP1(config-if)# channel-group 1 mode active             | Map this interface to po1   |
| VTEP1(config-if)#interface xe42                           | Enter interface mode  |
| VTEP1(config-if)# channel-group 1 mode active             | Map this interface to po1   |

## VxLAN Tunnel Over SVI

|   |  |
|---|--|
| VTEP1(config-if)#interface xe46   | Enter interface mode   |
| VTEP1(config-if)# switchport  | Map this interface to po1  |
| VTEP1(config-if)#router ospf 1  | Enter ospf configuration mode  |
| VTEP1(config-router)# ospf router-id 1.1.1.1                            | Configure ospf router id   |
| VTEP1(config-router)# bfd all-interfaces                                | Enable bfd in all ospf interfaces  |
| VTEP1(config-router)# network 1.1.1.1/32<br>area 0.0.0.0                | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| VTEP1(config-router)# network 12.1.1.0/24<br>area 0.0.0.0               | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| VTEP1(config-router)# network 13.1.1.0/24<br>area 0.0.0.0               | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| VTEP1(config-router)# network 14.1.1.0/24<br>area 0.0.0.0               | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| VTEP1(config-router)#router bgp 100                                     | Enter Router BGP mode and define the AS number 100.  |
| VTEP1(config-router)# address-family ipv4<br>unicast                    | Enter address-family ipv4 unicast mode   |
| VTEP1(config-router)# network 1.1.1.1/32                                | Add the lo network to bgp route  |
| VTEP1(config-router-af)# neighbor 2.2.2.2<br>activate                   | Activate neighbors   |
| VTEP1(config-router-af)# neighbor 6.6.6.6<br>activate                   | Activate neighbors   |
| VTEP1(config-router-af)#exit-address-family                             | Exit address-family mode.  |
| VTEP1(config-router)# neighbor 2.2.2.2<br>remote-as 100                 | Configure bgp remote-as 100 with neighbor IP   |
| VTEP1(config-router)# neighbor 2.2.2.2<br>update-source lo              | Define BGP neighbors, to update the source routes with lo                                    |
| (config-router)#neighbor 2.2.2.2<br>advertisement-interval 0            | Configure advertisement-interval as 0 for fast convergence for VTEP2                         |
| VTEP1(config-router)# neighbor 6.6.6.6<br>remote-as 100                 | Configure bgp remote-as 100 with neighbor IP   |
| VTEP1(config-router)# neighbor 6.6.6.6<br>update-source lo              | Define BGP neighbors, to update the source routes with lo                                    |
| (config-router)#neighbor 6.6.6.6<br>advertisement-interval 0            | Configure advertisement-interval as 0 for fast convergence for VTEP3                         |
| VTEP1(config-router)# address-family l2vpn<br>evpn                      | Enter in to bgp l2vpn evpn address-family  |
| VTEP1(config-router-af)# neighbor 2.2.2.2<br>activate                   | Activate neighbors   |
| VTEP1(config-router-af)# neighbor 6.6.6.6<br>activate                   | Activate neighbors   |
| VTEP1(config-router-af)# exit-address-<br>family                        | Exit from bgp l2vpn evpn address-family  |
| VTEP1(config-router)#nvo vxlan vtep-ip-<br>global 1.1.1.1               | Configure vxlan global ip  |
| VTEP1(config)#nvo vxlan id 1 ingress-<br>replication inner-vid-disabled | Create vnid 1  |
| VTEP1(config-nvo)# vxlan host-reachability-<br>protocol evpn-bgp vrf1   | Associate vnid with evpn and vrf1  |

|  |   |
|--|---|
| VTEP1(config-nvo)#nvo vxlan id 1000 ingress-replication inner-vid-disabled | Create vnid 1000  |
| VTEP1(config-nvo)# vxlan host-reachability-protocol evpn-bgp vrf2          | Associate vnid with evpn and vrf2                               |
| VTEP1(config-nvo-acc-if)#nvo vxlan access-if port-vlan po1 2000            | Create vxlan access port port-vlan                              |
| VTEP1(config-nvo-acc-if)# no shutdown                                      | Unshut the access interface                                     |
| VTEP1(config-nvo-acc-if)# map vnid 1000                                    | Map the vnid to access-if                                       |
| VTEP1(config-nvo)#nvo vxlan access-if port xe46                            | Create vxlan access port  |
| VTEP1(config-nvo-acc-if)# no shutdown                                      | Unshut the access interface                                     |
| VTEP1(config-nvo-acc-if)# map vnid 1                                       | Map the vnid to access-if                                       |
| VTEP1(config-nvo-acc-if)#nvo vxlan access-if port-vlan po1 1000            | Create vxlan access port port-vlan                              |
| VTEP1(config-nvo-acc-if)# no shutdown                                      | Unshut the access interface                                     |
| VTEP1(config-nvo-acc-if)# map vnid 1                                       | Map the vnid to access-if                                       |
| VTEP1(config-nvo-acc-if)# mac 0000.1111.1111 ip 100.1.1.100                | Configure static mac ip   |
| VTEP1(config-nvo-acc-if)# mac 0000.1111.1112                               | Configure static mac  |
| VTEP1(config-nvo-acc-if)# mac 0000.1111.1113                               | Configure static mac  |
| VTEP1(config-nvo-acc-if)# mac 0000.1111.1114                               | Configure static mac  |
| VTEP1(config-nvo-acc-if)# mac 0000.1111.1115                               | Configure static mac  |
| VTEP1(config-nvo-acc-if)# commit   | Commit the candidate configuration to the running configuration |

## VTEP2

|  |  |
|--|--|
| VTEP2#configure terminal                                 | Enter configuration terminal           |
| VTEP2(config)#hostname VTEP2                             | Configure hostname                     |
| VTEP2(config)#mac vrf vrf1                               | Configure mac vrf vrf1                 |
| VTEP2(config-vrf)# rd 2.2.2.2:11                         | Configure RD for vrf1                  |
| VTEP2(config-vrf)# route-target both 10.10.10.10:100     | Configure RT for vrf1                  |
| VTEP2(config-vrf)#mac vrf vrf2                           | Configure mac vrf vrf2                 |
| VTEP2(config-vrf)# rd 2.2.2.2:12                         | Configure RD for vrf2                  |
| VTEP2(config-vrf)# route-target both 10.10.10.10:102     | Configure RT for vrf2                  |
| VTEP2(config)#hardware-profile filter egress-ipv4 enable | Enable hardware filter for egress ipv4 |
| VTEP2(config)#hardware-profile filter vxlan enable       | Enable vxlan in hardware               |
| VTEP2(config)#nvo vxlan enable                           | Enable vxlan                           |
| VTEP2(config)# hardware-profile filter vxlan-mh enable   | Enable vxlan-mh in hardware            |
| VTEP2(config)#evpn vxlan multihoming enable              | Enable evpn vxlan multihoming          |

## VxLAN Tunnel Over SVI

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| VTEP2(config)#hardware-profile statistics<br>ac-lif enable   | Enable ac-lif for enabling vxlan counters                             |
| VTEP2(config)#qos enable                                     | Enable qos  |
| VTEP2(config)#qos statistics                                 | Enable qos statistics   |
| VTEP2(config)#bridge 1 protocol ieee vlan-bridge             | Configure IEEE vlan bridge  |
| VTEP2(config)#no bridge 1 spanning-tree enable               | Disable spanning tree in bridge 1 globally                            |
| VTEP2(config)#vlan database                                  | Enter into the vlan database  |
| VTEP2(config-vlan)# vlan 10-200 bridge 1 state enable        | Configure vlan 10-200 and associate with bridge 1                     |
| VTEP2(config-vlan)#interface po1                             | Enter interface mode  |
| VTEP2(config-if)# switchport                                 | Set the interface as Layer2 port                                      |
| VTEP2(config-if)# load-interval 30                           | Configure load period in multiple of 30 seconds                       |
| VTEP2(config-if)# evpn multi-homed system-mac aa22.3344.5566 | Configure evpn system-mac   |
| VTEP2(config-if)#interface lo                                | Enter interface mode  |
| VTEP2(config-if)# ip address 2.2.2.2/32 secondary            | Configure loopback ip   |
| VTEP2(config-if)#interface vlan1.10                          | Specify interface vlan1.10 to be configured.                          |
| VTEP2(config-if)# ip address 12.1.1.2/24                     | Assign ip address   |
| VTEP2(config-if)#interface vlan1.40                          | Specify interface vlan1.40 to be configured.                          |
| VTEP2(config-if)# ip address 23.1.1.1/24                     | Assign ip address   |
| VTEP2(config-if)# ip ospf cost 1                             | Change ospf cost of the link  |
| VTEP2(config-if)#interface vlan1.50                          | Specify interface vlan1.50 to be configured.                          |
| VTEP2(config-if)# ip address 24.1.1.1/24                     | Assign ip address   |
| VTEP2(config-if)#interface ce53                              | Enter interface mode  |
| VTEP2(config-if)# switchport                                 | Set the interface as Layer2 port                                      |
| VTEP2(config-if)# bridge-group 1 spanning-tree disable       | Associate the interface with bridge group 1 and disable spanning tree |
| VTEP2(config-if)# switchport mode trunk                      | Set the switching characteristics of this interface to trunk mode.    |
| VTEP2(config-if)# switchport trunk allowed vlan add 40,49    | Enable VLAN's allowed on this interface.                              |
| VTEP2(config-if)# switchport trunk native vlan 49            | Configure native vlan   |
| VTEP2(config-if)# load-interval 30                           | Configure load period in multiple of 30 seconds                       |
| VTEP2(config-if)# spanning-tree edgeport                     | Set the port as an edge-port to enable rapid transitions              |
| VTEP2(config-if)#interface xe5                               | Enter interface mode  |
| VTEP2(config-if)# switchport                                 | Set the interface as Layer2 port                                      |
| VTEP2(config-if)# bridge-group 1 spanning-tree disable       | Associate the interface with bridge group 1 and disable spanning tree |
| VTEP2(config-if)# switchport mode trunk                      | Set the switching characteristics of this interface to trunk mode     |

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| VTEP2(config-if)# switchport trunk allowed vlan add 10,19 | Enable VLAN's allowed on this interface  |
| VTEP2(config-if)# switchport trunk native vlan 19         | Configure native vlan  |
| VTEP2(config-if)# load-interval 30                        | Configure load period in multiple of 30 seconds  |
| VTEP2(config-if)# spanning-tree edgeport                  | Set the port as an edge-port to enable rapid transitions                                     |
| VTEP2(config-if)#interface xe9                            | Enter interface mode   |
| VTEP2(config-if)# switchport                              | Set the interface as Layer2 port   |
| VTEP2(config-if)# bridge-group 1 spanning-tree disable    | Associate the interface with bridge group 1 and disable spanning tree                        |
| VTEP2(config-if)# switchport mode trunk                   | Set the switching characteristics of this interface to trunk mode.                           |
| VTEP2(config-if)# switchport trunk allowed vlan add 50,59 | Enable VLAN's allowed on this interface.   |
| VTEP2(config-if)# switchport trunk native vlan 59         | Configure native vlan  |
| VTEP2(config-if)# load-interval 30                        | Configure load period in multiple of 30 seconds  |
| VTEP2(config-if)# spanning-tree edgeport                  | Set the port as an edge-port to enable rapid transitions                                     |
| VTEP2(config-if)#interface xe41                           | Enter interface mode   |
| VTEP2(config-if)# channel-group 1 mode active             | Map the interface to po1   |
| VTEP2(config-if)#interface xe42                           | Enter interface mode   |
| VTEP2(config-if)# channel-group 1 mode active             | Map the interface to po1   |
| VTEP2(config-if)#interface xe47                           | Enter interface mode   |
| VTEP2(config-if)# switchport                              | Set the interface as Layer2 port   |
| VTEP2(config-if)#router ospf 1                            | Enter ospf configuration mode  |
| VTEP2(config-router)# ospf router-id 2.2.2.2              | Configure ospf router id   |
| VTEP2(config-router)# network 2.2.2.2/32 area 0.0.0.0     | Enable bfd in all ospf interfaces  |
| VTEP2(config-router)# network 12.1.1.0/24 area 0.0.0.0    | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| VTEP2(config-router)# network 23.1.1.0/24 area 0.0.0.0    | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| VTEP2(config-router)# network 24.1.1.0/24 area 0.0.0.0    | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| VTEP2(config-router)# network 25.1.1.0/24 area 0.0.0.0    | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| VTEP2(config-router)#router bgp 100                       | Enter Router BGP mode and define the AS number 100.  |
| VTEP2(config-router)# address-family ipv4 unicast         | Enter address-family ipv4 unicast mode   |
| VTEP2(config-router)# network 2.2.2.2/32                  | Add the lo network to bgp route  |
| VTEP2(config-router-af)# neighbor 1.1.1.1 activate        | Activate neighbors   |
| VTEP2(config-router-af)# neighbor 6.6.6.6 activate        | Activate neighbors   |
| VTEP2(config-router-af)#exit-address-family               | Exit address-family mode.  |

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| VTEP2(config-router)# neighbor 1.1.1.1<br>remote-as 100                        | Configure bgp remote-as 100 with neighbor IP                         |
| VTEP2(config-router)#neighbor 1.1.1.1<br>advertisement-interval 0              | Configure advertisement-interval as 0 for fast convergence for VTEP1 |
| VTEP2(config-router)# neighbor 1.1.1.1<br>update-source lo                     | Define BGP neighbors, to update the source routes with lo            |
| VTEP2(config-router)# neighbor 6.6.6.6<br>remote-as 100                        | Configure bgp remote-as 100 with neighbor IP                         |
| VTEP2(config-router)#neighbor 6.6.6.6<br>advertisement-interval 0              | Configure advertisement-interval as 0 for fast convergence for VTEP3 |
| VTEP2(config-router)# neighbor 6.6.6.6<br>update-source lo                     | Define BGP neighbors, to update the source routes with lo            |
| VTEP2(config-router)# address-family l2vpn<br>evpn                             | Enter in to bgp l2vpn evpn address-family                            |
| VTEP2(config-router-af)# neighbor 1.1.1.1<br>activate                          | Activate neighbors   |
| VTEP2(config-router-af)# neighbor 6.6.6.6<br>activate                          | Activate neighbors   |
| VTEP2(config-router-af)# exit-address-<br>family                               | Exit from bgp l2vpn evpn address-family                              |
| VTEP2(config-router)#nvo vxlan vtep-ip-<br>global 2.2.2.2                      | Configure vxlan global ip  |
| VTEP2(config)#nvo vxlan id 1 ingress-<br>replication inner-vid-disabled        | Create vnid 1  |
| VTEP2(config-nvo)# vxlan host-reachability-<br>protocol evpn-bgp vrf1          | Associate vnid with evpn and vrf1                                    |
| VTEP2(config-nvo)#nvo vxlan id 1000 ingress-<br>replication inner-vid-disabled | Create vnid 1000   |
| VTEP2(config-nvo)# vxlan host-reachability-<br>protocol evpn-bgp vrf2          | Associate vnid with evpn and vrf2                                    |
| VTEP2(config-nvo)#nvo vxlan access-if port<br>xe47                             | Create vxlan access port   |
| VTEP2(config-nvo-acc-if)# map vnid 1   | Map the vnid to access-if  |
| VTEP2(config-nvo-acc-if)#nvo vxlan access-if<br>port-vlan pol 2001             | Create vxlan access port   |
| VTEP2(config-nvo-acc-if)# map vnid 1000  | Map the vnid to access-if  |
| VTEP2(config-nvo-acc-if)#nvo vxlan access-if<br>port-vlan pol 2000             | Create vxlan access port   |
| VTEP2(config-nvo-acc-if)# map vnid 1000  | Map the vnid to access-if  |
| VTEP2(config-nvo-acc-if)# commit   | Commit the candidate configuration to the running configuration      |

### P1

|   |                                 |
|---|---------------------------------|
| P1#configure terminal                             | Enter configuration terminal    |
| P1(config)#hostname P1                            | Configure hostname              |
| P1(config)#bfd interval 3 minrx 3 multiplier<br>3 | Configure bfd interval globally |
| P1(config)#qos enable                             | Enable qos                      |



|  |   |
|--|---|
| P1(config)#bridge 1 protocol ieee vlan-bridge          | Configure IEEE vlan bridge  |
| P1(config)#no bridge 1 spanning-tree enable            | Disable spanning tree in bridge 1 globally                            |
| P1(config)#no igmp snooping                            | Disable igmp snooping messages globally                               |
| P1(config)#vlan database                               | Enter into the vlan database  |
| P1(config-vlan)# vlan 10-200 bridge 1 state enable     | Configure vlan 10-200 and associate with bridge 1                     |
| P1(config-if)#interface lo                             | Enter loopback interface mode   |
| P1(config-if)# ip address 3.3.3.3/32 secondary         | Assign loopback ip  |
| P1(config-if)#interface vlan1.20                       | Specify interface vlan1.20 to be configured.                          |
| P1(config-if)# ip address 13.1.1.2/24                  | Assign ip address   |
| P1(config-if)# ip ospf cost 1                          | Change ospf cost of the link  |
| P1(config-if)#interface vlan1.40                       | Specify interface vlan1.40 to be configured.                          |
| P1(config-if)# ip address 23.1.1.2/24                  | Assign ip address   |
| P1(config-if)#interface vlan1.60                       | Specify interface vlan1.60 to be configured.                          |
| P1(config-if)# ip address 35.1.1.1/24                  | Assign ip address   |
| P1(config-if)# ip ospf cost 1                          | Change ospf cost of the link  |
| P1(config-if)#interface vlan1.100                      | Specify interface vlan1.100 to be configured.                         |
| P1(config-if)# ip address 34.1.1.1/24                  | Assign ip address   |
| P1(config-if)# ip ospf cost 1                          | Change ospf cost of the link  |
| P1(config-vlan)#interface ce49                         | Enter interface mode  |
| P1(config-if)# switchport                              | Set the interface as Layer2 port                                      |
| P1(config-if)# bridge-group 1 spanning-tree disable    | Associate the interface with bridge group 1 and disable spanning tree |
| P1(config-if)# switchport mode trunk                   | Set the switching characteristics of this interface to trunk mode.    |
| P1(config-if)# switchport trunk allowed vlan add 40,49 | Enable VLAN's allowed on this interface.                              |
| P1(config-if)# switchport trunk native vlan 49         | Configure native vlan   |
| P1(config-if)# load-interval 30                        | Configure load period in multiple of 30 seconds                       |
| P1(config-if)# spanning-tree edgeport                  | Set the port as an edge-port to enable rapid transitions              |
| P1(config-if)#interface xe1                            | Enter interface mode  |
| P1(config-if)# switchport                              | Set the interface as Layer2 port                                      |
| P1(config-if)# bridge-group 1 spanning-tree disable    | Associate the interface with bridge group 1 and disable spanning tree |
| P1(config-if)# switchport mode trunk                   | Set the switching characteristics of this interface to trunk mode.    |
| P1(config-if)# switchport trunk allowed vlan add 20,29 | Enable VLAN's allowed on this interface.                              |
| P1(config-if)# switchport trunk native vlan 29         | Configure native vlan   |
| P1(config-if)# load-interval 30                        | Configure load period in multiple of 30 seconds                       |
| P1(config-if)# mtu 1600                                | Change the interface mtu value  |

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|--|--|
| P1(config-if)# spanning-tree edgeport                    | Set the port as an edge-port to enable rapid transitions                                     |
| P1(config-if)#interface xe10                             | Enter interface mode   |
| P1(config-if)# switchport                                | Set the interface as Layer2 port   |
| P1(config-if)# bridge-group 1 spanning-tree disable      | Associate the interface with bridge group 1 and disable spanning tree                        |
| P1(config-if)# switchport mode trunk                     | Set the switching characteristics of this interface to trunk mode.                           |
| P1(config-if)# switchport trunk allowed vlan add 60,69   | Enable VLAN's allowed on this interface.   |
| P1(config-if)# switchport trunk native vlan 69           | Configure native vlan  |
| P1(config-if)# load-interval 30                          | Configure load period in multiple of 30 seconds  |
| P1(config-if)# mtu 1600                                  | Change the interface mtu value   |
| P1(config-if)# spanning-tree edgeport                    | Set the port as an edge-port to enable rapid transitions                                     |
| P1(config-if)#interface xe25                             | Enter interface mode   |
| P1(config-if)# switchport                                | Set the interface as Layer2 port   |
| P1(config-if)# bridge-group 1 spanning-tree disable      | Associate the interface with bridge group 1 and disable spanning tree                        |
| P1(config-if)# switchport mode trunk                     | Set the switching characteristics of this interface to trunk mode.                           |
| P1(config-if)# switchport trunk allowed vlan add 100,109 | Enable VLAN's allowed on this interface.   |
| P1(config-if)# switchport trunk native vlan 109          | Configure native vlan  |
| P1(config-if)# load-interval 30                          | Configure load period in multiple of 30 seconds  |
| P1(config-if)# spanning-tree edgeport                    | Set the port as an edge-port to enable rapid transitions                                     |
| P1(config-if)#router ospf 1                              | Enter ospf configuration mode  |
| P1(config-router)# ospf router-id 3.3.3.3                | Configure ospf router id   |
| P1(config-router)# bfd all-interfaces                    | Enable bfd in all ospf interfaces  |
| P1(config-router)# network 3.3.3.3/32 area 0.0.0.0       | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P1(config-router)# network 10.10.10.0/24 area 0.0.0.0    | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P1(config-router)# network 13.1.1.0/24 area 0.0.0.0      | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P1(config-router)# network 23.1.1.0/24 area 0.0.0.0      | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P1(config-router)# network 34.1.1.0/24 area 0.0.0.0      | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P1(config-router)# network 35.1.1.0/24 area 0.0.0.0      | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P1(config-router)# commit                                | Commit the candidate configuration to the running configuration                              |

**P2**

|  |   |
|--|---|
| P2#configure terminal                                  | Enter configuration terminal  |
| P2(config)#bfd interval 3 minrx 3 multiplier 3         | Configure bfd interval globally                                       |
| P2(config)#qos enable                                  | Enable qos  |
| P2(config)#hostname P2                                 | Configure hostname  |
| P2(config)#bridge 1 protocol ieee vlan-bridge          | Configure IEEE vlan bridge  |
| P2(config)#no bridge 1 spanning-tree enable            | Disable spanning tree in bridge 1 globally                            |
| P2(config)#no igmp snooping                            | Disable igmp snooping messages globally                               |
| P2(config)#vlan database                               | Enter into the vlan database  |
| P2(config-vlan)# vlan 10-200 bridge 1 state enable     | Configure vlan 10-200 and associate with bridge 1                     |
| P2(config-vlan)#interface lo                           | Enter lo interface mode   |
| P2(config-if)# ip address 4.4.4.4/32 secondary         | Assign loopback ip  |
| P2(config-if)#interface vlan1.30                       | Specify interface vlan1.30 to be configured.                          |
| P2(config-if)# ip address 14.1.1.2/24                  | Assign ip address   |
| P2(config-if)# ip ospf cost 1                          | Change ospf cost of the link  |
| P2(config-if)#interface vlan1.50                       | Specify interface vlan1.50 to be configured.                          |
| P2(config-if)# ip address 24.1.1.2/24                  | Assign ip address   |
| P2(config-if)#interface vlan1.70                       | Specify interface vlan1.70 to be configured.                          |
| P2(config-if)# ip address 45.1.1.1/24                  | Assign ip address   |
| P2(config-if)# ip ospf cost 1                          | Change ospf cost of the link  |
| P2(config-if)#interface vlan1.90                       | Specify interface vlan1.90 to be configured.                          |
| P2(config-if)# ip address 46.1.1.1/24                  | Assign ip address   |
| P2(config-if)# ip ospf cost 1                          | Change ospf cost of the link  |
| P2(config-if)#interface vlan1.100                      | Specify interface vlan1.100 to be configured.                         |
| P2(config-if)# ip address 34.1.1.2/24                  | Assign ip address   |
| P2(config-if)# ip ospf cost 1                          | Change ospf cost of the link  |
| P2(config-if)#interface xe2                            | Enter interface mode  |
| P2(config-if)# switchport                              | Set the interface as Layer2 port                                      |
| P2(config-if)# bridge-group 1 spanning-tree disable    | Associate the interface with bridge group 1 and disable spanning tree |
| P2(config-if)# switchport mode trunk                   | Set the switching characteristics of this interface to trunk mode.    |
| P2(config-if)# switchport trunk allowed vlan add 70,79 | Enable VLAN's allowed on this interface.                              |
| P2(config-if)# switchport trunk native vlan 79         | Configure native vlan   |
| P2(config-if)# load-interval 30                        | Configure load period in multiple of 30 seconds                       |
| P2(config-if)# spanning-tree edgeport                  | Set the port as an edge-port to enable rapid transitions              |

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|  |   |
|--|---|
| P2(config-if)#interface xe3                              | Enter interface mode  |
| P2(config-if)# switchport                                | Set the interface as Layer2 port                                      |
| P2(config-if)# bridge-group 1 spanning-tree disable      | Associate the interface with bridge group 1 and disable spanning tree |
| P2(config-if)# switchport mode trunk                     | Set the switching characteristics of this interface to trunk mode.    |
| P2(config-if)# switchport trunk allowed vlan add 90,99   | Enable VLAN's allowed on this interface.                              |
| P2(config-if)# switchport trunk native vlan 99           | Configure native vlan   |
| P2(config-if)# load-interval 30                          | Configure load period in multiple of 30 seconds                       |
| P2(config-if)# spanning-tree edgeport                    | Set the port as an edge-port to enable rapid transitions              |
| P2(config-if)#interface xe7                              | Enter interface mode  |
| P2(config-if)# switchport                                | Set the interface as Layer2 port                                      |
| P2(config-if)# bridge-group 1 spanning-tree disable      | Associate the interface with bridge group 1 and disable spanning tree |
| P2(config-if)# switchport mode trunk                     | Set the switching characteristics of this interface to trunk mode.    |
| P2(config-if)# switchport trunk allowed vlan add 30,39   | Enable VLAN's allowed on this interface.                              |
| P2(config-if)# switchport trunk native vlan 39           | Configure native vlan   |
| P2(config-if)# load-interval 30                          | Configure load period in multiple of 30 seconds                       |
| P2(config-if)# spanning-tree edgeport                    | Set the port as an edge-port to enable rapid transitions              |
| P2(config-if)#interface xe9                              | Enter interface mode  |
| P2(config-if)# switchport                                | Set the interface as Layer2 port                                      |
| P2(config-if)# bridge-group 1 spanning-tree disable      | Associate the interface with bridge group 1 and disable spanning tree |
| P2(config-if)# switchport mode trunk                     | Set the switching characteristics of this interface to trunk mode.    |
| P2(config-if)# switchport trunk allowed vlan add 50,59   | Enable VLAN's allowed on this interface.                              |
| P2(config-if)# switchport trunk native vlan 59           | Configure native vlan   |
| P2(config-if)# load-interval 30                          | Configure load period in multiple of 30 seconds                       |
| P2(config-if)# spanning-tree edgeport                    | Set the port as an edge-port to enable rapid transitions              |
| P2(config-if)#interface xe25                             | Enter interface mode  |
| P2(config-if)# switchport                                | Set the interface as Layer2 port                                      |
| P2(config-if)# bridge-group 1 spanning-tree disable      | Associate the interface with bridge group 1 and disable spanning tree |
| P2(config-if)# switchport mode trunk                     | Set the switching characteristics of this interface to trunk mode.    |
| P2(config-if)# switchport trunk allowed vlan add 100,109 | Enable VLAN's allowed on this interface.                              |
| P2(config-if)# switchport trunk native vlan 109          | Configure native vlan   |
| P2(config-if)# load-interval 30                          | Configure load period in multiple of 30 seconds                       |

|   |  |
|---|--|
| P2(config-if)# spanning-tree edgeport               | Set the port as an edge-port to enable rapid transitions                                     |
| P2(config-if)#router ospf 1                         | Enter ospf configuration mode  |
| P2(config-router)# ospf router-id 4.4.4.4           | Configure ospf router id   |
| P2(config-router)# bfd all-interfaces               | Enable bfd in all ospf interfaces  |
| P2(config-router)# network 4.4.4.4/32 area 0.0.0.0  | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P2(config-router)# network 14.1.1.0/24 area 0.0.0.0 | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P2(config-router)# network 24.1.1.0/24 area 0.0.0.0 | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P2(config-router)# network 34.1.1.0/24 area 0.0.0.0 | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P2(config-router)# network 45.1.1.0/24 area 0.0.0.0 | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P2(config-router)# network 46.1.1.0/24 area 0.0.0.0 | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P2(config-router)#commit                            | Commit the candidate configuration to the running configuration                              |

### P3

|  |   |
|--|---|
| P3(config)#hostname P3                             | Configure hostname                                |
| P3(config)#bfd interval 3 minrx 3 multiplier 3     | Configure bfd interval globally                   |
| P3(config)#qos enable                              | Enable qos  |
| P3(config)#bridge 1 protocol ieee vlan-bridge      | Configure IEEE vlan bridge                        |
| P3(config)#no bridge 1 spanning-tree enable        | Disable spanning tree in bridge 1 globally        |
| P3(config)#no igmp snooping                        | Disable igmp snooping messages globally           |
| P3(config)#vlan database                           | Enter into the vlan database                      |
| P3(config-vlan)# vlan 10-200 bridge 1 state enable | Configure vlan 10-200 and associate with bridge 1 |
| P3(config-vlan)#interface lo                       | Enter lo interface mode                           |
| P3(config-if)# ip address 5.5.5.5/32 secondary     | Assign loopback ip                                |
| P3(config-if)#interface vlan1.60                   | Specify interface vlan1.60 to be configured.      |
| P3(config-if)# ip address 35.1.1.2/24              | Assign ip address                                 |
| P3(config-if)# ip ospf cost 1                      | Change ospf cost of the link                      |
| P3(config-if)#interface vlan1.70                   | Specify interface vlan1.70 to be configured.      |
| P3(config-if)# ip address 45.1.1.2/24              | Assign ip address                                 |
| P3(config-if)# ip ospf cost 1                      | Change ospf cost of the link                      |
| P3(config-if)#interface vlan1.80                   | Specify interface vlan1.80 to be configured.      |
| P3(config-if)# ip address 56.1.1.1/24              | Assign ip address                                 |
| P3(config-if)# ip ospf cost 1                      | Change ospf cost of the link                      |
| P3(config-if)#interface vlan1.110                  | Specify interface vlan1.1100 to be configured.    |

## VxLAN Tunnel Over SVI

|  |   |
|--|---|
| P3(config-if)# ip address 15.1.1.2/24                  | Assign ip address   |
| P3(config-if)# ip ospf cost 1                          | Change ospf cost of the link  |
| P3(config-if)#interface vlan1.160                      | Specify interface vlan1.160 to be configured.                         |
| P3(config-if)# ip address 25.1.1.2/24                  | Assign ip address   |
| P3(config-if)# ip ospf cost 1                          | Change ospf cost of the link  |
| P3(config-if)#interface xe2                            | Enter interface mode  |
| P3(config-if)# switchport                              | Set the interface as Layer2 port                                      |
| P3(config-if)# bridge-group 1 spanning-tree disable    | Associate the interface with bridge group 1 and disable spanning tree |
| P3(config-if)# switchport mode trunk                   | Set the switching characteristics of this interface to trunk mode.    |
| P3(config-if)# switchport trunk allowed vlan add 70,79 | Enable VLAN's allowed on this interface.                              |
| P3(config-if)# switchport trunk native vlan 79         | Configure native vlan   |
| P3(config-if)# load-interval 30                        | Configure load period in multiple of 30 seconds                       |
| P3(config-if)# spanning-tree edgeport                  | Set the port as an edge-port to enable rapid transitions              |
| P3(config-if)#interface xe10                           | Enter interface mode  |
| P3(config-if)# switchport                              | Set the interface as Layer2 port                                      |
| P3(config-if)# bridge-group 1 spanning-tree disable    | Associate the interface with bridge group 1 and disable spanning tree |
| P3(config-if)# switchport mode trunk                   | Set the switching characteristics of this interface to trunk mode.    |
| P3(config-if)# switchport trunk allowed vlan add 60,69 | Enable VLAN's allowed on this interface.                              |
| P3(config-if)# switchport trunk native vlan 69         | Configure native vlan   |
| P3(config-if)# load-interval 30                        | Configure load period in multiple of 30 seconds                       |
| P3(config-if)# mtu 1600                                | Change interface mtu value  |
| P3(config-if)# spanning-tree edgeport                  | Set the port as an edge-port to enable rapid transitions              |
| P3(config-if)#interface xe15                           | Enter interface mode  |
| P3(config-if)# switchport                              | Set the interface as Layer2 port                                      |
| P3(config-if)# bridge-group 1 spanning-tree disable    | Associate the interface with bridge group 1 and disable spanning tree |
| P3(config-if)# switchport mode trunk                   | Set the switching characteristics of this interface to trunk mode.    |
| P3(config-if)# switchport trunk allowed vlan add 80,89 | Enable VLAN's allowed on this interface.                              |
| P3(config-if)# switchport trunk native vlan 89         | Configure native vlan   |
| P3(config-if)# load-interval 30                        | Configure load period in multiple of 30 seconds                       |
| P3(config-if)# mtu 1600                                | Change interface mtu value  |
| P3(config-if)# spanning-tree edgeport                  | Set the port as an edge-port to enable rapid transitions              |
| P3(config-if)#router ospf 1                            | Enter ospf configuration mode   |
| P3(config-router)# ospf router-id 5.5.5.5              | Configure ospf router id  |

|   |  |
|---|--|
| P3(config-router)# bfd all-interfaces               | Enable bfd in all ospf interfaces  |
| P3(config-router)# network 5.5.5.5/32 area 0.0.0.0  | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P3(config-router)# network 15.1.1.0/24 area 0.0.0.0 | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P3(config-router)# network 25.1.1.0/24 area 0.0.0.0 | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P3(config-router)# network 35.1.1.0/24 area 0.0.0.0 | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P3(config-router)# network 45.1.1.0/24 area 0.0.0.0 | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P3(config-router)# network 56.1.1.0/24 area 0.0.0.0 | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| P3(config-router)#commit                            | Commit the candidate configuration to the running configuration                              |

**VTEP3**

|  |  |
|--|--|
| VTEP3#configure terminal                                 | Enter configuration terminal                                 |
| VTEP3(config)#hostname VTEP3                             | Configure hostname   |
| VTEP3(config)#mac vrf vrf1                               | Configure mac vrf vrf1                                       |
| VTEP3(config-vrf)# rd 6.6.6.6:11                         | Configure RD for vrf1  |
| VTEP3(config-vrf)# route-target both 10.10.10.10:100     | Configure RT for vrf1  |
| VTEP3(config-vrf)#mac vrf vrf2                           | Configure mac vrf vrf2                                       |
| VTEP3(config-vrf)# rd 6.6.6.6:12                         | Configure RD for vrf2  |
| VTEP3(config-vrf)# route-target both 10.10.10.10:101     | Configure RT for vrf2  |
| VTEP3(config-vrf)# route-target both 10.10.10.10:102     | Configure RT for vrf2  |
| VTEP3(config-vrf)#bfd interval 3 minrx 3 multiplier 3    | Configure bfd interval globally                              |
| VTEP3(config)#load-balance enable                        | Enable load balancing  |
| VTEP3(config)#load-balance ipv4 dest-ipv4 src-ipv4       | Enable load balnce based on souce and destination ip address |
| VTEP3(config)#hardware-profile filter egress-ipv4 enable | Enable hardware filter for egress ipv4                       |
| VTEP3(config)#hardware-profile filter vxlan enable       | Enable vxlan-mh in hardware                                  |
| VTEP3(config)# hardware-profile filter vxlan-mh enable   | Enable evpn vxlan multihoming                                |
| VTEP3(config)#evpn vxlan multihoming enable              | Enable vxlan in hardware                                     |
| VTEP3(config)#hardware-profile statistics ac-lif enable  | Enable statistics on vxlan access interface                  |
| VTEP3(config)#nvo vxlan enable                           | Enable vxlan   |
| VTEP3(config)#qos enable                                 | Enable qos   |
| VTEP3(config)#qos statistics                             | Enable qos statistics  |

## VxLAN Tunnel Over SVI

|   |   |
|---|---|
| VTEP3(config)#bridge 1 protocol ieee vlan-bridge          | Configure IEEE vlan bridge  |
| VTEP3(config)#no bridge 1 spanning-tree enable            | Disable spanning tree in bridge 1 globally                            |
| VTEP3(config)#no igmp snooping                            | Disable igmp snooping messages globally                               |
| VTEP3(config)#vlan database                               | Enter into the vlan database  |
| VTEP3(config-vlan)# vlan 10-200 bridge 1 state enable     | Configure vlan 10-200 and associate with bridge 1                     |
| VTEP3(config-vlan)#interface lo                           | Enter lo interface mode   |
| VTEP3(config-if)# ip address 6.6.6.6/32 secondary         | Assign loopback ip  |
| VTEP3(config-if)#interface vlan1.80                       | Specify interface vlan1.80 to be configured.                          |
| VTEP3(config-if)# ip address 56.1.1.2/24                  | Assign ip address   |
| VTEP3(config-if)# ip ospf cost 1                          | Change ospf cost of the link  |
| VTEP3(config-if)#interface vlan1.90                       | Specify interface vlan1.90 to be configured.                          |
| VTEP3(config-if)# ip address 46.1.1.2/24                  | Assign ip address   |
| VTEP3(config-if)# ip ospf cost 1                          | Change ospf cost of the link  |
| VTEP3(config-if)#interface xe3                            | Enter interface mode  |
| VTEP3(config-if)# switchport                              | Set the interface as Layer2 port                                      |
| VTEP3(config-if)# bridge-group 1 spanning-tree disable    | Associate the interface with bridge group 1 and disable spanning tree |
| VTEP3(config-if)# switchport mode trunk                   | Set the switching characteristics of this interface to trunk mode.    |
| VTEP3(config-if)# switchport trunk allowed vlan add 90,99 | Enable VLAN's allowed on this interface.                              |
| VTEP3(config-if)# switchport trunk native vlan 99         | Configure native vlan   |
| VTEP3(config-if)# load-interval 30                        | Configure load period in multiple of 30 seconds                       |
| VTEP3(config-if)# spanning-tree edgeport                  | Set the port as an edge-port to enable rapid transitions              |
| VTEP3(config-if)#interface xe15                           | Enter interface mode  |
| VTEP3(config-if)# switchport                              | Set the interface as Layer2 port                                      |
| VTEP3(config-if)# bridge-group 1 spanning-tree disable    | Associate the interface with bridge group 1 and disable spanning tree |
| VTEP3(config-if)# switchport mode trunk                   | Set the switching characteristics of this interface to trunk mode.    |
| VTEP3(config-if)# switchport trunk allowed vlan add 80,89 | Enable VLAN's allowed on this interface.                              |
| VTEP3(config-if)# switchport trunk native vlan 89         | Configure native vlan   |
| VTEP3(config-if)# load-interval 30                        | Configure load period in multiple of 30 seconds                       |
| VTEP3(config-if)# mtu 1600                                | Change interface mtu value  |
| VTEP3(config-if)# spanning-tree edgeport                  | Set the port as an edge-port to enable rapid transitions              |
| VTEP3(config-if)#interface xe45                           | Enter interface mode  |
| VTEP3(config-if)# switchport                              | Set the interface as Layer2 port                                      |
| VTEP3(config-if)# load-interval 30                        | Configure load period in multiple of 30 seconds                       |



|   |  |
|---|--|
| VTEP3(config-if)#interface xe46   | Enter interface mode   |
| VTEP3(config-if)# switchport  | Set the interface as Layer2 port   |
| VTEP3(config-if)# load-interval 30                                      | Configure load period in multiple of 30 seconds  |
| VTEP3(config-if)#router ospf 1  | Enter ospf configuration mode  |
| VTEP3(config-router)# ospf router-id 6.6.6.6                            | Configure ospf router id   |
| VTEP3(config-router)# bfd all-interfaces                                | Enable bfd in all ospf interfaces  |
| VTEP3(config-router)# network 6.6.6.6/32<br>area 0.0.0.0                | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| VTEP3(config-router)# network 46.1.1.0/24<br>area 0.0.0.0               | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| VTEP3(config-router)# network 56.1.1.0/24<br>area 0.0.0.0               | Define the Network on which OSPF runs and associate the area ID (area 0) with the interface. |
| VTEP3(config-router)#router bgp 100                                     | Enter address-family ipv4 unicast mode   |
| VTEP3(config-router)# address-family ipv4<br>unicast                    | Add the lo network to bgp route  |
| VTEP3(config-router)# network 6.6.6.6/32                                | Activate neighbors   |
| VTEP3(config-router-af)# neighbor 1.1.1.1<br>activate                   | Activate neighbors   |
| VTEP3(config-router-af)# neighbor 2.2.2.2<br>activate                   | Exit address-family mode.  |
| VTEP3(config-router-af)#exit-address-family                             | Enter Router BGP mode and define the AS number 100.  |
| VTEP3(config-router)# neighbor 1.1.1.1<br>remote-as 100                 | Configure bgp remote-as 100 with neighbor IP   |
| VTEP3(config-router)# neighbor 1.1.1.1<br>update-source lo              | Define BGP neighbors, to update the source routes with lo                                    |
| VTEP3(config-router)# neighbor 2.2.2.2<br>remote-as 100                 | Configure bgp remote-as 100 with neighbor IP   |
| VTEP3(config-router)# neighbor 2.2.2.2<br>update-source lo              | Configure advertisement-interval as 0 for fast convergence for VTEP2                         |
| (config-router)#neighbor 2.2.2.2<br>advertisement-interval 0            | Configure advertisement-interval as 0 for fast convergence for VTEP1                         |
| (config-router)#neighbor 1.1.1.1<br>advertisement-interval 0            | Define BGP neighbors, to update the source routes with lo                                    |
| VTEP3(config-router)# address-family l2vpn<br>evpn                      | Enter in to bgp l2vpn evpn address-family  |
| VTEP3(config-router-af)# neighbor 1.1.1.1<br>activate                   | Activate neighbors   |
| VTEP3(config-router-af)# neighbor 2.2.2.2<br>activate                   | Activate neighbors   |
| VTEP3(config-router-af)# exit-address-<br>family                        | Exit from bgp l2vpn evpn address-family  |
| VTEP3(config-router)#nvo vxlan vtep-ip-<br>global 6.6.6.6               | Configure vxlan global ip  |
| VTEP3(config)#nvo vxlan id 1 ingress-<br>replication inner-vid-disabled | Create vnid 1  |
| VTEP3(config-nvo)# vxlan host-reachability-<br>protocol evpn-bgp vrf1   | Associate vnid with evpn and vrf1  |

## VxLAN Tunnel Over SVI

|  |   |
|--|---|
| VTEP3(config-nvo)#nvo vxlan id 1000 ingress-replication inner-vid-disabled | Create vnid 1000  |
| VTEP3(config-nvo)# vxlan host-reachability-protocol evpn-bgp vrf2          | Associate vnid with evpn and vrf2                               |
| VTEP3(config-nvo)#nvo vxlan access-if port-vlan xe45 3001                  | Create vxlan access port port-vlan                              |
| VTEP3(config-nvo-acc-if)# map vnid 1                                       | Map the vnid to access-if                                       |
| VTEP3(config-nvo-acc-if)#nvo vxlan access-if port xe46                     | Create vxlan access port  |
| VTEP3(config-nvo-acc-if)# map vnid 1000                                    | Map the vnid to access-if                                       |
| VTEP3(config-nvo-acc-if)# commit   | Commit the candidate configuration to the running configuration |

## SWITCH

|  |   |
|--|---|
| SWITCH#configure terminal                                | Enter configuration terminal  |
| SWITCH#(config)# bridge 1 protocol rstp vlan-bridge      | Configure rstp vlan bridge  |
| SWITCH#(config)#interface po1                            | Enter interface mode  |
| SWITCH#(config-if)# switchport                           | Set the interface as Layer2 port                                      |
| SWITCH#(config-if)# load-interval 30                     | Configure load period in multiple of 30 seconds                       |
| SWITCH#(config-if)#interface ce9/1                       | Enter interface mode  |
| SWITCH#(config-if)# channel-group 1 mode active          | Map this interface to po1   |
| SWITCH#(config-if)#interface ce9/2                       | Enter interface mode  |
| SWITCH#(config-if)# channel-group 1 mode active          | Map this interface to po1   |
| SWITCH#(config-if)#interface ce10/1                      | Enter interface mode  |
| SWITCH#(config-if)# channel-group 1 mode active          | Map this interface to po1   |
| SWITCH#(config-if)#interface ce10/2                      | Enter interface mode  |
| SWITCH#(config-if)# channel-group 1 mode active          | Map this interface to po1   |
| SWITCH#(config-if)#interface ce31/1                      | Set the port as an edge-port to enable rapid transitions              |
| SWITCH#(config-if)# switchport                           | Enter interface mode  |
| SWITCH#(config-if)# bridge-group 1 spanning-tree disable | Set the interface as Layer2 port                                      |
| SWITCH#(config-if)# switchport mode trunk                | Associate the interface with bridge group 1 and disable spanning tree |
| SWITCH#(config-if)# switchport trunk allowed vlan all    | Set the switching characteristics of this interface to trunk mode.    |
| SWITCH#(config-if)# load-interval 30                     | Configure native vlan   |
| SWITCH#(config-if)# commit                               | Commit the candidate configuration to the running configuration       |

## Validation

VTEP1#sh ip ospf neighbor

Total number of full neighbors: 3

OSPF process 1 VRF(default):

| Neighbor ID<br>Instance ID | Pri | State   | Dead Time | Address  | Interface |   |
|----------------------------|-----|---------|-----------|----------|-----------|---|
| 2.2.2.2<br>0               | 1   | Full/DR | 00:00:30  | 12.1.1.2 | vlan1.10  | 0 |
| 3.3.3.3<br>0               | 1   | Full/DR | 00:00:31  | 13.1.1.2 | vlan1.20  | 0 |
| 4.4.4.4<br>0               | 1   | Full/DR | 00:00:33  | 14.1.1.2 | vlan1.30  | 0 |

VTEP2#sh ip ospf neighbor

Total number of full neighbors: 3

OSPF process 1 VRF(default):

| Neighbor ID<br>Instance ID | Pri | State       | Dead Time | Address  | Interface |   |
|----------------------------|-----|-------------|-----------|----------|-----------|---|
| 1.1.1.1<br>0               | 1   | Full/Backup | 00:00:38  | 12.1.1.1 | vlan1.10  |   |
| 3.3.3.3<br>0               | 1   | Full/DR     | 00:00:39  | 23.1.1.2 | vlan1.40  | 0 |
| 4.4.4.4<br>0               | 1   | Full/DR     | 00:00:39  | 24.1.1.2 | vlan1.50  | 0 |

P1#sh ip ospf neighbor

Total number of full neighbors: 4

OSPF process 1 VRF(default):

| Neighbor ID<br>Instance ID | Pri | State       | Dead Time | Address  | Interface |   |
|----------------------------|-----|-------------|-----------|----------|-----------|---|
| 1.1.1.1<br>0               | 1   | Full/Backup | 00:00:39  | 13.1.1.1 | vlan1.20  |   |
| 2.2.2.2<br>0               | 1   | Full/Backup | 00:00:38  | 23.1.1.1 | vlan1.40  |   |
| 4.4.4.4<br>0               | 1   | Full/DR     | 00:00:40  | 34.1.1.2 | vlan1.100 | 0 |
| 5.5.5.5<br>0               | 1   | Full/DR     | 00:00:36  | 35.1.1.2 | vlan1.60  | 0 |

P2#sh ip ospf neighbor

Total number of full neighbors: 5

OSPF process 1 VRF(default):

| Neighbor ID<br>Instance ID | Pri | State       | Dead Time | Address  | Interface |   |
|----------------------------|-----|-------------|-----------|----------|-----------|---|
| 1.1.1.1<br>0               | 1   | Full/Backup | 00:00:30  | 14.1.1.1 | vlan1.30  |   |
| 2.2.2.2<br>0               | 1   | Full/Backup | 00:00:38  | 24.1.1.1 | vlan1.50  |   |
| 3.3.3.3<br>0               | 1   | Full/Backup | 00:00:33  | 34.1.1.1 | vlan1.100 |   |
| 5.5.5.5<br>0               | 1   | Full/DR     | 00:00:30  | 45.1.1.2 | vlan1.70  | 0 |
| 6.6.6.6<br>0               | 1   | Full/DR     | 00:00:34  | 46.1.1.2 | vlan1.90  | 0 |

P2#

## VxLAN Tunnel Over SVI

---

P3#sh ip ospf neighbor

Total number of full neighbors: 3

OSPF process 1 VRF(default):

| Neighbor ID<br>Instance ID | Pri | State       | Dead Time | Address  | Interface |   |
|----------------------------|-----|-------------|-----------|----------|-----------|---|
| 3.3.3.3<br>0               | 1   | Full/Backup | 00:00:34  | 35.1.1.1 | vlan1.60  |   |
| 4.4.4.4<br>0               | 1   | Full/Backup | 00:00:34  | 45.1.1.1 | vlan1.70  |   |
| 6.6.6.6                    | 1   | Full/DR     | 00:00:33  | 56.1.1.2 | vlan1.80  | 0 |

P3#

VTEP1#sh bgp l2vpn evpn summary

BGP router identifier 1.1.1.1, local AS number 100

BGP table version is 4

1 BGP AS-PATH entries

0 BGP community entries

| Neighbor<br>PfxRcd | AD | MACIP | V<br>MCAST | AS       | MsgRcv<br>ESI | MsgSen<br>PREFIX-ROUTE | TblVer | InQ | OutQ | Up/Down  | State/ |
|--------------------|----|-------|------------|----------|---------------|------------------------|--------|-----|------|----------|--------|
| 2.2.2.2<br>2       | 0  | 0     | 4<br>2     | 100<br>0 | 23<br>0       | 22                     | 4      | 0   | 0    | 00:07:34 |        |
| 6.6.6.6<br>2       | 0  | 0     | 4<br>2     | 100<br>0 | 21<br>0       | 22                     | 4      | 0   | 0    | 00:07:34 |        |

Total number of neighbors 2

Total number of Established sessions 2

VTEP1#

VTEP2#sh bgp l2vpn evpn summary

BGP router identifier 2.2.2.2, local AS number 100

BGP table version is 5

1 BGP AS-PATH entries

0 BGP community entries

| Neighbor<br>PfxRcd | AD | MACIP | V<br>MCAST | AS       | MsgRcv<br>ESI | MsgSen<br>PREFIX-ROUTE | TblVer | InQ | OutQ | Up/Down  | State/ |
|--------------------|----|-------|------------|----------|---------------|------------------------|--------|-----|------|----------|--------|
| 1.1.1.1<br>2       | 0  | 0     | 4<br>2     | 100<br>0 | 22<br>0       | 24                     | 5      | 0   | 0    | 00:07:41 |        |
| 6.6.6.6<br>2       | 0  | 0     | 4<br>2     | 100<br>0 | 24<br>0       | 27                     | 5      | 0   | 0    | 00:08:51 |        |

Total number of neighbors 2

Total number of Established sessions 2

VTEP2#

VTEP3#sh bgp l2vpn evpn summary

BGP router identifier 6.6.6.6, local AS number 100

BGP table version is 5

1 BGP AS-PATH entries

0 BGP community entries

| Neighbor PfxRcd | AD | MACIP | V MCAST | AS  | MsgRcv ESI | MsgSen PREFIX-ROUTE | TblVer | InQ | OutQ | Up/Down  | State/ |
|-----------------|----|-------|---------|-----|------------|---------------------|--------|-----|------|----------|--------|
| 1.1.1.1         |    |       | 4       | 100 | 23         | 21                  | 5      | 0   | 0    | 00:07:44 |        |
| 2               | 0  | 0     | 2       | 0   | 0          |                     |        |     |      |          |        |
| 2.2.2.2         |    |       | 4       | 100 | 26         | 24                  | 5      | 0   | 0    | 00:08:54 |        |
| 2               | 0  | 0     | 2       | 0   | 0          |                     |        |     |      |          |        |

Total number of neighbors 2

Total number of Established sessions 2

VTEP3#

VTEP1#show nvo vxlan mac-table

```

=====
VxLAN MAC Entries
=====

```

| VNID Type    | Interface   | VlanId Status | Inner-VlanId | Mac-Addr AccessPortDesc | VTEP-Ip/ESI                   |
|--------------|-------------|---------------|--------------|-------------------------|-------------------------------|
| 1 Static     | po1 Local   | 1000 -----    | ----         | 0000.1111.1111 -----    | 00:aa:22:33:44:55:66:00:00:00 |
| 1 Static     | po1 Local   | 1000 -----    | ----         | 0000.1111.1112 -----    | 00:aa:22:33:44:55:66:00:00:00 |
| 1 Static     | po1 Local   | 1000 -----    | ----         | 0000.1111.1113 -----    | 00:aa:22:33:44:55:66:00:00:00 |
| 1 Static     | po1 Local   | 1000 -----    | ----         | 0000.1111.1114 -----    | 00:aa:22:33:44:55:66:00:00:00 |
| 1 Static     | po1 Local   | 1000 -----    | ----         | 0000.1111.1115 -----    | 00:aa:22:33:44:55:66:00:00:00 |
| 1 Dynamic    | po1 Local   | 1000 -----    | ----         | a82b.b57c.4470 -----    | 00:aa:22:33:44:55:66:00:00:00 |
| 1000 Dynamic | ---- Remote | -----         | ----         | a82b.b57c.4476 -----    | 00:aa:22:33:44:55:66:00:00:00 |

Total number of entries are : 7

VTEP1#

VTEP2#sh nvo vxlan mac-table

```

=====
VxLAN MAC Entries
=====

```

| VNID Type | Interface   | VlanId Status | Inner-VlanId | Mac-Addr AccessPortDesc | VTEP-Ip/ESI                   |
|-----------|-------------|---------------|--------------|-------------------------|-------------------------------|
| 1 Static  | ---- Remote | -----         | ----         | 0000.1111.1111 -----    | 00:aa:22:33:44:55:66:00:00:00 |

## VxLAN Tunnel Over SVI

```

1      ----      ----      ----      0000.1111.1112 00:aa:22:33:44:55:66:00:00:00
Static Remote      -----
1      ----      ----      ----      0000.1111.1113 00:aa:22:33:44:55:66:00:00:00
Static Remote      -----
1      ----      ----      ----      0000.1111.1114 00:aa:22:33:44:55:66:00:00:00
Static Remote      -----
1      ----      ----      ----      0000.1111.1115 00:aa:22:33:44:55:66:00:00:00
Static Remote      -----
1      ----      ----      ----      a82b.b57c.4470 00:aa:22:33:44:55:66:00:00:00
Dynamic Remote     -----
1000   po1      2000   ----      a82b.b57c.4476 00:aa:22:33:44:55:66:00:00:00
Dynamic Local     -----

```

Total number of entries are : 7

VTEP2#

VTEP3#sh nvo vxlan mac-table

```

=====
VxLAN MAC Entries
=====
VNID      Interface  VlanId  Inner-VlanId  Mac-Addr      VTEP-Ip/ESI
Type                                     AccessPortDesc
-----
1      ----      ----      ----      0000.1111.1111 00:aa:22:33:44:55:66:00:00:00
Static Remote      -----
1      ----      ----      ----      0000.1111.1112 00:aa:22:33:44:55:66:00:00:00
Static Remote      -----
1      ----      ----      ----      0000.1111.1113 00:aa:22:33:44:55:66:00:00:00
Static Remote      -----
1      ----      ----      ----      0000.1111.1114 00:aa:22:33:44:55:66:00:00:00
Static Remote      -----
1      ----      ----      ----      0000.1111.1115 00:aa:22:33:44:55:66:00:00:00
Static Remote      -----
1      ----      ----      ----      a82b.b57c.4470 00:aa:22:33:44:55:66:00:00:00
Dynamic Remote     -----
1000   ----      ----      ----      a82b.b57c.4476 00:aa:22:33:44:55:66:00:00:00
Dynamic Remote     -----

```

Total number of entries are : 7

VTEP3#

VTEP1#show nvo vxlan access-if brief

| Interface | Vlan | Inner<br>vlan | Ifindex | Vnid | Admin<br>status | Link<br>status |
|-----------|------|---------------|---------|------|-----------------|----------------|
| xe46      | ---  | ---           | 500000  | 1    | up              | up             |
| po1       | 2000 | ---           | 500001  | 1000 | up              | up             |
| po1       | 2001 | ---           | 500002  | 1000 | up              | up             |

Total number of entries are 2

VTEP1#

VTEP2#show nvo vxlan access-if brief

| Interface | Vlan | Inner<br>vlan | Ifindex | Vnid | Admin<br>status | Link<br>status |
|-----------|------|---------------|---------|------|-----------------|----------------|
| xe47      | ---  | ---           | 500000  | 1    | up              | up             |
| po1       | 2001 | ---           | 500001  | 1000 | up              | up             |
| po1       | 2000 | ---           | 500002  | 1000 | up              | up             |

Total number of entries are 3

VTEP2#

VTEP3#show nvo vxlan access-if brief

| Interface | Vlan | Inner<br>vlan | Ifindex | Vnid | Admin<br>status | Link<br>status |
|-----------|------|---------------|---------|------|-----------------|----------------|
| xe45      | 3001 | ---           | 500000  | 1    | up              | up             |
| xe46      | ---  | ---           | 500001  | 1000 | up              | up             |

Total number of entries are 2

VTEP3#

VTEP1#sh nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 1.1.1.1 | 6.6.6.6     | Installed | 00:03:59 | 00:03:59 |
| 1.1.1.1 | 2.2.2.2     | Installed | 00:03:59 | 00:03:59 |

Total number of entries are 2

VTEP1#sh nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port  
AC - Access Port  
(u) - Untagged

| VNID<br>Status | VNI-Name<br>Src-Addr | VNI-Type<br>Dst-Addr | Type | Interface | ESI                               | VLAN | DF- |
|----------------|----------------------|----------------------|------|-----------|-----------------------------------|------|-----|
| 1              | ----                 | L2                   | NW   | ----      | ----                              | ---- | --  |
| --             | 1.1.1.1              | 6.6.6.6              |      |           |                                   |      |     |
| 1              | ----                 | L2                   | NW   | ----      | ----                              | ---- | --  |
| --             | 1.1.1.1              | 2.2.2.2              |      |           |                                   |      |     |
| 1000           | ----                 | --                   | AC   | po1       | --- 00:aa:22:33:44:55:66:00:00:00 | 2000 | DF  |
| ----           | ----                 | ----                 |      |           |                                   |      |     |
| 1000           | ----                 | --                   | AC   | po1       | --- 00:aa:22:33:44:55:66:00:00:00 | 2001 | DF  |
| ----           | ----                 | ----                 |      |           |                                   |      |     |

## VxLAN Tunnel Over SVI

```

1000    ----      L2      NW      ----      ----      ---- -
----    1.1.1.1      6.6.6.6
1000    ----      L2      NW      ----      ----      ---- -
----    1.1.1.1      2.2.2.2
1000    ----      --      AC      xe46      --- Single Homed Port ---      ---- -
----    ----      ----

```

Total number of entries are 10

VTEP1#

```

VTEP2#sh nvo vxlan tunnel
VxLAN Network tunnel Entries

```

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 2.2.2.2 | 1.1.1.1     | Installed | 00:03:59 | 00:03:59 |
| 2.2.2.2 | 6.6.6.6     | Installed | 00:05:09 | 00:05:09 |

Total number of entries are 2

VTEP2#sh nvo vxlan

VxLAN Information

=====

```

Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged

```

| VNIID  | VNI-Name | VNI-Type | Type | Interface | ESI  | VLAN                          | DF-       |
|--------|----------|----------|------|-----------|------|-------------------------------|-----------|
| Status | Src-Addr | Dst-Addr |      |           |      |                               |           |
| 1      | ----     | L2       | NW   | ----      | ---- | ----                          | --        |
| --     | 2.2.2.2  | 1.1.1.1  |      |           |      |                               |           |
| 1      | ----     | L2       | NW   | ----      | ---- | ----                          | --        |
| --     | 2.2.2.2  | 6.6.6.6  |      |           |      |                               |           |
| 1      | ----     | --       | AC   | xe47      | ---  | Single Homed Port             | ---       |
| --     | ----     | ----     |      |           |      |                               |           |
| 1000   | ----     | L2       | NW   | ----      | ---- | ----                          | --        |
| --     | 2.2.2.2  | 1.1.1.1  |      |           |      |                               |           |
| 1000   | ----     | L2       | NW   | ----      | ---- | ----                          | --        |
| --     | 2.2.2.2  | 6.6.6.6  |      |           |      |                               |           |
| 1000   | ----     | --       | AC   | po1       | ---  | 00:aa:22:33:44:55:66:00:00:00 | 2001 NON- |
| DF     | ----     | ----     |      |           |      |                               |           |
| 1000   | ----     | --       | AC   | po1       | ---  | 00:aa:22:33:44:55:66:00:00:00 | 2000 NON- |
| DF     | ----     | ----     |      |           |      |                               |           |

Total number of entries are 11

VTEP2#

```

VTEP3#sh nvo vxlan tunnel
VxLAN Network tunnel Entries

```

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 6.6.6.6 | 1.1.1.1     | Installed | 00:03:58 | 00:03:58 |
| 6.6.6.6 | 2.2.2.2     | Installed | 00:05:08 | 00:04:03 |



Total number of entries are 2

VTEP3#sh nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port

AC - Access Port

(u) - Untagged

| VNID     | VNI-Name | VNI-Type | Type | Interface | ESI  | VLAN               | DF-Status |
|----------|----------|----------|------|-----------|------|--------------------|-----------|
| Src-Addr | Dst-Addr |          |      |           |      |                    |           |
| 1        | ----     | L2       | NW   | ----      | ---- | ----               | ----      |
| 6.6.6.6  | 1.1.1.1  |          |      |           |      |                    |           |
| 1        | ----     | L2       | NW   | ----      | ---- | ----               | ----      |
| 6.6.6.6  | 2.2.2.2  |          |      |           |      |                    |           |
| 1        | ----     | --       | AC   | xe45      | ---  | Single Hommed port | ---       |
| ----     | ----     |          |      |           |      | 3001               | ----      |
| 1000     | ----     | L2       | NW   | ----      | ---- | ----               | ----      |
| 6.6.6.6  | 1.1.1.1  |          |      |           |      |                    |           |
| 1000     | ----     | L2       | NW   | ----      | ---- | ----               | ----      |
| 6.6.6.6  | 2.2.2.2  |          |      |           |      |                    |           |
| 1000     | ----     | --       | AC   | xe46      | ---  | Single Homed Port  | ---       |
| ----     | ----     |          |      |           |      |                    | ----      |

Total number of entries are 10

VTEP3#



---

## CHAPTER 9 VxLAN-EVPN with IRB

---

---

### Overview

An EVPN-based Integrated Routing and Bridging solution used for forwarding of intra-subnets and inter-subnets traffic. There are 2 modes of IRB.

#### Symmetric IRB

In this mode, both the ingress and egress VTEPs perform layer-2 and layer-3 lookups (switching and routing). In this case, a given VTEP needs to learn the ARP and MAC-address entries only for tenant systems (TSs) across the tenant VxLAN network belonging to VNIDs attached to that VTEP.

#### Asymmetric IRB

In this mode, the ingress VTEP perform layer-2 and layer-3 lookups and egress VTEPs perform layer-2 lookups only. The disadvantage of this mode is the need for each VTEP in the tenant network to be configured with all the VNIDs for that tenant irrespective of whether a given VTEP has TS attached for that VNID or not.

Three approaches are available to achieve IRB solution.

- Centralized Gateway
- Anycast Gateway
- Distributed Gateway

---

### Topology

The procedures in this section use the topology in [Figure 9-10](#).

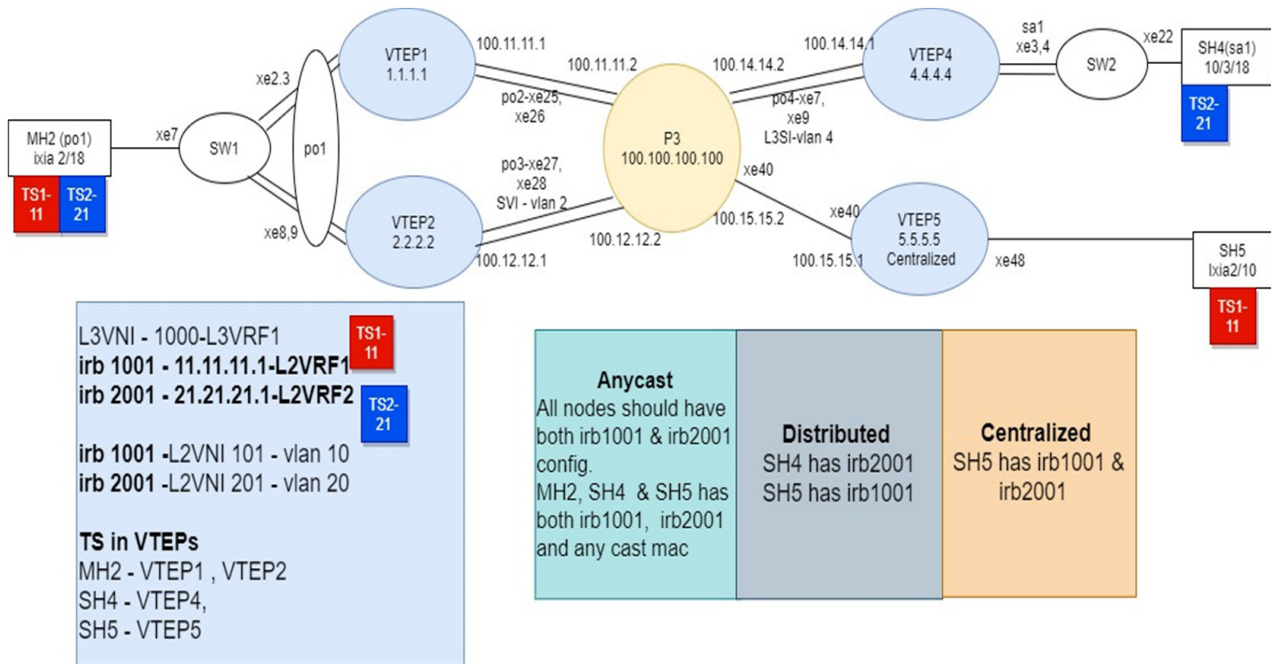


Figure 9-10: VxLAN EVPN IRB

Note: In the above topology TS1, TS2 are the tenant systems. The blue and red color denotes different subnets in the Tenant systems.

## Base Configuration - L2 VxLAN

### VTEP1

(Multi-homed group1) - Part of both Multi-homed with po1(MH2).

Hardware profile and generic configuration:

|   |   |
|---|---|
| #configure terminal                                 | Enter Configure mode.   |
| (config)#hardware-profile filter vxlan enable       | Enable hardware-profile filter for VxLAN.   |
| (config)#hardware-profile filter vxlan-mh enable    | Enable hardware-profile filter for VxLAN multi-homing.                                |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4.                                       |
| (config)#evpn vxlan multihoming enable              | Enable Multihoming, save configs and reboot the board for multihoming to be effective |
| (config)#hardware-profile statistics ac-lif enable  | Enable ac-lif for VxLAN access-if port counters                                       |
| (config)#qos enable                                 | Enabling QoS  |
| (config)#commit                                     | Commit the candidate configuration to running configuration                           |

## Interface and loopback configuration:

|   |   |
|---|---|
| (config)#interface po1                                  | Enter Interface mode for po1 (MH2)  |
| (config-if)#switchport                                  | Make it L2 interface  |
| (config-if)# evpn multi-homed system-mac 0000.0000.2222 | Configure system MAC as ESI value for Lag (po1) interface. VTEP1 and VTEP2 should have same ESI value |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface xe2                                  | Enter Interface mode for xe2  |
| (config-if)#channel-group 1 mode active                 | Make it member port of po1  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface xe3                                  | Enter Interface mode for xe3  |
| (config-if)#channel-group 1 mode active                 | Make it member port of po1  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface lo                                   | Enter Interface mode for lo   |
| (config-if)#ip address 1.1.1.1/32 secondary             | Configure loopback IP address as 1.1.1.1 for VTEP1  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface po2                                  | Enter Interface mode for po2  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface xe25                                 | Enter Interface mode for xe25   |
| (config-if)#channel-group 2 mode active                 | Make it member port of po2  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface xe26                                 | Enter Interface mode for xe26   |
| (config-if)#channel-group 2 mode active                 | Make it member port of po2  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface po2                                  | Enter Interface mode for po2  |
| (config-if)#ip address 100.11.11.1/24                   | Configure IP address as 100.11.11.1 on network side of Spine-P3                                       |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#commit   | Commit the candidate configuration to running configuration   |

## OSPF configuration:

|   |   |
|---|---|
| (config)#router ospf 100                            | Enter into router OSPF mode                                 |
| (config-router)#ospf router-id 1.1.1.1              | Configure router-id as 1.1.1.1 (lo IP address)              |
| (config-router)#network 1.1.1.1/32 area 0.0.0.0     | Add 1.1.1.1 (lo IP address) network into area 0             |
| (config-router)#network 100.11.11.0/24 area 0.0.0.0 | Add 100.11.11.0 (Spine-P3) network into area 0              |
| (config-router)#bfd all-interfaces                  | Enabling BFD on all OSPF interface for fast convergence     |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.           |
| (config)#commit                                     | Commit the candidate configuration to running configuration |

## BGP configuration:

|   |  |
|---|--|
| (Config)#router bgp 5000                                  | Enter into Router BGP mode   |
| (config-router)#bgp router-id 1.1.1.1                     | Configure router-id as 1.1.1.1 (lo IP address)                       |
| (config-router)#neighbor 2.2.2.2 remote-as 5000           | Specify a VTEP2 loopback IP address and remote-as defined            |
| (config-router)#neighbor 2.2.2.2 update-source lo         | Configure update as loopback for VTEP2                               |
| (config-router)#neighbor 2.2.2.2 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP2 |
| (config-router)#neighbor 4.4.4.4 remote-as 5000           | Specify a VTEP4 loopback IP address and remote-as defined            |
| (config-router)#neighbor 4.4.4.4 update-source lo         | Configure update as loopback for VTEP4                               |
| (config-router)#neighbor 4.4.4.4 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP4 |
| (config-router)#neighbor 5.5.5.5 remote-as 5000           | Specify a VTEP5 loopback IP address and remote-as defined            |
| (config-router)#neighbor 5.5.5.5 update-source lo         | Configure update as loopback for VTEP5                               |
| (config-router)#neighbor 5.5.5.5 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP5 |
| (config-router)#address-family l2vpn evpn                 | Enter into L2VPN EVPN address family mode                            |
| (config-router-af)#neighbor 2.2.2.2 activate              | Activate 2.2.2.2(VTEP2) into L2VPN EVPN address family mode          |
| (config-router-af)#neighbor 4.4.4.4 activate              | Activate 3.3.3.3(VTEP4) into L2VPN EVPN address family mode          |
| (config-router-af)#neighbor 5.5.5.5 activate              | Activate 5.5.5.5(VTEP5) into L2VPN EVPN address family mode          |
| (config-router-af)#exit-address-family                    | Exit from L2VPN address family mode                                  |
| (config-router)#exit                                      | Exit from Router BGP mode and enter into config mode                 |
| (config)#commit   | Commit the candidate configuration to running configuration          |

## L2 MAC VRF Configuration:

|  |   |
|--|---|
| (config)#mac vrf L2VRF1                        | Create MAC routing/forwarding instance with L2VRF1 name and enter into VRF mode                 |
| (config-vrf)#rd 1.1.1.1:11                     | Assign RD value   |
| (config-vrf)#description MAC VRF RED           | Give description to L2VRF1 as RED   |
| (config-vrf)#route-target both 9.9.9.9:100     | Assign route-target value for same for import and export. Should be same on all node for L2VRF1 |
| (config-vrf)#exit                              | Exit from VRF mode  |
| (config)#mac vrf L2VRF2                        | Create MAC routing/forwarding instance with L2VRF2 name and enter into VRF mode                 |
| (config-vrf)#rd 1.1.1.1:21                     | Assign RD value   |
| (config-vrf)#route-target both 90.90.90.90:100 | Assign route-target value for same for import and export  |

|                                       |   |
|---------------------------------------|---|
| (config-vrf)#description MAC VRF BLUE | Give description to L2VRF2 as BLUE                          |
| (config-vrf)#exit                     | Exit from VRF mode  |
| (config)#commit                       | Commit the candidate configuration to running configuration |

## L2 VxLAN configuration:

|  |  |
|--|--|
| (config)#nvo vxlan enable  | Enable VxLAN   |
| (config)#evpn esi hold-time 90                                   | Configure ESI hold time to allow tunnel to come up at the time of VxLAN initialization before making the ESI up. It should be same on both VTEP1 and VTEP2 |
| (config)#nvo vxlan vtep-ip-global 1.1.1.1                        | Configure Source vtep-ip-global configuration - Use loopback IP address  |
| (config)#nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode  |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1    | Assign VRF for EVPN-BGP to carry EVPN route  |
| (config-nvo)#vni-name VNI-101                                    | Configure VNI name as VNI-101  |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.   |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode  |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2    | Assign VRF for EVPN-BGP to carry EVPN route  |
| (config-nvo)#vni-name VNI-201                                    | Configure VNI name as VNI-201  |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.   |
| (config)#commit  | Commit the candidate configuration to running configuration  |
| (config)#nvo vxlan access-if port-vlan po1 10                    | Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port   |
| (config-nvo-acc-if)#map vnid 101                                 | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)# mac 0000.2222.1010 ip 11.11.11.51           | Configure static MAC-IP  |
| (config-nvo-acc-if)#exit   | Exit from VxLAN access-interface mode and enter into configuration mode  |
| (config)#nvo vxlan access-if port-vlan po1 20                    | Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port   |
| (config-nvo-acc-if)#map vnid 201                                 | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)# mac 0000.2222.1020 ip 21.21.21.51           | Configure static MAC-IP  |
| (config-nvo-acc-if)#exit   | Exit from VxLAN access-interface mode and enter into configuration mode  |
| (config)#exit  | Exit from configuration mode   |
| (config)#commit  | Commit the candidate configuration to running configuration  |

## VTEP2

(Multi-homed group1) - Part of both Multi-homed with po1(MH1).

## Hardware profile and generic configuration:

|   |   |
|---|---|
| #configure terminal                                 | Enter Configure mode.   |
| (config)#hardware-profile filter vxlan enable       | Enable hardware-profile filter for VxLAN.   |
| (config)#hardware-profile filter vxlan-mh enable    | Enable hardware-profile filter for VxLAN multi-homing.                                |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4.                                       |
| (config)#evpn vxlan multihoming enable              | Enable Multihoming, save configs and reboot the board for multihoming to be effective |
| (config)#hardware-profile statistics ac-lif enable  | Enable ac-lif for VxLAN access-if port counters                                       |
| (config)#qos enable                                 | Enabling QoS  |
| (config)#commit                                     | Commit the candidate configuration to running configuration                           |

## Interface and loopback configuration:

|   |   |
|---|---|
| (config)#interface po1                                  | Enter Interface mode for po1 (MH2)  |
| (config-if)#switchport                                  | Make it L2 interface  |
| (config-if)# evpn multi-homed system-mac 0000.0000.2222 | Configure system MAC as ESI value for Lag (po1) interface. VTEP1 and VTEP2 should have same ESI value |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface xe8                                  | Enter Interface mode for xe2  |
| (config-if)#channel-group 1 mode active                 | Make it member port of po1  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface xe9                                  | Enter Interface mode for xe3  |
| (config-if)#channel-group 1 mode active                 | Make it member port of po1  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface lo                                   | Enter Interface mode for lo   |
| (config-if)#ip address 2.2.2.2/32 secondary             | Configure loopback IP address as 2.2.2.2 for VTEP2  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface po3                                  | Enter Interface mode for po3  |
| (config)#i switchport                                   | Configure po3 as L2 interface   |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface xe27                                 | Enter Interface mode for xe27   |
| (config-if)#channel-group 3 mode active                 | Make it member port of po3  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface xe28                                 | Enter Interface mode for xe28   |
| (config-if)#channel-group 3 mode active                 | Make it member port of po3  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)# bridge 1 protocol rstp vlan-bridge            | Configure bridge 1  |
| (config)# vlan database                                 | Enter into VLAN database mode   |
| (config)#vlan 2 bridge 1 state enable                   | Configure VLAN 2 as part of bridge 1  |



|  |   |
|--|---|
| (config)#interface po3                           | Enter Interface mode for po3                                    |
| (config-if)# bridge-group 1                      | Configure bridge 1 for po3                                      |
| (config-if)# switchport mode trunk               | Switchport mode as trunk  |
| (config-if)# switchport trunk allowed vlan add 2 | Trunk allowed VLAN 2  |
| (config-if)#exit                                 | Exit Interface mode and return to Configure mode.               |
| (config) interface vlan1.2                       | Enter into SVI port VLAN1.2                                     |
| (config-if)#ip address 100.12.12.1/24            | Configure IP address as 100.12.12.1 on network side of Spine-P3 |
| (config-if)#exit                                 | Exit Interface mode and return to Configure mode.               |
| (config)#commit                                  | Commit the candidate configuration to running configuration     |

### OSPF configuration:

|   |   |
|---|---|
| (config)#router ospf 100                            | Enter into router OSPF mode                                 |
| (config-router)#ospf router-id 2.2.2.2              | Configure router-id as 2.2.2.2 (lo IP address)              |
| (config-router)#network 2.2.2.2/32 area 0.0.0.0     | Add 2.2.2.2 (lo IP address) network into area 0             |
| (config-router)#network 100.12.12.0/24 area 0.0.0.0 | Add 100.12.12.0(Spine-P3) network into area 0               |
| (config-router)#bfd all-interfaces                  | Enabling bfd on all ospf interface for fast convergence     |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.           |
| (config)#commit                                     | Commit the candidate configuration to running configuration |

### BGP configuration:

|   |  |
|---|--|
| (Config)#router bgp 5000                                  | Enter into Router BGP mode   |
| (config-router)#bgp router-id 2.2.2.2                     | Configure router-id as 2.2.2.2 (lo IP address)                       |
| (config-router)#neighbor 1.1.1.1 remote-as 5000           | Specify a VTEP1 loopback IP address and remote-as defined            |
| (config-router)#neighbor 1.1.1.1 update-source lo         | Configure update as loopback for VTEP1                               |
| (config-router)#neighbor 1.1.1.1 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP1 |
| (config-router)#neighbor 4.4.4.4 remote-as 5000           | Specify a VTEP4 loopback IP address and remote-as defined            |
| (config-router)#neighbor 4.4.4.4 update-source lo         | Configure update as loopback for VTEP4                               |
| (config-router)#neighbor 4.4.4.4 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP4 |
| (config-router)#neighbor 5.5.5.5 remote-as 5000           | Specify a VTEP5 loopback IP address and remote-as defined            |
| (config-router)#neighbor 5.5.5.5 update-source lo         | Configure update as loopback for VTEP5                               |
| (config-router)#neighbor 5.5.5.5 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP5 |
| (config-router)#address-family l2vpn evpn                 | Enter into L2VPN EVPN address family mode                            |

## VxLAN-EVPN with IRB

|  |   |
|--|---|
| (config-router-af)#neighbor 1.1.1.1 activate | Activate 1.1.1.1(VTEP1) into L2VPN EVPN address family mode |
| (config-router-af)#neighbor 4.4.4.4 activate | Activate 4.4.4.4(VTEP4) into L2VPN EVPN address family mode |
| (config-router-af)#neighbor 5.5.5.5 activate | Activate 5.5.5.5(VTEP5) into L2VPN EVPN address family mode |
| (config-router-af)#exit-address-family       | Exit from L2VPN address family mode                         |
| (config-router)#exit                         | Exit from Router BGP mode and enter into config mode        |
| (config)#commit                              | Commit the candidate configuration to running configuration |

## VRF Configuration:

|  |   |
|--|---|
| (config)#mac vrf L2VRF1                        | Create MAC routing/forwarding instance with L2VRF1 name and enter into VRF mode                 |
| (config-vrf)#rd 2.2.2.2:11                     | Assign RD value   |
| (config-vrf)#description MAC VRF RED           | Give description to L2VRF1 as RED   |
| (config-vrf)#route-target both 9.9.9.9:100     | Assign route-target value for same for import and export. Should be same on all node for L2VRF1 |
| (config-vrf)#exit                              | Exit from VRF mode  |
| (config)#mac vrf L2VRF2                        | Create MAC routing/forwarding instance with L2VRF2 name and enter into VRF mode                 |
| (config-vrf)#rd 2.2.2.2:21                     | Assign RD value   |
| (config-vrf)#route-target both 90.90.90.90:100 | Assign route-target value for same for import and export  |
| (config-vrf)#description MAC VRF BLUE          | Give description to L2VRF2 as BLUE  |
| (config-vrf)#exit                              | Exit from VRF mode  |
| (config)#commit                                | Commit the candidate configuration to running configuration                                     |

## VxLAN configuration:

|  |   |
|--|---|
| (config)#nvo vxlan enable  | Enable VxLAN  |
| (config)#evpn esi hold-time 90                                   | Configure ESI hold time to allow tunnel to come up at the time of vxlan initialization before making the ESI up.It should be same on both VTEP1 and VTEP2 |
| (config)#nvo vxlan vtep-ip-global 2.2.2.2                        | Configure Source vtep-IP-global configuration - Use loopback IP address   |
| (config)#nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode   |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1    | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# vni-name VNI-101                                   | Configure VNI name as VNI-101   |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#commit  | Commit the candidate configuration to running configuration   |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode   |

|   |  |
|---|--|
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2 | Assign VRF for EVPN-BGP to carry EVPN route  |
| (config-nvo)# vni-name VNI-201                                | Configure VNI name as VNI-201  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.                           |
| (config)#nvo vxlan access-if port-vlan po1 10                 | Enable port-VLAN mapping i.e. access port to outer-vlan (SVLAN) - Multihomed access port |
| (config-nvo-acc-if)#map vnid 101                              | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)# mac 0000.2222.1010 ip 11.11.11.51        | Configure static MAC-IP  |
| (config-nvo-acc-if)#exit                                      | Exit from VxLAN access-interface mode and enter into configuration mode                  |
| (config)#nvo vxlan access-if port-vlan po1 20                 | Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port |
| (config-nvo-acc-if)#map vnid 201                              | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)# mac 0000.2222.1020 ip 21.21.21.51        | Configure static MAC-IP  |
| (config-nvo-acc-if)#exit                                      | Exit from VxLAN access-interface mode and enter into configuration mode                  |
| (config)#commit   | Commit the candidate configuration to running configuration                              |

#### VTEP4

Single Home -SH5.

Hardware profile and generic configuration:

|   |   |
|---|---|
| #configure terminal                                 | Enter Configure mode.                                       |
| (config)#hardware-profile filter vxlan enable       | Enable hardware-profile filter for VxLAN.                   |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4.             |
| (config)#hardware-profile statistics ac-lif enable  | Enable ac-lif for vxlan access-if port counters             |
| (config)#qos enable                                 | Enabling qos  |
| (config)#commit                                     | Commit the candidate configuration to running configuration |

Interface and loopback configuration:

|   |  |
|---|--|
| (config)#interface sa1                      | Enter Interface mode for sa1 (SH5)                 |
| (config-if)#switchport                      | Make it L2 interface                               |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.  |
| (config)#interface lo                       | Enter Interface mode for lo                        |
| (config-if)#ip address 4.4.4.4/32 secondary | Configure loopback IP address as 4.4.4.4 for VTEP4 |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.  |
| (config)#interface po4                      | Enter Interface mode for po4                       |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.  |

|   |   |
|---|---|
| (config)#interface xe7                  | Enter Interface mode for xe7                                    |
| (config-if)#channel-group 4 mode active | Make it member port of po4                                      |
| (config-if)#exit                        | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe9                  | Enter Interface mode for xe9                                    |
| (config-if)#channel-group 4 mode active | Make it member port of po4                                      |
| (config-if)#exit                        | Exit Interface mode and return to Configure mode.               |
| (config) interface po4.4                | Enter L3SI po4.4  |
| (config-if)# encapsulation dot1q 4      | Encapsulation as dot1q with VLAN 4                              |
| (config-if)#ip address 100.14.14.1/24   | Configure IP address as 100.14.14.1 on network side of Spine-P3 |
| (config-if)#exit                        | Exit Interface mode and return to Configure mode.               |
| (config)#commit                         | Commit the candidate configuration to running configuration     |

## OSPF configuration:

|   |   |
|---|---|
| (config)#router ospf 100                            | Enter into router OSPF mode                                 |
| (config-router)#ospf router-id 4.4.4.4              | Configure router-id as 4.4.4.4 (lo IP address)              |
| (config-router)#network 4.4.4.4/32 area 0.0.0.0     | Add 4.4.4.4 (lo IP address) network into area 0             |
| (config-router)#network 100.14.14.0/24 area 0.0.0.0 | Add 100.14.14.0(Spine-P3) network into area 0               |
| (config-router)#bfd all-interfaces                  | Enabling bfd on all ospf interface for fast convergence     |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.           |
| (config)#commit                                     | Commit the candidate configuration to running configuration |

## BGP configuration:

|   |  |
|---|--|
| (Config)#router bgp 5000                                  | Enter into Router BGP mode   |
| (config-router)#bgp router-id 4.4.4.4                     | Configure router-id as 4.4.4.4 (lo IP address)                       |
| (config-router)#neighbor 1.1.1.1 remote-as 5000           | Specify a VTEP1 loopback IP address and remote-as defined 5000       |
| (config-router)#neighbor 1.1.1.1 update-source lo         | Configure update as loopback for VTEP1                               |
| (config-router)#neighbor 1.1.1.1 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP1 |
| (config-router)#neighbor 2.2.2.2 remote-as 5000           | Specify a VTEP2 loopback IP address and remote-as defined 5000       |
| (config-router)#neighbor 2.2.2.2 update-source lo         | Configure update as loopback for VTEP2                               |
| (config-router)#neighbor 2.2.2.2 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP2 |
| (config-router)#neighbor 5.5.5.5 remote-as 5000           | Specify a VTEP5 loopback IP address and remote-as defined 5000       |
| (config-router)#neighbor 5.5.5.5 update-source lo         | Configure update as loopback for VTEP5                               |

|   |  |
|---|--|
| (config-router)#neighbor 5.5.5.5 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP5 |
| (config-router)#address-family l2vpn evpn                 | Enter into L2VPN EVPN address family mode                            |
| (config-router-af)#neighbor 1.1.1.1 activate              | Activate 1.1.1.1(VTEP1) into L2VPN EVPN address family mode          |
| (config-router-af)#neighbor 2.2.2.2 activate              | Activate 2.2.2.2(VTEP2) into L2VPN EVPN address family mode          |
| (config-router-af)#neighbor 5.5.5.5 activate              | Activate 5.5.5.5(VTEP5) into L2VPN EVPN address family mode          |
| (config-router-af)#exit-address-family                    | Exit from L2VPN address family mode                                  |
| (config-router)#exit                                      | Exit from Router BGP mode and enter into config mode                 |
| (config)#commit   | Commit the candidate configuration to running configuration          |

### VRF Configuration:

|  |   |
|--|---|
| (config)#mac vrf L2VRF1                        | Create MAC routing/forwarding instance with L2VRF1 name and enter into VRF mode                 |
| (config-vrf)#rd 4.4.4.4:11                     | Assign RD value   |
| (config-vrf)#description MAC VRF RED           | Give description to L2VRF1 as RED   |
| (config-vrf)#route-target both 9.9.9.9:100     | Assign route-target value for same for import and export. Should be same on all node for L2VRF1 |
| (config-vrf)#exit                              | Exit from VRF mode  |
| (config)#mac vrf L2VRF2                        | Create MAC routing/forwarding instance with L2VRF2 name and enter into VRF mode                 |
| (config-vrf)#rd 4.4.4.4:21                     | Assign RD value   |
| (config-vrf)#route-target both 90.90.90.90:100 | Assign route-target value for same for import and export  |
| (config-vrf)#description MAC VRF BLUE          | Give description to L2VRF2 as BLUE  |
| (config-vrf)#exit                              | Exit from VRF mode  |
| (config)#commit                                | Commit the candidate configuration to running configuration                                     |

### VxLAN configuration:

|  |   |
|--|---|
| (config)#nvo vxlan enable  | Enable VxLAN  |
| (config)#nvo vxlan vtep-ip-global 4.4.4.4                        | Configure Source vtep-IP-global configuration. Use loopback IP address  |
| (config)#nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1    | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# vni-name VNI-101                                   | Configure VNI name as VNI-101   |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2    | Assign VRF for EVPN-BGP to carry EVPN route   |

|   |  |
|---|--|
| (config-nvo)# vni-name VNI-201                          | Configure VNI name as VNI-201  |
| (config-nvo)#exit                                       | Exit from VxLAN tenant mode and enter into configuration mode.                           |
| (config)#commit   | Commit the candidate configuration to running configuration                              |
| (config)# nvo vxlan access-if port-vlan sa1 20          | Enable port-VLAN mapping i.e. access port to outer-vlan (SVLAN) - Multihomed access port |
| (config-nvo-acc-if)#map vnid 201                        | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)# mac 0000.5555.1020 ip 21.21.21.101 | Configure static MAC-IP  |
| (config-nvo-acc-if)#exit                                | Exit from VxLAN access-interface mode and enter into configuration mode                  |
| (config)#exit   | Exit from configuration mode   |
| (config)#commit   | Commit the candidate configuration to running configuration                              |

**VTEP5**

## Single Home -SH3

## Hardware profile and generic configuration:

|   |   |
|---|---|
| #configure terminal                                 | Enter Configure mode.                                       |
| (config)#hardware-profile filter vxlan enable       | Enable hardware-profile filter for VxLAN.                   |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4.             |
| (config)#hardware-profile statistics ac-lif enable  | Enable ac-lif for vxlan access-if port counters             |
| (config)#qos enable                                 | Enabling qos  |
| (config)#commit                                     | Commit the candidate configuration to running configuration |

## Interface and loopback configuration:

|   |   |
|---|---|
| (config)#interface xe48                     | Enter Interface mode for xe48 (SH3)                             |
| (config-if)#switchport                      | Make it L2 interface  |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.               |
| (config)#interface lo                       | Enter Interface mode for lo                                     |
| (config-if)#ip address 5.5.5.5/32 secondary | Configure loopback IP address as 5.5.5.5 for VTEP5              |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.               |
| (config) interface xe40                     | Enter interface mode  |
| (config-if)#ip address 100.15.15.1/24       | Configure IP address as 100.15.15.1 on network side of Spine-P3 |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.               |
| (config)#commit                             | Commit the candidate configuration to running configuration     |

## OSPF configuration:

|   |   |
|---|---|
| (config)#router ospf 100                            | Enter into router OSPF mode                                 |
| (config-router)#ospf router-id 5.5.5.5              | Configure router-id as 5.5.5.5 (lo IP address)              |
| (config-router)#network 5.5.5.5/32 area 0.0.0.0     | Add 5.5.5.5 (lo IP address) network into area 0             |
| (config-router)#network 100.15.15.0/24 area 0.0.0.0 | Add 100.15.15.0(Spine-P3) network into area 0               |
| (config-router)#bfd all-interfaces                  | Enabling bfd on all ospf interface for fast convergence     |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.           |
| (config)#commit                                     | Commit the candidate configuration to running configuration |

## BGP configuration:

|   |  |
|---|--|
| (Config)#router bgp 5000                                  | Enter into Router BGP mode   |
| (config-router)#bgp router-id 5.5.5.5                     | Configure router-id as 5.5.5.5(lo IP address)                        |
| (config-router)#neighbor 1.1.1.1 remote-as 5000           | Specify a VTEP1 loopback IP address and remote-as defined            |
| (config-router)#neighbor 1.1.1.1 update-source lo         | Configure update as loopback for VTEP1                               |
| (config-router)#neighbor 1.1.1.1 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP1 |
| (config-router)#neighbor 2.2.2.2 remote-as 5000           | Specify a VTEP2 loopback IP address and remote-as defined            |
| (config-router)#neighbor 2.2.2.2 update-source lo         | Configure update as loopback for VTEP2                               |
| (config-router)#neighbor 2.2.2.2 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP2 |
| (config-router)#neighbor 4.4.4.4 remote-as 5000           | Specify a VTEP4 loopback IP address and remote-as defined            |
| (config-router)#neighbor 4.4.4.4 update-source lo         | Configure update as loopback for VTEP4                               |
| (config-router)#neighbor 4.4.4.4 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP4 |
| (config-router)#address-family l2vpn evpn                 | Enter into L2VPN EVPN address family mode                            |
| (config-router-af)#neighbor 1.1.1.1 activate              | Activate 1.1.1.1(VTEP1) into L2VPN EVPN address family mode          |
| (config-router-af)#neighbor 2.2.2.2 activate              | Activate 2.2.2.2(VTEP2) into L2VPN EVPN address family mode          |
| (config-router-af)#neighbor 4.4.4.4 activate              | Activate 4.4.4.4(VTEP4) into L2VPN EVPN address family mode          |
| (config-router-af)#exit-address-family                    | Exit from L2VPN address family mode                                  |
| (config-router)#exit                                      | Exit from Router BGP mode and enter into config mode                 |
| (config)#commit   | Commit the candidate configuration to running configuration          |

## VRF Configuration:

|  |   |
|--|---|
| (config)#mac vrf L2VRF1                        | Create MAC routing/forwarding instance with L2VRF1 name and enter into VRF mode                 |
| (config-vrf)#rd 5.5.5.5:11                     | Assign RD value   |
| (config-vrf)#description MAC VRF RED           | Give description to L2VRF1 as RED   |
| (config-vrf)#route-target both 9.9.9.9:100     | Assign route-target value for same for import and export. Should be same on all node for L2VRF1 |
| (config-vrf)#exit                              | Exit from VRF mode  |
| (config)#mac vrf L2VRF2                        | Create MAC routing/forwarding instance with L2VRF2 name and enter into VRF mode                 |
| (config-vrf)#rd 5.5.5.5:21                     | Assign RD value   |
| (config-vrf)#route-target both 90.90.90.90:100 | Assign route-target value for same for import and export  |
| (config-vrf)#description MAC VRF BLUE          | Give description to L2VRF2 as BLUE  |
| (config-vrf)#exit                              | Exit from VRF mode  |
| (config)#commit                                | Commit the candidate configuration to running configuration                                     |

## VxLAN configuration:

|  |   |
|--|---|
| (config)#nvo vxlan enable  | Enable VxLAN  |
| (config)#nvo vxlan vtep-ip-global 5.5.5.5                        | Configure Source vtep-IP-global configuration. Use loopback IP address  |
| (config)#nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1    | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# vni-name VNI-101                                   | Configure VNI name as VNI-101   |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2    | Assign vrf for EVPN-BGP to carry EVPN route   |
| (config-nvo)# vni-name VNI-201                                   | Configure VNI name as VNI-201   |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)# nvo vxlan access-if port-vlan xe48 10                  | Enable port-VLAN mapping i.e. access port to outer-vlan (SVLAN) - Multihomed access port                      |
| (config-nvo-acc-if)#map vnid 101                                 | Map VxLAN Identified to access-port for VxLAN   |
| (config-nvo-acc-if)# mac 0000.4444.1010 ip 11.11.11.201          | Configure static MAC-IP   |
| (config-nvo-acc-if)#exit   | Exit from VxLAN access-interface mode and enter into configuration mode                                       |
| (config)#commit  | Commit the candidate configuration to running configuration   |



**Switch1 (MH2)**

Multihomed to 2-VTEPs (VTEP1 and VTEP2). It acts as Tenant system for VLAN1.20.

|  |   |
|--|---|
| #configure terminal                                    | Enter Configure mode.                                       |
| (config)# bridge 1 protocol rstp vlan-bridge           | Configure RSTP VLAN bridge                                  |
| (config)# vlan database                                | Enter into VLAN database mode                               |
| (config)#vlan 2-20 bridge 1 state enable               | Configure VLANs from 2-20 and associate with bridge 1       |
| (config)#commit  | Commit the candidate configuration to running configuration |
| (config)#interface xe7                                 | Enter Interface mode for xe7                                |
| (config-if)#switchport                                 | Make as L2 port by configuring switchport                   |
| (config-if)#bridge-group 1                             | Associate bridge 1 into interface                           |
| (config-if)# bridge-group 1 spanning-tree disable      | Configure interface as STP disable                          |
| (config-if)# switchport mode trunk                     | Mode as trunk   |
| (config-if)# switchport trunk allowed vlan add 2,10,20 | Trunk allowed VLAN as 2.10.20                               |
| (config-if)#switchport trunk native vlan 2             | Native VLAN as 2  |
| (config-if)#exit                                       | Exit Interface mode and return to Configure mode.           |
| (config)#interface po1                                 | Enter Interface mode for po1                                |
| (config-if)#switchport                                 | Make po1 as L2 port by configuring switchport               |
| (config-if)#bridge-group 1                             | Associate po1 to bridge 1                                   |
| (config-if)# bridge-group 1 spanning-tree disable      | Configure po1 as STP disable                                |
| (config-if)# switchport mode trunk                     | Mode as trunk   |
| (config-if)# switchport trunk allowed vlan add 2,10,20 | Trunk allowed VLAN as 2.10.20                               |
| (config-if)#switchport trunk native vlan 2             | Native VLAN as 2  |
| (config-if)#exit                                       | Exit Interface mode and return to Configure mode.           |
| (config)#interface xe3                                 | Enter Interface mode for xe3                                |
| (config-if)#channel-group 1 mode active                | Make it member port of po1                                  |
| (config)#interface xe4                                 | Enter Interface mode for xe4                                |
| (config-if)#channel-group 1 mode active                | Make it member port of po1                                  |
| (config)#exit  | Exit from configuration mode                                |
| (config)#interface xe9                                 | Enter Interface mode for xe9                                |
| (config-if)#channel-group 1 mode active                | Make it member port of po1                                  |
| (config)#interface xe10                                | Enter Interface mode for xe10                               |
| (config-if)#channel-group 1 mode active                | Make it member port of po1                                  |
| (config)#exit  | Exit from configuration mode                                |
| (config)#interface vlan1.20                            | Enter Interface mode for VLAN1.20                           |
| (config-if)# ip address 21.21.21.2/24                  | Configure IP address  |
| (config-if)#ipv6 address 21:21::21:2/48                | Configure IPv6 address                                      |

|                  |   |
|------------------|---|
| (config-if)#exit | Exit from configuration mode                                |
| (config)#commit  | Commit the candidate configuration to running configuration |

**Switch2 (SH5)**

|  |   |
|--|---|
| #configure terminal                                    | Enter Configure mode.                                       |
| (config)# bridge 1 protocol rstp vlan-bridge           | Configure RSTP VLAN bridge                                  |
| (config)# vlan database                                |   |
| (config)#vlan 2-20 bridge 1 state enable               | Configure VLANs from 2-20 and associate with bridge 1       |
| (config)#commit  | Commit the candidate configuration to running configuration |
| (config)#interface xe22                                | Enter Interface mode for xe22                               |
| (config-if)#switchport                                 | Make xe22 as L2 port by configuring switchport              |
| (config-if)#bridge-group 1                             | Associate xe22 to bridge 1                                  |
| (config-if)# bridge-group 1 spanning-tree disable      | Configure xe22 as STP disable                               |
| (config-if)# switchport mode trunk                     | Mode as trunk   |
| (config-if)# switchport trunk allowed vlan add 6,10,20 | Trunk allowed VLAN as 6,.10 &.20                            |
| (config-if)#switchport trunk native vlan 6             | Native VLAN as 6  |
| (config-if)#exit                                       | Exit Interface mode and return to Configure mode.           |
| (config)#interface sa1                                 | Enter Interface mode for sa11                               |
| (config-if)#switchport                                 | Make sa1 as L2 port by configuring switchport               |
| (config-if)#bridge-group 1                             | Associate sa1 to bridge 1                                   |
| (config-if)# bridge-group 1 spanning-tree disable      | Configure sa1 as STP disable                                |
| (config-if)# switchport mode trunk                     | Mode as trunk   |
| (config-if)# switchport trunk allowed vlan add 6,10,20 | Trunk allowed VLAN as 2,.10.& 20                            |
| (config-if)#switchport trunk native vlan 6             | Native VLAN as 6  |
| (config-if)#exit                                       | Exit Interface mode and return to Configure mode.           |
| (config)#interface xe3                                 | Enter Interface mode for xe3                                |
| (config-if)# static-channel-group 1                    | Make it member port of sa1                                  |
| (config)#interface xe4                                 | Enter Interface mode for xe4                                |
| (config-if)# static-channel-group 1                    | Make it member port of sa1                                  |
| (config)#exit  | Exit from configuration mode                                |
| (config)#interface vlan1.20                            | Enter Interface mode for VLAN1.20                           |
| (config-if)# ip address 21.21.21.3/24                  | Configure IP address  |
| (config-if)#ipv6 address 21:21::21:3/48                | Configure IPv6 address                                      |
| (config-if)#exit                                       | Exit from configuration mode                                |
| (config)#commit  | Commit the candidate configuration to running configuration |

**Spine-P3**

Spine node where all VTEPs are connected.

**Generic configuration:**

|                     |   |
|---------------------|---|
| #configure terminal | Enter Configure mode.                                       |
| (config)#qos enable | Enabling qos  |
| (config)#commit     | Commit the candidate configuration to running configuration |

**Interface and loopback configuration:**

|   |   |
|---|---|
| (config)#interface lo                               | Enter Interface mode for lo                                   |
| (config-if)#ip address 100.100.100.100/32 secondary | Configure loopback IP address as 100.100.100.100 for Spine-P3 |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.             |
| (config)#interface po2                              | Enter Interface mode for po2                                  |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.             |
| (config)#interface xe25                             | Enter Interface mode for xe25                                 |
| (config-if)#channel-group 2 mode active             | Make it member port of po2                                    |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.             |
| (config)#interface xe26                             | Enter Interface mode for xe26                                 |
| (config-if)#channel-group 2 mode active             | Make it member port of po3                                    |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.             |
| (config)#interface po2                              | Enter Interface mode for po2                                  |
| (config-if)#ip address 100.11.11.2/24               | Configure IP address as 100.11.11.2 on network side of VTEP1  |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.             |
| (config)#interface po3                              | Enter Interface mode for po3                                  |
| (config)#i switchport                               | Configure po3 as L2 interface                                 |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.             |
| (config)#interface xe27                             | Enter Interface mode for xe27                                 |
| (config-if)#channel-group 3 mode active             | Make it member port of po3                                    |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.             |
| (config)#interface xe28                             | Enter Interface mode for xe28                                 |
| (config-if)#channel-group 3 mode active             | Make it member port of po3                                    |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.             |
| (config)# bridge 1 protocol rstp vlan-bridge        | Configure bridge 1  |
| (config)# vlan database                             | Enter into VLAN database mode                                 |
| (config)#vlan 2 bridge 1 state enable               | Configure VLAN 2 as part of bridge 1                          |
| (config)#interface po3                              | Enter Interface mode for po3                                  |
| (config-if)# bridge-group 1                         | Configure bridge 1 for po3                                    |
| (config-if)# switchport mode trunk                  | Switchport mode as trunk                                      |
| (config-if)# switchport trunk allowed vlan add 2    | Trunk allowed VLAN 2  |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.             |
| (config) interface vlan1.2                          | Enter into SVI port VLAN1.2                                   |

|   |   |
|---|---|
| (config-if)#ip address 100.12.12.2/24   | Configure IP address as 100.12.12.2 on network side of VTEP2  |
| (config-if)#exit                        | Exit Interface mode and return to Configure mode.             |
| (config)#interface po4                  | Enter Interface mode for po4                                  |
| (config-if)#exit                        | Exit Interface mode and return to Configure mode.             |
| (config)#interface xe7                  | Enter Interface mode for xe7                                  |
| (config-if)#channel-group 4 mode active | Make it member port of po4                                    |
| (config-if)#exit                        | Exit Interface mode and return to Configure mode.             |
| (config)#interface xe9                  | Enter Interface mode for xe9                                  |
| (config-if)#channel-group 4 mode active | Make it member port of po4                                    |
| (config-if)#exit                        | Exit Interface mode and return to Configure mode.             |
| (config) interface po4.4                | Enter L3SI po4.4  |
| (config-if)# encapsulation dot1q 4      | Encapsulation as dot1q with VLAN 4                            |
| (config-if)#ip address 100.14.14.2/24   | Configure IP address as 100.14.14.12 on network side of VTEP4 |
| (config-if)#exit                        | Exit Interface mode and return to Configure mode.             |
| (config) interface xe40                 | Enter interface mode  |
| (config-if)#ip address 100.15.15.1/24   | Configure IP address as 100.15.15.1 on network side of VTEP5  |
| (config-if)#exit                        | Exit Interface mode and return to Configure mode.             |
| (config)#commit                         | Commit the candidate configuration to running configuration   |

## OSPF configuration:

|   |   |
|---|---|
| (config)#router ospf 100                                | Enter into router OSPF mode                                 |
| (config-router)#ospf router-id 100.100.100.100          | Configure router-id as 100.100.100.100 (lo IP address)      |
| (config-router)#network 100.100.100.100/32 area 0.0.0.0 | Add 100.100.100.100 (lo IP address) network into area 0     |
| (config-router)#network 100.11.11.0/24 area 0.0.0.0     | Add 100.11.11.0 (VTEP1) network into area 0                 |
| (config-router)#network 100.12.12.0/24 area 0.0.0.0     | Add 100.12.12.0 (VTEP2) network into area 0                 |
| (config-router)#network 100.14.14.0/24 area 0.0.0.0     | Add 100.14.14.0 (VTEP4) network into area 0                 |
| (config-router)#network 100.15.15.0/24 area 0.0.0.0     | Add 100.15.15.0 (VTEP5) network into area 0                 |
| (config-router)#bfd all-interfaces                      | Enabling bfd on all ospf interface for fast convergence     |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.           |
| (config)#commit   | Commit the candidate configuration to running configuration |

## Centralized Gateway

In Centralized gateway approach, when two TS belonging to two different subnets connected to the same/different VTEP node, wanted to communicate with each other, their traffic needed to be back hauled from the VTEP node to the centralized gateway node where inter- subnet switching is performed and then back to the VTEP node.

## IRB Configuration for Centralized Gateway

Configure from Base Configuration-L2 VxLAN section, then configure below commands for centralized gateway approach.

### VTEP5

|   |   |
|---|---|
| (config)#nvo vxlan irb  | Enable VxLAN IRB  |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)#ip vrf L3VRF1  | Create MAC routing/forwarding instance with L3VRF1 name and enter into VRF mode                               |
| (config-vrf)#rd 51000:11  | Assign RD value   |
| (config-vrf)# route-target both 100:100                           | Assign route-target value for same for import and export.   |
| (config-vrf)# l3vni 1000  | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit   | Exit from VRF mode  |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)# interface irb1001                                       | Configure IRB interface 1001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 11.11.11.1/24                               | Configure IP address  |
| (config-if)ipv6 address 11:11::11:1/48                            | Configure IPv6 address  |
| (config-if)exit   | Exit from interface config mode   |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)# interface irb2001                                       | Configure IRB interface 2001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 21.21.21.1/24                               | Configure IP address  |
| (config-if)ipv6 address 21:21::21:1/48                            | Configure IPv6 address  |
| (config-if)exit   | Exit from interface config mode   |
| (config)router bgp 5000   | Enter into BGP router mode  |
| (config-router)#address-family ipv4 vrf L3VRF1                    | Enter into address-family mode for L3VRF1   |
| (config-router-af)#redistribute connected                         | Redistribute connected  |
| (config-router-af)#exit-address-family                            | Exit from address-family  |
| (config-router)#exit  | Exit from bgp router configuration mode   |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |

|  |   |
|--|---|
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1    | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# evpn irb1001                                       | Configure IRB1001 under VxLAN ID 101  |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2    | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# evpn irb2001                                       | Configure IRB2001 under VxLAN ID 201  |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#commit  | Commit the candidate configuration to running configuration   |

## Validation

### VTEP5

TB2-VTEP5#show nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 5.5.5.5 | 2.2.2.2     | Installed | 00:26:30 | 00:26:30 |
| 5.5.5.5 | 4.4.4.4     | Installed | 00:26:30 | 00:26:30 |
| 5.5.5.5 | 1.1.1.1     | Installed | 00:26:30 | 00:26:30 |

Total number of entries are 3

TB2-VTEP5#show nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port  
AC - Access Port  
(u) - Untagged

| VNID | VNI-Name | VNI-Type | Type | Interface | ESI  | VLAN | DF-Status | Src-Addr | Dst-Addr |
|------|----------|----------|------|-----------|------|------|-----------|----------|----------|
| 101  | VNI-101  | L2       | NW   | ----      | ---- | ---- | ----      | 5.5.5.5  | 2.2.2.2  |
| 101  | VNI-101  | L2       | NW   | ----      | ---- | ---- | ----      | 5.5.5.5  | 4.4.4.4  |
| 101  | VNI-101  | L2       | NW   | ----      | ---- | ---- | ----      | 5.5.5.5  | 1.1.1.1  |
| 101  | VNI-101  | --       | AC   | xe48      | ---  | 10   | ----      | ----     | ----     |
| 201  | VNI-201  | L2       | NW   | ----      | ---- | ---- | ----      | 5.5.5.5  | 2.2.2.2  |
| 201  | VNI-201  | L2       | NW   | ----      | ---- | ---- | ----      | 5.5.5.5  | 4.4.4.4  |
| 201  | VNI-201  | L2       | NW   | ----      | ---- | ---- | ----      | 5.5.5.5  | 1.1.1.1  |

Total number of entries are 7

TB2-VTEP5#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

| VNID | Ip-Addr      | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|--------------|----------------|---------------|---------|--------------|
| 201  | 21.21.21.51  | 0000.2222.1020 | Static Remote | ----    | ----         |
| 201  | 21.21.21.1   | 3c2c.99d6.167a | Static Local  | ----    | ----         |
| 201  | 21.21.21.101 | 0000.4444.1020 | Static Remote | ----    | ----         |
| 101  | 11.11.11.51  | 0000.2222.1010 | Static Remote | ----    | ----         |
| 101  | 11.11.11.1   | 3c2c.99d6.167a | Static Local  | ----    | ----         |
| 101  | 11.11.11.201 | 0000.5555.1010 | Static Local  | ----    | ----         |

Total number of entries are 6

TB2-VTEP5#show nvo vxlan nd-cache

VxLAN ND-CACHE Information

=====

| VNID | Ip-Addr     | Mac-Addr       | Type         | Age-Out | Retries-Left |
|------|-------------|----------------|--------------|---------|--------------|
| 201  | 21:21::21:1 | 3c2c.99d6.167a | Static Local | ----    | ----         |

```

101      11:11::1:1          3c2c.99d6.167a Static Local    ----
Total number of entries are 2
TB2-VTEP5#show nvo vxlan l3vni-map
  L3VNI      L2VNI      IRB-interface
=====
  1000      101        irb1001
  1000      201        irb2001

TB2-VTEP5#show ip route vrf L3VRF1
Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP
       O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,
       ia - IS-IS inter area, E - EVPN,
       v - vrf leaked
       * - candidate default

IP Route Table for VRF "L3VRF1"
C       11.11.11.0/24 is directly connected, irb1001, 00:27:00
C       21.21.21.0/24 is directly connected, irb2001, 00:26:58
C       127.0.0.0/8 is directly connected, lo.L3VRF1, 00:32:53

Gateway of last resort is not set
TB2-VTEP5#show ipv6 route vrf L3VRF1
IPv6 Routing Table
Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,
       IA - OSPF inter area, E1 - OSPF external type 1,
       E2 - OSPF external type 2, E - EVPN N1 - OSPF NSSA external type 1,
       N2 - OSPF NSSA external type 2, i - IS-IS, B - BGP
Timers: Uptime

IP Route Table for VRF "L3VRF1"
C       ::1/128 via ::, lo.L3VRF1, 00:32:53
C       11:11::/48 via ::, irb1001, 00:27:00
C       21:21::/48 via ::, irb2001, 00:26:58
C       fe80::/64 via ::, irb2001, 00:04:38
TB2-VTEP5#show ip route summary

-----
IP routing table name is Default-IP-Routing-Table(0)
-----
IP routing table maximum-paths   : 8
Total number of IPv4 routes      : 12
Total number of IPv4 paths      : 12
Pending routes (due to route max reached): 0
Route Source      Networks
connected         3
ospf              9
Total            12
FIB               12

ECMP statistics (active in ASIC):
  Total number of IPv4 ECMP routes : 0
  Total number of IPv4 ECMP paths  : 0
TB2-VTEP5#show ipv6 route summary

-----
IPv6 routing table name is Default-IPv6-Routing-Table(0)
-----
IPv6 routing table maximum-paths : 8
Total number of IPv6 routes      : 2
Total number of IPv6 paths      : 2
Pending routes (due to route max reached): 0
Route Source      Networks
connected         2
Total            2
FIB               2

ECMP statistics (active in ASIC):
  Total number of IPv6 ECMP routes : 0
  Total number of IPv6 ECMP paths  : 0
TB2-VTEP5#show bgp l2vpn evpn

```

## VxLAN-EVPN with IRB

BGP table version is 11, local router ID is 5.5.5.5  
Status codes: s suppressed, d damped, h history, \* valid, > best, i - internal,  
l - labeled, S Stale  
Origin codes: i - IGP, e - EGP, ? - incomplete

[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]

- 1 - Ethernet Auto-discovery Route
- 2 - MAC/IP Route
- 3 - Inclusive Multicast Route
- 4 - Ethernet Segment Route
- 5 - Prefix Route

| Network  | Next Hop | Metric | LocPrf | Weight | Path      | Peer | Encap |
|--|----------|--------|--------|--------|-----------|------|-------|
| RD[1.1.1.1:1]  |          |        |        |        |           |      |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]                                 | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| *>i [4]:[00:00:00:00:00:22:22:00:00:00]:[32,1.1.1.1]                                     | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| RD[1.1.1.1:11]   |          |        |        |        |           |      |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]                                      | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| *>i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101] | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| *>i [3]:[101]:[32,1.1.1.1]   | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| RD[1.1.1.1:21]   |          |        |        |        |           |      |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]                                      | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| *>i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201] | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| *>i [3]:[201]:[32,1.1.1.1]   | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| RD[2.2.2.2:1]  |          |        |        |        |           |      |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]                                 | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 |      | VxLAN |
| *>i [4]:[00:00:00:00:00:22:22:00:00:00]:[32,2.2.2.2]                                     | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 |      | VxLAN |
| RD[2.2.2.2:11]   |          |        |        |        |           |      |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]                                      | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 |      | VxLAN |
| *>i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101] | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 |      | VxLAN |
| *>i [3]:[101]:[32,2.2.2.2]   | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 |      | VxLAN |
| RD[2.2.2.2:21]   |          |        |        |        |           |      |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]                                      | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 |      | VxLAN |
| *>i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201] | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 |      | VxLAN |
| *>i [3]:[201]:[32,2.2.2.2]   | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 |      | VxLAN |
| RD[4.4.4.4:11]   |          |        |        |        |           |      |       |
| *>i [3]:[101]:[32,4.4.4.4]   | 4.4.4.4  | 0      | 100    | 0      | i 4.4.4.4 |      | VxLAN |
| RD[4.4.4.4:21]   |          |        |        |        |           |      |       |
| *>i [2]:[0]:[201]:[48,0000:4444:1020]:[32,21.21.21.101]:[201]                            | 4.4.4.4  | 0      | 100    | 0      | i 4.4.4.4 |      | VxLAN |
| *>i [3]:[201]:[32,4.4.4.4]   | 4.4.4.4  | 0      | 100    | 0      | i 4.4.4.4 |      | VxLAN |
| RD[5.5.5.5:11] VRF[L2VRF1]:  |          |        |        |        |           |      |       |
| * i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]                                      | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| * i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]                                 | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 |      | VxLAN |



```

1.1.1.1          0          100          0          i  1.1.1.1          VxLAN
2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
* i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101]
1.1.1.1          0          100          0          i  1.1.1.1          VxLAN
* i 2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
*> [2]:[0]:[101]:[48,0000:5555:1010]:[32,11.11.11.201]:[101]
5.5.5.5          0          100          32768         i  -----          VxLAN
*> [2]:[0]:[101]:[48,3c2c:99d6:167a]:[32,11.11.11.1]:[101]
5.5.5.5          0          100          32768         i  -----          VxLAN
*> [2]:[0]:[101]:[48,3c2c:99d6:167a]:[128,11:11::11:1]:[101]
5.5.5.5          0          100          32768         i  -----          VxLAN
* i [3]:[101]:[32,1.1.1.1]
1.1.1.1          0          100          0          i  1.1.1.1          VxLAN
* i [3]:[101]:[32,2.2.2.2]
2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
* i [3]:[101]:[32,4.4.4.4]
4.4.4.4          0          100          0          i  4.4.4.4          VxLAN
*> [3]:[101]:[32,5.5.5.5]
5.5.5.5          0          100          32768         i  -----          VxLAN

RD[5.5.5.5:21] VRF[L2VRF2]:
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]
1.1.1.1          0          100          0          i  1.1.1.1          VxLAN
* i 2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
1.1.1.1          0          100          0          i  1.1.1.1          VxLAN
* i 2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
* i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201]
1.1.1.1          0          100          0          i  1.1.1.1          VxLAN
* i 2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
* i [2]:[0]:[201]:[48,0000:4444:1020]:[32,21.21.21.101]:[201]
4.4.4.4          0          100          0          i  4.4.4.4          VxLAN
*> [2]:[0]:[201]:[48,3c2c:99d6:167a]:[32,21.21.21.1]:[201]
5.5.5.5          0          100          32768         i  -----          VxLAN
*> [2]:[0]:[201]:[48,3c2c:99d6:167a]:[128,21:21::21:1]:[201]
5.5.5.5          0          100          32768         i  -----          VxLAN
* i [3]:[201]:[32,1.1.1.1]
1.1.1.1          0          100          0          i  1.1.1.1          VxLAN
* i [3]:[201]:[32,2.2.2.2]
2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
* i [3]:[201]:[32,4.4.4.4]
4.4.4.4          0          100          0          i  4.4.4.4          VxLAN
*> [3]:[201]:[32,5.5.5.5]
5.5.5.5          0          100          32768         i  -----          VxLAN

Total number of prefixes 39
TB2-VTEP5#

```

## Anycast Gateway

For today's large multi-tenant data center, centralized L3 gateway scheme is very inefficient and sometimes impractical. In order to overcome the drawback of centralized L3GW approach, anycast mode is used.

In Anycast gateway approach, all the VTEPs acts as default gateway for all the VNIDs. We will configure same anycast MAC in all VTEPs.

## IRB Configuration for Anycast

Configure from Base Configuration-L2 VxLAN section, then configure below commands for Anycast gateway approach.

**VTEP1**

|   |   |
|---|---|
| (config)#nvo vxlan irb  | Enable VxLAN IRB  |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)#ip vrf L3VRF1  | Create MAC routing/forwarding instance with L3VRF1 name and enter into VRF mode                               |
| (config-vrf)#rd 11000:11  | Assign RD value   |
| (config-vrf)# route-target both 100:100                           | Assign route-target value for same for import and export.   |
| (config-vrf)# l3vni 1000  | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit   | Exit from VRF mode  |
| (config)# evpn irb-forwarding anycast-gateway-mac 0000.0000.1111  | Configure anycast MAC address   |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)# interface irb1001                                       | Configure IRB interface 1001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 11.11.11.1/24                               | Configure IP address  |
| (config-if)ipv6 address 11:11::11:1/48                            | Configure IPv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac            | Configure anycast MAC address   |
| (config-if)exit   | Exit from interface config mode   |
| (config)# interface irb2001                                       | Configure IRB interface 2001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 21.21.21.1/24 anycast                       | Configure IP address  |
| (config-if)ipv6 address 21:21::21:1/48                            | Configure IPv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac            | Configure anycast MAC address   |
| (config-if)exit   | Exit from interface config mode   |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)router bgp 5000   | Enter into BGP router mode  |
| (config-router)#address-family ipv4 vrf L3VRF1                    | Enter into address-family mode for L3VRF1   |
| (config-router-af)#redistribute connected                         | Redistribute connected  |
| (config-router-af)#exit-address-family                            | Exit from address-family  |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1     | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# evpn irb1001  | Configure IRB1001 under VxLAN ID 101  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled  | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2     | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# evpn irb2001  | Configure IRB2001 under VxLAN ID 201  |

|                   |  |
|-------------------|--|
| (config-nvo)#exit | Exit from VxLAN tenant mode and enter into configuration mode. |
| (config)#commit   | Commit the candidate configuration to running configuration    |

**VSTEP2**

|   |   |
|---|---|
| (config)#nvo vxlan irb  | Enable VxLAN IRB  |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)#ip vrf L3VRF1  | Create MAC routing/forwarding instance with L3VRF1 name and enter into VRF mode                               |
| (config-vrf)#rd 21000:11  | Assign RD value   |
| (config-vrf)# route-target both 100:100                           | Assign route-target value for same for import and export.   |
| (config-vrf)# l3vni 1000  | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit   | Exit from VRF mode  |
| (config)# evpn irb-forwarding anycast-gateway-mac 0000.0000.1111  | Configure anycast MAC address   |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)# interface irb1001                                       | Configure IRB interface 1001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 11.11.11.1/24                               | Configure IP address  |
| (config-if)ipv6 address 11:11::11:1/48                            | Configure IPv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac            | Configure anycast MAC address   |
| (config-if)exit   | Exit from interface config mode   |
| (config)# interface irb2001                                       | Configure IRB interface 2001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 21.21.21.1/24                               | Configure IP address  |
| (config-if)ipv6 address 21:21::21:1/48                            | Configure IPv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac            | Configure anycast MAC address   |
| (config-if)exit   | Exit from interface config mode   |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)router bgp 5000   | Enter into BGP router mode  |
| (config-router)#address-family ipv4 vrf L3VRF1                    | Enter into address-family mode for L3VRF1   |
| (config-router-af)#redistribute connected                         | Redistribute connected  |
| (config-router-af)#exit-address-family                            | Exit from address-family  |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1     | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# evpn irb1001  | Configure IRB1001 under VxLAN ID 101  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |

## VxLAN-EVPN with IRB

|  |   |
|--|---|
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2    | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# evpn irb2001                                       | Configure IRB2001 under VxLAN ID 201  |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#commit  | Commit the candidate configuration to running configuration   |

## VTEP4

|   |   |
|---|---|
| (config)#nvo vxlan irb  | Enable VxLAN IRB  |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)#ip vrf L3VRF1  | Create MAC routing/forwarding instance with L3VRF1 name and enter into VRF mode                               |
| (config-vrf)#rd 41000:11  | Assign RD value   |
| (config-vrf)# route-target both 100:100                           | Assign route-target value for same for import and export.   |
| (config-vrf)# l3vni 1000  | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit   | Exit from VRF mode  |
| (config)# evpn irb-forwarding anycast-gateway-mac 0000.0000.1111  | Configure anycast MAC address   |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)# interface irb1001                                       | Configure IRB interface 1001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 11.11.11.1/24                               | Configure IP address  |
| (config-if)ipv6 address 11:11::11:1/48                            | Configure IPv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac            | Configure anycast MAC address   |
| (config-if)exit   | Exit from interface config mode   |
| (config)# interface irb2001                                       | Configure IRB interface 2001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 21.21.21.1/24                               | Configure IP address  |
| (config-if)ipv6 address 21:21::21:1/48                            | Configure IPv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac            | Configure anycast MAC address   |
| (config-if)exit   | Exit from interface config mode   |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)router bgp 5000   | Enter into BGP router mode  |
| (config-router)#address-family ipv4 vrf L3VRF1                    | Enter into address-family mode for L3VRF1   |
| (config-router-af)#redistribute connected                         | Redistribute connected  |
| (config-router-af)#exit-address-family                            | Exit from address-family  |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |

|  |   |
|--|---|
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1    | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# evpn irb1001                                       | Configure IRB1001 under VxLAN ID 101  |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2    | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# evpn irb2001                                       | Configure IRB2001 under VxLAN ID 201  |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#commit  | Commit the candidate configuration to running configuration   |

**VTEP5**

|  |   |
|--|---|
| (config)#nvo vxlan irb   | Enable VxLAN IRB  |
| (config)#commit  | Commit the candidate configuration to running configuration                     |
| (config)#ip vrf L3VRF1   | Create MAC routing/forwarding instance with L3VRF1 name and enter into VRF mode |
| (config-vrf)#rd 51000:11   | Assign RD value   |
| (config-vrf)# route-target both 100:100                          | Assign route-target value for same for import and export.                       |
| (config-vrf)# l3vni 1000   | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit  | Exit from VRF mode  |
| (config)# evpn irb-forwarding anycast-gateway-mac 0000.0000.1111 | Configure anycast MAC address   |
| (config)#commit  | Commit the candidate configuration to running configuration                     |
| (config)# interface irb1001                                      | Configure IRB interface 1001  |
| (config-if)ip vrf forwarding L3VRF1                              | Configure L3VRF1  |
| (config-if)ip address 11.11.11.1/24                              | Configure IP address  |
| (config-if)ipv6 address 11:11::11:1/48                           | Configure IPv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac           | Configure anycast MAC address   |
| (config-if)exit  | Exit from interface config mode   |
| (config)# interface irb2001                                      | Configure IRB interface 2001  |
| (config-if)ip vrf forwarding L3VRF1                              | Configure L3VRF1  |
| (config-if)ip address 21.21.21.1/24                              | Configure IP address  |
| (config-if)ipv6 address 21:21::21:1/48                           | Configure IPv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac           | Configure anycast MAC address   |
| (config-if)exit  | Exit from interface config mode   |
| (config)#commit  | Commit the candidate configuration to running configuration                     |
| (config)router bgp 5000  | Enter into BGP router mode  |
| (config-router)#address-family ipv4 vrf L3VRF1                   | Enter into address-family mode for L3VRF1                                       |

|   |   |
|---|---|
| (config-router-af)#redistribute connected                         | Redistribute connected  |
| (config-router-af)#exit-address-family                            | Exit from address-family  |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1     | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# evpn irb1001  | Configure IRB1001 under VxLAN ID 101  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled  | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2     | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# evpn irb2001  | Configure IRB2001 under VxLAN ID 201  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#commit   | Commit the candidate configuration to running configuration   |

## Validations

### VTEP1

TB2-VTEP1#show nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 1.1.1.1 | 5.5.5.5     | Installed | 00:13:05 | 00:13:05 |
| 1.1.1.1 | 4.4.4.4     | Installed | 00:18:33 | 00:18:33 |
| 1.1.1.1 | 2.2.2.2     | Installed | 00:18:34 | 00:18:34 |

Total number of entries are 3

TB2-VTEP1#show nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port  
AC - Access Port  
(u) - Untagged

| VNIID | VNI-Name | VNI-Type | Type | Interface | ESI                           | VLAN | DF-Status | Src-Addr | Dst-Addr |
|-------|----------|----------|------|-----------|-------------------------------|------|-----------|----------|----------|
| 101   | VNI-101  | L2       | NW   | ----      | ----                          | ---- | ----      | 1.1.1.1  | 5.5.5.5  |
| 101   | VNI-101  | L2       | NW   | ----      | ----                          | ---- | ----      | 1.1.1.1  | 4.4.4.4  |
| 101   | VNI-101  | L2       | NW   | ----      | ----                          | ---- | ----      | 1.1.1.1  | 2.2.2.2  |
| 101   | VNI-101  | --       | AC   | po1       | 00:00:00:00:00:22:22:00:00:00 | 10   | DF        | ----     | ----     |
| 201   | VNI-201  | L2       | NW   | ----      | ----                          | ---- | ----      | 1.1.1.1  | 5.5.5.5  |
| 201   | VNI-201  | L2       | NW   | ----      | ----                          | ---- | ----      | 1.1.1.1  | 4.4.4.4  |
| 201   | VNI-201  | L2       | NW   | ----      | ----                          | ---- | ----      | 1.1.1.1  | 2.2.2.2  |
| 201   | VNI-201  | --       | AC   | po1       | 00:00:00:00:00:22:22:00:00:00 | 20   | DF        | ----     | ----     |

Total number of entries are 8

TB2-VTEP1#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

| VNIID | Ip-Addr      | Mac-Addr       | Type          | Age-Out | Retries-Left |
|-------|--------------|----------------|---------------|---------|--------------|
| 201   | 21.21.21.51  | 0000.2222.1020 | Static Local  | ----    | ----         |
| 201   | 21.21.21.1   | 0000.0000.1111 | Static Local  | ----    | ----         |
| 201   | 21.21.21.101 | 0000.4444.1020 | Static Remote | ----    | ----         |
| 101   | 11.11.11.51  | 0000.2222.1010 | Static Local  | ----    | ----         |

```

101      11.11.11.1      0000.0000.1111 Static Local ----
101      11.11.11.201    0000.5555.1010 Static Remote ----

```

Total number of entries are 6

TB2-VTEP1#show nvo vxlan nd-cache

VxLAN ND-CACHE Information

=====

| VNID | Ip-Addr     | Mac-Addr       | Type         | Age-Out | Retries-Left |
|------|-------------|----------------|--------------|---------|--------------|
| 201  | 21:21::21:1 | 0000.0000.1111 | Static Local | ----    |              |
| 101  | 11:11::11:1 | 0000.0000.1111 | Static Local | ----    |              |

Total number of entries are 2

TB2-VTEP1#show nvo vxlan l3vni-map

L3VNI L2VNI IRB-interface

=====

|      |     |         |
|------|-----|---------|
| 1000 | 101 | irb1001 |
| 1000 | 201 | irb2001 |

TB2-VTEP1#show ip route vrf L3VRF1

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP

O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,

ia - IS-IS inter area, E - EVPN,

v - vrf leaked

\* - candidate default

IP Route Table for VRF "L3VRF1"

```

C      11.11.11.0/24 is directly connected, irb1001, 00:19:26
C      21.21.21.0/24 is directly connected, irb2001, 00:19:26
C      127.0.0.0/8 is directly connected, lo.L3VRF1, 00:19:28

```

Gateway of last resort is not set

TB2-VTEP1#show ipv6 route vrf L3VRF1

IPv6 Routing Table

Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,

IA - OSPF inter area, E1 - OSPF external type 1,

E2 - OSPF external type 2, E - EVPN N1 - OSPF NSSA external type 1,

N2 - OSPF NSSA external type 2, i - IS-IS, B - BGP

Timers: Uptime

IP Route Table for VRF "L3VRF1"

```

C      ::1/128 via ::, lo.L3VRF1, 00:19:28
C      11:11::/48 via ::, irb1001, 00:19:26
C      21:21::/48 via ::, irb2001, 00:19:26
C      fe80::/64 via ::, irb2001, 00:19:25

```

TB2-VTEP1#show ip route summary

-----  
IP routing table name is Default-IP-Routing-Table(0)  
-----

```

IP routing table maximum-paths : 8
Total number of IPv4 routes : 12
Total number of IPv4 paths : 12
Pending routes (due to route max reached): 0
Route Source Networks
connected 3
ospf 9
Total 12
FIB 12

```

ECMP statistics (active in ASIC):

Total number of IPv4 ECMP routes : 0

Total number of IPv4 ECMP paths : 0

TB2-VTEP1#show ipv6 route summary

-----  
IPv6 routing table name is Default-IPv6-Routing-Table(0)  
-----

```

IPv6 routing table maximum-paths : 8
Total number of IPv6 routes : 2
Total number of IPv6 paths : 2
Pending routes (due to route max reached): 0

```

## VxLAN-EVPN with IRB

```
Route Source   Networks
connected     2
Total         2
FIB           2
```

### ECMP statistics (active in ASIC):

```
Total number of IPv6 ECMP routes   : 0
Total number of IPv6 ECMP paths     : 0
```

```
TB2-VTEP1#show bgp l2vpn evpn
```

```
BGP table version is 6, local router ID is 1.1.1.1
```

```
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               l - labeled, S Stale
```

```
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]
```

```
1 - Ethernet Auto-discovery Route
```

```
2 - MAC/IP Route
```

```
3 - Inclusive Multicast Route
```

```
4 - Ethernet Segment Route
```

```
5 - Prefix Route
```

| Network  | Next Hop | Metric | LocPrf | Weight | Path | Peer    | Encap |
|--|----------|--------|--------|--------|------|---------|-------|
| RD[21000:11]   |          |        |        |        |      |         |       |
| *>i [5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]                                    | 2.2.2.2  | 0      | 100    | 0      | ?    | 2.2.2.2 | VxLAN |
| *>i [5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]                                    | 2.2.2.2  | 0      | 100    | 0      | ?    | 2.2.2.2 | VxLAN |
| RD[41000:11]   |          |        |        |        |      |         |       |
| *>i [5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]                                    | 4.4.4.4  | 0      | 100    | 0      | ?    | 4.4.4.4 | VxLAN |
| *>i [5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]                                    | 4.4.4.4  | 0      | 100    | 0      | ?    | 4.4.4.4 | VxLAN |
| RD[51000:11]   |          |        |        |        |      |         |       |
| *>i [5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]                                    | 5.5.5.5  | 0      | 100    | 0      | ?    | 5.5.5.5 | VxLAN |
| *>i [5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]                                    | 5.5.5.5  | 0      | 100    | 0      | ?    | 5.5.5.5 | VxLAN |
| RD[1.1.1.1:1] VRF[evpn-gvrf-1]:  |          |        |        |        |      |         |       |
| *> [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]                                  | 1.1.1.1  | 0      | 100    | 32768  | i    | -----   | VxLAN |
| *> [4]:[00:00:00:00:00:22:22:00:00:00]:[32,1.1.1.1]                                      | 1.1.1.1  | 0      | 100    | 32768  | i    | -----   | VxLAN |
| * i [4]:[00:00:00:00:00:22:22:00:00:00]:[32,2.2.2.2]                                     | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| RD[1.1.1.1:11] VRF[L2VRF1]:  |          |        |        |        |      |         |       |
| *> [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]                                       | 1.1.1.1  | 0      | 100    | 32768  | i    | -----   | VxLAN |
| * i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]                                 | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| * i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]                              | 5.5.5.5  | 0      | 100    | 0      | i    | 5.5.5.5 | VxLAN |
| * i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]                              | 4.4.4.4  | 0      | 100    | 0      | i    | 4.4.4.4 | VxLAN |
| * i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]                              | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *> [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]                               | 1.1.1.1  | 0      | 100    | 32768  | i    | -----   | VxLAN |
| * i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]                            | 5.5.5.5  | 0      | 100    | 0      | i    | 5.5.5.5 | VxLAN |
| * i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]                            | 4.4.4.4  | 0      | 100    | 0      | i    | 4.4.4.4 | VxLAN |
| * i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]                            | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *> [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101]  | 1.1.1.1  | 0      | 100    | 32768  | i    | -----   | VxLAN |
| * i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101] | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| * i [2]:[0]:[101]:[48,0000:5555:1010]:[32,11.11.11.201]:[101]                            | 5.5.5.5  | 0      | 100    | 0      | i    | 5.5.5.5 | VxLAN |
| *> [3]:[101]:[32,1.1.1.1]  | 1.1.1.1  | 0      | 100    | 32768  | i    | -----   | VxLAN |
| * i [3]:[101]:[32,2.2.2.2]   |          |        |        |        |      |         |       |



```

      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
* i  [3]:[101]:[32,4.4.4.4]
      4.4.4.4          0          100          0          i  4.4.4.4          VxLAN
* i  [3]:[101]:[32,5.5.5.5]
      5.5.5.5          0          100          0          i  5.5.5.5          VxLAN

RD[1.1.1.1:21] VRF[L2VRF2]:
*> [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]
      1.1.1.1          0          100          32768         i  -----          VxLAN
* i  [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
* i  [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
      5.5.5.5          0          100          0          i  5.5.5.5          VxLAN
* i  [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
      4.4.4.4          0          100          0          i  4.4.4.4          VxLAN
* i  [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
*> [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
      5.5.5.5          0          100          0          i  5.5.5.5          VxLAN
* i  [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
      4.4.4.4          0          100          0          i  4.4.4.4          VxLAN
* i  [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
*> [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
      1.1.1.1          0          100          32768         i  -----          VxLAN
* i  [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
* i  [2]:[0]:[201]:[48,0000:4444:1020]:[32,21.21.21.101]:[201]
      4.4.4.4          0          100          0          i  4.4.4.4          VxLAN
*> [3]:[201]:[32,1.1.1.1]
      1.1.1.1          0          100          32768         i  -----          VxLAN
* i  [3]:[201]:[32,2.2.2.2]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
* i  [3]:[201]:[32,4.4.4.4]
      4.4.4.4          0          100          0          i  4.4.4.4          VxLAN
* i  [3]:[201]:[32,5.5.5.5]
      5.5.5.5          0          100          0          i  5.5.5.5          VxLAN

RD[2.2.2.2:1]
*>i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
*>i [4]:[00:00:00:00:00:22:22:00:00:00]:[32,2.2.2.2]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN

RD[2.2.2.2:11]
*>i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
*>i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
*>i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
*>i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
*>i [3]:[101]:[32,2.2.2.2]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN

RD[2.2.2.2:21]
*>i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
*>i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
*>i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
*>i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN
*>i [3]:[201]:[32,2.2.2.2]
      2.2.2.2          0          100          0          i  2.2.2.2          VxLAN

RD[4.4.4.4:11]
*>i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
      4.4.4.4          0          100          0          i  4.4.4.4          VxLAN
*>i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
      4.4.4.4          0          100          0          i  4.4.4.4          VxLAN
*>i [3]:[101]:[32,4.4.4.4]
      4.4.4.4          0          100          0          i  4.4.4.4          VxLAN

```

# VxLAN-EVPN with IRB

```
RD[4.4.4.4:21]
*>i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
    4.4.4.4          0          100      0    i  4.4.4.4          VxLAN
*>i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
    4.4.4.4          0          100      0    i  4.4.4.4          VxLAN
*>i [2]:[0]:[201]:[48,0000:4444:1020]:[32,21.21.21.101]:[201]
    4.4.4.4          0          100      0    i  4.4.4.4          VxLAN
*>i [3]:[201]:[32,4.4.4.4]
    4.4.4.4          0          100      0    i  4.4.4.4          VxLAN
```

```
RD[5.5.5.5:11]
*>i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
    5.5.5.5          0          100      0    i  5.5.5.5          VxLAN
*>i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
    5.5.5.5          0          100      0    i  5.5.5.5          VxLAN
*>i [2]:[0]:[101]:[48,0000:5555:1010]:[32,11.11.11.201]:[101]
    5.5.5.5          0          100      0    i  5.5.5.5          VxLAN
*>i [3]:[101]:[32,5.5.5.5]
    5.5.5.5          0          100      0    i  5.5.5.5          VxLAN
```

```
RD[5.5.5.5:21]
*>i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
    5.5.5.5          0          100      0    i  5.5.5.5          VxLAN
*>i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
    5.5.5.5          0          100      0    i  5.5.5.5          VxLAN
*>i [3]:[201]:[32,5.5.5.5]
    5.5.5.5          0          100      0    i  5.5.5.5          VxLAN
```

Total number of prefixes 55  
TB2-VTEP1#

TB2-VTEP2#show nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 2.2.2.2 | 4.4.4.4     | Installed | 00:18:42 | 00:18:42 |
| 2.2.2.2 | 1.1.1.1     | Installed | 00:18:43 | 00:18:43 |
| 2.2.2.2 | 5.5.5.5     | Installed | 00:13:14 | 00:13:14 |

Total number of entries are 3

TB2-VTEP2#show nvo vxlan

VxLAN Information

```
=====
Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged
```

| VNID | VNI-Name | VNI-Type | Type | Interface | ESI                           | VLAN | DF-Status | Src-Addr | Dst-Addr |
|------|----------|----------|------|-----------|-------------------------------|------|-----------|----------|----------|
| 101  | VNI-101  | L2       | NW   | ----      | ----                          | ---- | ----      | 2.2.2.2  | 4.4.4.4  |
| 101  | VNI-101  | L2       | NW   | ----      | ----                          | ---- | ----      | 2.2.2.2  | 1.1.1.1  |
| 101  | VNI-101  | L2       | NW   | ----      | ----                          | ---- | ----      | 2.2.2.2  | 5.5.5.5  |
| 101  | VNI-101  | --       | AC   | po1       | 00:00:00:00:00:22:22:00:00:00 | 10   | NON-DF    | ----     | ----     |
| 201  | VNI-201  | L2       | NW   | ----      | ----                          | ---- | ----      | 2.2.2.2  | 4.4.4.4  |
| 201  | VNI-201  | L2       | NW   | ----      | ----                          | ---- | ----      | 2.2.2.2  | 1.1.1.1  |
| 201  | VNI-201  | L2       | NW   | ----      | ----                          | ---- | ----      | 2.2.2.2  | 5.5.5.5  |
| 201  | VNI-201  | --       | AC   | po1       | 00:00:00:00:00:22:22:00:00:00 | 20   | NON-DF    | ----     | ----     |

Total number of entries are 8

TB2-VTEP2#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

```
=====
```

| VNID | Ip-Addr      | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|--------------|----------------|---------------|---------|--------------|
| 201  | 21.21.21.51  | 0000.2222.1020 | Static Local  | ----    | ----         |
| 201  | 21.21.21.1   | 0000.0000.1111 | Static Local  | ----    | ----         |
| 201  | 21.21.21.101 | 0000.4444.1020 | Static Remote | ----    | ----         |
| 101  | 11.11.11.51  | 0000.2222.1010 | Static Local  | ----    | ----         |
| 101  | 11.11.11.1   | 0000.0000.1111 | Static Local  | ----    | ----         |
| 101  | 11.11.11.201 | 0000.5555.1010 | Static Remote | ----    | ----         |

```

Total number of entries are 6
TB2-VTEP2#show nvo vxlan nd-cache
VxLAN ND-CACHE Information
=====
VNID      Ip-Addr                Mac-Addr      Type      Age-Out  Retries-Left
-----
201      21:21::21:1          0000.0000.1111 Static Local  ----
101      11:11::11:1          0000.0000.1111 Static Local  ----
Total number of entries are 2
TB2-VTEP2#show nvo vxlan l3vni-map
L3VNI      L2VNI      IRB-interface
=====
1000      101        irb1001
1000      201        irb2001

TB2-VTEP2#show ip route vrf L3VRF1
Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP
       O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,
       ia - IS-IS inter area, E - EVPN,
       v - vrf leaked
       * - candidate default

IP Route Table for VRF "L3VRF1"
C      11.11.11.0/24 is directly connected, irb1001, 00:19:37
C      21.21.21.0/24 is directly connected, irb2001, 00:19:37
C      127.0.0.0/8 is directly connected, lo.L3VRF1, 00:19:40

Gateway of last resort is not set
TB2-VTEP2#show ipv6 route vrf L3VRF1
IPv6 Routing Table
Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,
       IA - OSPF inter area, E1 - OSPF external type 1,
       E2 - OSPF external type 2, E - EVPN N1 - OSPF NSSA external type 1,
       N2 - OSPF NSSA external type 2, i - IS-IS, B - BGP
Timers: Uptime

IP Route Table for VRF "L3VRF1"
C      ::1/128 via ::, lo.L3VRF1, 00:19:40
C      11:11::/48 via ::, irb1001, 00:19:37
C      21:21::/48 via ::, irb2001, 00:19:37
C      fe80::/64 via ::, irb2001, 00:19:36
TB2-VTEP2#show ip route summary

-----
IP routing table name is Default-IP-Routing-Table(0)
-----
IP routing table maximum-paths : 8
Total number of IPv4 routes : 12
Total number of IPv4 paths : 12
Pending routes (due to route max reached): 0
Route Source      Networks
connected         3
ospf              9
Total            12
FIB              12

ECMP statistics (active in ASIC):
  Total number of IPv4 ECMP routes : 0
  Total number of IPv4 ECMP paths : 0
TB2-VTEP2#show ipv6 route summary

-----
IPv6 routing table name is Default-IPv6-Routing-Table(0)
-----
IPv6 routing table maximum-paths : 8
Total number of IPv6 routes : 2
Total number of IPv6 paths : 2
Pending routes (due to route max reached): 0
Route Source      Networks
connected         2

```

# VxLAN-EVPN with IRB

Total 2  
 FIB 2

ECMP statistics (active in ASIC):

Total number of IPv6 ECMP routes : 0  
 Total number of IPv6 ECMP paths : 0

TB2-VTEP2#show bgp l2vpn evpn

BGP table version is 6, local router ID is 2.2.2.2

Status codes: s suppressed, d damped, h history, \* valid, > best, i - internal,  
 l - labeled, S Stale

Origin codes: i - IGP, e - EGP, ? - incomplete

[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]

- 1 - Ethernet Auto-discovery Route
- 2 - MAC/IP Route
- 3 - Inclusive Multicast Route
- 4 - Ethernet Segment Route
- 5 - Prefix Route

| Network   | Next Hop | Metric | LocPrf | Weight | Path | Peer    | Encap |
|---|----------|--------|--------|--------|------|---------|-------|
| RD[11000:11]  |          |        |        |        |      |         |       |
| *>i[5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]                                    | 1.1.1.1  | 0      | 100    | 0      | ?    | 1.1.1.1 | VxLAN |
| *>i[5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]                                    | 1.1.1.1  | 0      | 100    | 0      | ?    | 1.1.1.1 | VxLAN |
| RD[41000:11]  |          |        |        |        |      |         |       |
| *>i[5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]                                    | 4.4.4.4  | 0      | 100    | 0      | ?    | 4.4.4.4 | VxLAN |
| *>i[5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]                                    | 4.4.4.4  | 0      | 100    | 0      | ?    | 4.4.4.4 | VxLAN |
| RD[51000:11]  |          |        |        |        |      |         |       |
| *>i[5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]                                    | 5.5.5.5  | 0      | 100    | 0      | ?    | 5.5.5.5 | VxLAN |
| *>i[5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]                                    | 5.5.5.5  | 0      | 100    | 0      | ?    | 5.5.5.5 | VxLAN |
| RD[1.1.1.1:1]   |          |        |        |        |      |         |       |
| *>i[1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]                                 | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i[4]:[00:00:00:00:00:22:22:00:00:00]:[32,1.1.1.1]                                     | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[1.1.1.1:11]  |          |        |        |        |      |         |       |
| *>i[1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]                                      | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i[2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]                              | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i[2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]                            | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i[2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101] | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i[3]:[101]:[32,1.1.1.1]   | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[1.1.1.1:21]  |          |        |        |        |      |         |       |
| *>i[1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]                                      | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i[2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]                              | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i[2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]                            | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i[2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201] | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i[3]:[201]:[32,1.1.1.1]   | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[2.2.2.2:1] VRF[evpn-gvrf-1]:   |          |        |        |        |      |         |       |
| *> [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]                                 | 2.2.2.2  | 0      | 100    | 32768  | i    | -----   | VxLAN |
| * i[4]:[00:00:00:00:00:22:22:00:00:00]:[32,1.1.1.1]                                     |          |        |        |        |      |         |       |

```

1.1.1.1      0      100      0      i      1.1.1.1      VxLAN
*> [4]:[00:00:00:00:00:22:22:00:00]:[32,2.2.2.2]
2.2.2.2      0      100      32768      i      -----      VxLAN

RD[2.2.2.2:11] VRF[L2VRF1]:
* i[1]:[00:00:00:00:00:22:22:00:00]:[101]:[101]
1.1.1.1      0      100      0      i      1.1.1.1      VxLAN
*> 2.2.2.2      0      100      32768      i      -----      VxLAN
* i[1]:[00:00:00:00:00:22:22:00:00]:[4294967295]:[0]
1.1.1.1      0      100      0      i      1.1.1.1      VxLAN
* i[2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
5.5.5.5      0      100      0      i      5.5.5.5      VxLAN
* i 4.4.4.4      0      100      0      i      4.4.4.4      VxLAN
* i 1.1.1.1      0      100      0      i      1.1.1.1      VxLAN
*> 2.2.2.2      0      100      32768      i      -----      VxLAN
* i[2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
5.5.5.5      0      100      0      i      5.5.5.5      VxLAN
* i 4.4.4.4      0      100      0      i      4.4.4.4      VxLAN
* i 1.1.1.1      0      100      0      i      1.1.1.1      VxLAN
*> 2.2.2.2      0      100      32768      i      -----      VxLAN
* i[2]:[00:00:00:00:00:22:22:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101]
1.1.1.1      0      100      0      i      1.1.1.1      VxLAN
*> 2.2.2.2      0      100      32768      i      -----      VxLAN
* i[2]:[0]:[101]:[48,0000:5555:1010]:[32,11.11.11.201]:[101]
5.5.5.5      0      100      0      i      5.5.5.5      VxLAN
* i[3]:[101]:[32,1.1.1.1]
1.1.1.1      0      100      0      i      1.1.1.1      VxLAN
*> [3]:[101]:[32,2.2.2.2]
2.2.2.2      0      100      32768      i      -----      VxLAN
* i[3]:[101]:[32,4.4.4.4]
4.4.4.4      0      100      0      i      4.4.4.4      VxLAN
* i[3]:[101]:[32,5.5.5.5]
5.5.5.5      0      100      0      i      5.5.5.5      VxLAN

RD[2.2.2.2:21] VRF[L2VRF2]:
* i[1]:[00:00:00:00:00:22:22:00:00]:[201]:[201]
1.1.1.1      0      100      0      i      1.1.1.1      VxLAN
*> 2.2.2.2      0      100      32768      i      -----      VxLAN
* i[1]:[00:00:00:00:00:22:22:00:00]:[4294967295]:[0]
1.1.1.1      0      100      0      i      1.1.1.1      VxLAN
* i[2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
5.5.5.5      0      100      0      i      5.5.5.5      VxLAN
* i 4.4.4.4      0      100      0      i      4.4.4.4      VxLAN
* i 1.1.1.1      0      100      0      i      1.1.1.1      VxLAN
*> 2.2.2.2      0      100      32768      i      -----      VxLAN
* i[2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
5.5.5.5      0      100      0      i      5.5.5.5      VxLAN
* i 4.4.4.4      0      100      0      i      4.4.4.4      VxLAN
* i 1.1.1.1      0      100      0      i      1.1.1.1      VxLAN
*> 2.2.2.2      0      100      32768      i      -----      VxLAN
* i[2]:[00:00:00:00:00:22:22:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201]
1.1.1.1      0      100      0      i      1.1.1.1      VxLAN
*> 2.2.2.2      0      100      32768      i      -----      VxLAN
* i[2]:[0]:[201]:[48,0000:4444:1020]:[32,21.21.21.101]:[201]
4.4.4.4      0      100      0      i      4.4.4.4      VxLAN
* i[3]:[201]:[32,1.1.1.1]
1.1.1.1      0      100      0      i      1.1.1.1      VxLAN
*> [3]:[201]:[32,2.2.2.2]
2.2.2.2      0      100      32768      i      -----      VxLAN
* i[3]:[201]:[32,4.4.4.4]
4.4.4.4      0      100      0      i      4.4.4.4      VxLAN
* i[3]:[201]:[32,5.5.5.5]
5.5.5.5      0      100      0      i      5.5.5.5      VxLAN

RD[4.4.4.4:11]
*>i[2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
4.4.4.4      0      100      0      i      4.4.4.4      VxLAN
*>i[2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
4.4.4.4      0      100      0      i      4.4.4.4      VxLAN
*>i[3]:[101]:[32,4.4.4.4]
4.4.4.4      0      100      0      i      4.4.4.4      VxLAN

RD[4.4.4.4:21]

```

## VxLAN-EVPN with IRB

```

*>i[2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
    4.4.4.4          0          100          0          i          4.4.4.4          VxLAN
*>i[2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
    4.4.4.4          0          100          0          i          4.4.4.4          VxLAN
*>i[2]:[0]:[201]:[48,0000:4444:1020]:[32,21.21.21.101]:[201]
    4.4.4.4          0          100          0          i          4.4.4.4          VxLAN
*>i[3]:[201]:[32,4.4.4.4]
    4.4.4.4          0          100          0          i          4.4.4.4          VxLAN

RD[5.5.5.5:11]
*>i[2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
    5.5.5.5          0          100          0          i          5.5.5.5          VxLAN
*>i[2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
    5.5.5.5          0          100          0          i          5.5.5.5          VxLAN
*>i[2]:[0]:[101]:[48,0000:5555:1010]:[32,11.11.11.201]:[101]
    5.5.5.5          0          100          0          i          5.5.5.5          VxLAN
*>i[3]:[101]:[32,5.5.5.5]
    5.5.5.5          0          100          0          i          5.5.5.5          VxLAN

RD[5.5.5.5:21]
*>i[2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
    5.5.5.5          0          100          0          i          5.5.5.5          VxLAN
*>i[2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
    5.5.5.5          0          100          0          i          5.5.5.5          VxLAN
*>i[3]:[201]:[32,5.5.5.5]
    5.5.5.5          0          100          0          i          5.5.5.5          VxLAN

Total number of prefixes 55
TB2-VTEP2#

```

## VTEP4

TB2-VTEP4#show nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 4.4.4.4 | 2.2.2.2     | Installed | 00:18:55 | 00:18:55 |
| 4.4.4.4 | 1.1.1.1     | Installed | 00:18:55 | 00:18:55 |
| 4.4.4.4 | 5.5.5.5     | Installed | 00:13:27 | 00:13:27 |

Total number of entries are 3

TB2-VTEP4#show nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port  
AC - Access Port  
(u) - Untagged

| VNID | VNI-Name | VNI-Type | Type | Interface | ESI  | VLAN | DF-Status | Src-Addr          | Dst-Addr |
|------|----------|----------|------|-----------|------|------|-----------|-------------------|----------|
| 101  | VNI-101  | L2       | NW   | ----      | ---- | ---- | ----      | 4.4.4.4           | 2.2.2.2  |
| 101  | VNI-101  | L2       | NW   | ----      | ---- | ---- | ----      | 4.4.4.4           | 1.1.1.1  |
| 101  | VNI-101  | L2       | NW   | ----      | ---- | ---- | ----      | 4.4.4.4           | 5.5.5.5  |
| 201  | VNI-201  | L2       | NW   | ----      | ---- | ---- | ----      | 4.4.4.4           | 2.2.2.2  |
| 201  | VNI-201  | L2       | NW   | ----      | ---- | ---- | ----      | 4.4.4.4           | 1.1.1.1  |
| 201  | VNI-201  | L2       | NW   | ----      | ---- | ---- | ----      | 4.4.4.4           | 5.5.5.5  |
| 201  | VNI-201  | --       | AC   | sa1       | ---  | 20   | ----      | Single Homed Port | ---      |

Total number of entries are 7

TB2-VTEP4#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

| VNID | Ip-Addr      | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|--------------|----------------|---------------|---------|--------------|
| 201  | 21.21.21.51  | 0000.2222.1020 | Static Remote | ----    | ----         |
| 201  | 21.21.21.1   | 0000.0000.1111 | Static Local  | ----    | ----         |
| 201  | 21.21.21.101 | 0000.4444.1020 | Static Local  | ----    | ----         |
| 101  | 11.11.11.51  | 0000.2222.1010 | Static Remote | ----    | ----         |
| 101  | 11.11.11.1   | 0000.0000.1111 | Static Local  | ----    | ----         |
| 101  | 11.11.11.201 | 0000.5555.1010 | Static Remote | ----    | ----         |

```

Total number of entries are 6
TB2-VTEP4#show nvo vxlan nd-cache
VxLAN ND-CACHE Information
=====
VNID      Ip-Addr                Mac-Addr      Type      Age-Out  Retries-Left
-----
201      21:21::21:1          0000.0000.1111 Static Local  ----
101      11:11::11:1          0000.0000.1111 Static Local  ----
Total number of entries are 2
TB2-VTEP4#show nvo vxlan l3vni-map
L3VNI      L2VNI      IRB-interface
=====
1000      101        irb1001
1000      201        irb2001

TB2-VTEP4#show ip route vrf L3VRF1
Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP
       O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,
       ia - IS-IS inter area, E - EVPN,
       v - vrf leaked
       * - candidate default

IP Route Table for VRF "L3VRF1"
C      11.11.11.0/24 is directly connected, irb1001, 00:19:46
C      21.21.21.0/24 is directly connected, irb2001, 00:19:46
C      127.0.0.0/8 is directly connected, lo.L3VRF1, 00:19:49

Gateway of last resort is not set
TB2-VTEP4#show ipv6 route vrf L3VRF1
IPv6 Routing Table
Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,
       IA - OSPF inter area, E1 - OSPF external type 1,
       E2 - OSPF external type 2, E - EVPN N1 - OSPF NSSA external type 1,
       N2 - OSPF NSSA external type 2, i - IS-IS, B - BGP
Timers: Uptime

IP Route Table for VRF "L3VRF1"
C      ::1/128 via ::, lo.L3VRF1, 00:19:49
C      11:11::/48 via ::, irb1001, 00:19:46
C      21:21::/48 via ::, irb2001, 00:19:46
C      fe80::/64 via ::, irb2001, 00:19:46
TB2-VTEP4#show ip route summary

-----
IP routing table name is Default-IP-Routing-Table(0)
-----
IP routing table maximum-paths : 8
Total number of IPv4 routes : 12
Total number of IPv4 paths : 12
Pending routes (due to route max reached): 0
Route Source      Networks
connected         3
ospf              9
Total            12
FIB              12

ECMP statistics (active in ASIC):
Total number of IPv4 ECMP routes : 0
Total number of IPv4 ECMP paths : 0
TB2-VTEP4#show ipv6 route summary

-----
IPv6 routing table name is Default-IPv6-Routing-Table(0)
-----
IPv6 routing table maximum-paths : 8
Total number of IPv6 routes : 2
Total number of IPv6 paths : 2
Pending routes (due to route max reached): 0
Route Source      Networks
connected         2

```

## VxLAN-EVPN with IRB

Total 2  
FIB 2

### ECMP statistics (active in ASIC):

Total number of IPv6 ECMP routes : 0  
Total number of IPv6 ECMP paths : 0

TB2-VTEP4#show bgp l2vpn evpn

BGP table version is 4, local router ID is 4.4.4.4

Status codes: s suppressed, d damped, h history, \* valid, > best, i - internal,  
l - labeled, S Stale

Origin codes: i - IGP, e - EGP, ? - incomplete

[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]

1 - Ethernet Auto-discovery Route  
2 - MAC/IP Route  
3 - Inclusive Multicast Route  
4 - Ethernet Segment Route  
5 - Prefix Route

| Network  | Next Hop | Metric | LocPrf | Weight | Path | Peer    | Encap |
|--|----------|--------|--------|--------|------|---------|-------|
| RD[11000:11]   |          |        |        |        |      |         |       |
| *>i [5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]                                    | 1.1.1.1  | 0      | 100    | 0      | ?    | 1.1.1.1 | VxLAN |
| *>i [5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]                                    | 1.1.1.1  | 0      | 100    | 0      | ?    | 1.1.1.1 | VxLAN |
| RD[21000:11]   |          |        |        |        |      |         |       |
| *>i [5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]                                    | 2.2.2.2  | 0      | 100    | 0      | ?    | 2.2.2.2 | VxLAN |
| *>i [5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]                                    | 2.2.2.2  | 0      | 100    | 0      | ?    | 2.2.2.2 | VxLAN |
| RD[51000:11]   |          |        |        |        |      |         |       |
| *>i [5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]                                    | 5.5.5.5  | 0      | 100    | 0      | ?    | 5.5.5.5 | VxLAN |
| *>i [5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]                                    | 5.5.5.5  | 0      | 100    | 0      | ?    | 5.5.5.5 | VxLAN |
| RD[1.1.1.1:1]  |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]                                 | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [4]:[00:00:00:00:00:22:22:00:00:00]:[32,1.1.1.1]                                     | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[1.1.1.1:11]   |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]                                      | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]                              | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]                            | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101] | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [3]:[101]:[32,1.1.1.1]   | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[1.1.1.1:21]   |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]                                      | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]                              | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]                            | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201] | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [3]:[201]:[32,1.1.1.1]   | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[2.2.2.2:1]  |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]                                 | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *>i [4]:[00:00:00:00:00:22:22:00:00:00]:[32,2.2.2.2]                                     |          |        |        |        |      |         |       |



```

                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN

RD[2.2.2.2:11]
*>i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
*>i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
*>i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
*>i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
*>i [3]:[101]:[32,2.2.2.2]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN

RD[2.2.2.2:21]
*>i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
*>i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
*>i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
*>i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
*>i [3]:[201]:[32,2.2.2.2]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN

RD[4.4.4.4:11] VRF[L2VRF1]:
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]
                1.1.1.1                0                100                0                i                1.1.1.1                VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
                1.1.1.1                0                100                0                i                1.1.1.1                VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
* i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
                5.5.5.5                0                100                0                i                5.5.5.5                VxLAN
* i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
                1.1.1.1                0                100                0                i                1.1.1.1                VxLAN
* i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
*> [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
                4.4.4.4                0                100                32768                i                -----                VxLAN
* i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
                5.5.5.5                0                100                0                i                5.5.5.5                VxLAN
* i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
                1.1.1.1                0                100                0                i                1.1.1.1                VxLAN
* i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
*> [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
                4.4.4.4                0                100                32768                i                -----                VxLAN
* i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101]
                1.1.1.1                0                100                0                i                1.1.1.1                VxLAN
* i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
* i [2]:[0]:[101]:[48,0000:5555:1010]:[32,11.11.11.201]:[101]
                5.5.5.5                0                100                0                i                5.5.5.5                VxLAN
* i [3]:[101]:[32,1.1.1.1]
                1.1.1.1                0                100                0                i                1.1.1.1                VxLAN
* i [3]:[101]:[32,2.2.2.2]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
*> [3]:[101]:[32,4.4.4.4]
                4.4.4.4                0                100                32768                i                -----                VxLAN
* i [3]:[101]:[32,5.5.5.5]
                5.5.5.5                0                100                0                i                5.5.5.5                VxLAN

RD[4.4.4.4:21] VRF[L2VRF2]:
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]
                1.1.1.1                0                100                0                i                1.1.1.1                VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
                1.1.1.1                0                100                0                i                1.1.1.1                VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
* i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
                5.5.5.5                0                100                0                i                5.5.5.5                VxLAN
* i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
                1.1.1.1                0                100                0                i                1.1.1.1                VxLAN
* i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN
*> [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
                4.4.4.4                0                100                32768                i                -----                VxLAN
* i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
                5.5.5.5                0                100                0                i                5.5.5.5                VxLAN
* i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
                1.1.1.1                0                100                0                i                1.1.1.1                VxLAN
* i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
                2.2.2.2                0                100                0                i                2.2.2.2                VxLAN

```

## VxLAN-EVPN with IRB

```

*>          4.4.4.4          0          100          32768 i ----- VxLAN
* i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201]
          1.1.1.1          0          100          0 i 1.1.1.1 VxLAN
* i          2.2.2.2          0          100          0 i 2.2.2.2 VxLAN
*> [2]:[0]:[201]:[48,0000:4444:1020]:[32,21.21.21.101]:[201]
          4.4.4.4          0          100          32768 i ----- VxLAN
* i [3]:[201]:[32,1.1.1.1]
          1.1.1.1          0          100          0 i 1.1.1.1 VxLAN
* i [3]:[201]:[32,2.2.2.2]
          2.2.2.2          0          100          0 i 2.2.2.2 VxLAN
*> [3]:[201]:[32,4.4.4.4]
          4.4.4.4          0          100          32768 i ----- VxLAN
* i [3]:[201]:[32,5.5.5.5]
          5.5.5.5          0          100          0 i 5.5.5.5 VxLAN

RD[5.5.5.5:11]
*>i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
          5.5.5.5          0          100          0 i 5.5.5.5 VxLAN
*>i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
          5.5.5.5          0          100          0 i 5.5.5.5 VxLAN
*>i [2]:[0]:[101]:[48,0000:5555:1010]:[32,11.11.11.201]:[101]
          5.5.5.5          0          100          0 i 5.5.5.5 VxLAN
*>i [3]:[101]:[32,5.5.5.5]
          5.5.5.5          0          100          0 i 5.5.5.5 VxLAN

RD[5.5.5.5:21]
*>i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
          5.5.5.5          0          100          0 i 5.5.5.5 VxLAN
*>i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
          5.5.5.5          0          100          0 i 5.5.5.5 VxLAN
*>i [3]:[201]:[32,5.5.5.5]
          5.5.5.5          0          100          0 i 5.5.5.5 VxLAN

```

Total number of prefixes 57  
TB2-VTEP4#

## VTEP5

TB2-VTEP5#show nvo vxlan tunnel

VxLAN Network Tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 5.5.5.5 | 2.2.2.2     | Installed | 00:13:36 | 00:13:36 |
| 5.5.5.5 | 4.4.4.4     | Installed | 00:13:36 | 00:13:36 |
| 5.5.5.5 | 1.1.1.1     | Installed | 00:13:36 | 00:13:36 |

Total number of entries are 3

TB2-VTEP5#show nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port  
AC - Access Port  
(u) - Untagged

| VNIID | VNI-Name | VNI-Type | Type | Interface | ESI  | VLAN              | DF-Status | Src-Addr | Dst-Addr |
|-------|----------|----------|------|-----------|------|-------------------|-----------|----------|----------|
| 101   | VNI-101  | L2       | NW   | ----      | ---- | ----              | ----      | 5.5.5.5  | 2.2.2.2  |
| 101   | VNI-101  | L2       | NW   | ----      | ---- | ----              | ----      | 5.5.5.5  | 4.4.4.4  |
| 101   | VNI-101  | L2       | NW   | ----      | ---- | ----              | ----      | 5.5.5.5  | 1.1.1.1  |
| 101   | VNI-101  | --       | AC   | xe48      | ---  | Single Homed Port | ---       | 10       | ----     |
| 201   | VNI-201  | L2       | NW   | ----      | ---- | ----              | ----      | 5.5.5.5  | 2.2.2.2  |
| 201   | VNI-201  | L2       | NW   | ----      | ---- | ----              | ----      | 5.5.5.5  | 4.4.4.4  |
| 201   | VNI-201  | L2       | NW   | ----      | ---- | ----              | ----      | 5.5.5.5  | 1.1.1.1  |

Total number of entries are 7

TB2-VTEP5#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

| VNIID | Ip-Addr     | Mac-Addr       | Type          | Age-Out | Retries-Left |
|-------|-------------|----------------|---------------|---------|--------------|
| 201   | 21.21.21.51 | 0000.2222.1020 | Static Remote | ----    | ----         |

```

201      21.21.21.1      0000.0000.1111 Static Local ----
201      21.21.21.101    0000.4444.1020 Static Remote ----
101      11.11.11.51      0000.2222.1010 Static Remote ----
101      11.11.11.1       0000.0000.1111 Static Local ----
101      11.11.11.201    0000.5555.1010 Static Local ----

```

Total number of entries are 6

TB2-VTEP5#show nvo vxlan nd-cache

VxLAN ND-CACHE Information

=====

| VNID | Ip-Addr     | Mac-Addr       | Type         | Age-Out | Retries-Left |
|------|-------------|----------------|--------------|---------|--------------|
| 201  | 21:21::21:1 | 0000.0000.1111 | Static Local | ----    |              |
| 101  | 11:11::11:1 | 0000.0000.1111 | Static Local | ----    |              |

Total number of entries are 2

TB2-VTEP5#show nvo vxlan l3vni-map

L3VNI L2VNI IRB-interface

=====

|      |     |         |
|------|-----|---------|
| 1000 | 101 | irb1001 |
| 1000 | 201 | irb2001 |

TB2-VTEP5#show ip route vrf L3VRF1

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP

O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,

ia - IS-IS inter area, E - EVPN,

v - vrf leaked

\* - candidate default

IP Route Table for VRF "L3VRF1"

```

C      11.11.11.0/24 is directly connected, irb1001, 00:14:07
C      21.21.21.0/24 is directly connected, irb2001, 00:14:05
C      127.0.0.0/8 is directly connected, lo.L3VRF1, 00:20:00

```

Gateway of last resort is not set

TB2-VTEP5#show ipv6 route vrf L3VRF1

IPv6 Routing Table

Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,

IA - OSPF inter area, E1 - OSPF external type 1,

E2 - OSPF external type 2, E - EVPN N1 - OSPF NSSA external type 1,

N2 - OSPF NSSA external type 2, i - IS-IS, B - BGP

Timers: Uptime

IP Route Table for VRF "L3VRF1"

```

C      ::1/128 via ::, lo.L3VRF1, 00:20:00
C      11:11::/48 via ::, irb1001, 00:14:07
C      21:21::/48 via ::, irb2001, 00:14:05
C      fe80::/64 via ::, irb2001, 00:14:05

```

TB2-VTEP5#show ip route summary

-----  
IP routing table name is Default-IP-Routing-Table(0)  
-----

```

IP routing table maximum-paths : 8
Total number of IPv4 routes : 12
Total number of IPv4 paths : 12
Pending routes (due to route max reached): 0
Route Source Networks
connected 3
ospf 9
Total 12
FIB 12

```

ECMP statistics (active in ASIC):

Total number of IPv4 ECMP routes : 0

Total number of IPv4 ECMP paths : 0

TB2-VTEP5#show ipv6 route summary

-----  
IPv6 routing table name is Default-IPv6-Routing-Table(0)  
-----

IPv6 routing table maximum-paths : 8

## VxLAN-EVPN with IRB

```
Total number of IPv6 routes      : 2
Total number of IPv6 paths       : 2
Pending routes (due to route max reached): 0
Route Source   Networks
connected      2
Total          2
FIB            2
```

### ECMP statistics (active in ASIC):

```
Total number of IPv6 ECMP routes : 0
Total number of IPv6 ECMP paths   : 0
```

```
TB2-VTEP5#show bgp l2vpn evpn
```

```
BGP table version is 7, local router ID is 5.5.5.5
```

```
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               l - labeled, S Stale
```

```
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]
```

```
1 - Ethernet Auto-discovery Route
```

```
2 - MAC/IP Route
```

```
3 - Inclusive Multicast Route
```

```
4 - Ethernet Segment Route
```

```
5 - Prefix Route
```

| Network  | Next Hop | Metric | LocPrf | Weight | Path | Peer    | Encap |
|--|----------|--------|--------|--------|------|---------|-------|
| RD[11000:11]   |          |        |        |        |      |         |       |
| *>i [5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]                                    | 1.1.1.1  | 0      | 100    | 0      | ?    | 1.1.1.1 | VxLAN |
| *>i [5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]                                    | 1.1.1.1  | 0      | 100    | 0      | ?    | 1.1.1.1 | VxLAN |
| RD[21000:11]   |          |        |        |        |      |         |       |
| *>i [5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]                                    | 2.2.2.2  | 0      | 100    | 0      | ?    | 2.2.2.2 | VxLAN |
| *>i [5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]                                    | 2.2.2.2  | 0      | 100    | 0      | ?    | 2.2.2.2 | VxLAN |
| RD[41000:11]   |          |        |        |        |      |         |       |
| *>i [5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]                                    | 4.4.4.4  | 0      | 100    | 0      | ?    | 4.4.4.4 | VxLAN |
| *>i [5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]                                    | 4.4.4.4  | 0      | 100    | 0      | ?    | 4.4.4.4 | VxLAN |
| RD[1.1.1.1:1]  |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]                                 | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [4]:[00:00:00:00:00:22:22:00:00:00]:[32,1.1.1.1]                                     | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[1.1.1.1:11]   |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]                                      | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]                              | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]                            | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101] | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [3]:[101]:[32,1.1.1.1]   | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[1.1.1.1:21]   |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]                                      | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]                              | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]                            | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201] | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [3]:[201]:[32,1.1.1.1]   | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |

```

RD[2.2.2.2:1]
*>i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN
*>i [4]:[00:00:00:00:00:22:22:00:00:00]:[32,2.2.2.2]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN

RD[2.2.2.2:11]
*>i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN
*>i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN
*>i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN
*>i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN
*>i [3]:[101]:[32,2.2.2.2]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN

RD[2.2.2.2:21]
*>i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN
*>i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN
*>i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN
*>i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN
*>i [3]:[201]:[32,2.2.2.2]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN

RD[4.4.4.4:11]
*>i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
      4.4.4.4          0          100      0      i  4.4.4.4      VxLAN
*>i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
      4.4.4.4          0          100      0      i  4.4.4.4      VxLAN
*>i [3]:[101]:[32,4.4.4.4]
      4.4.4.4          0          100      0      i  4.4.4.4      VxLAN

RD[4.4.4.4:21]
*>i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
      4.4.4.4          0          100      0      i  4.4.4.4      VxLAN
*>i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
      4.4.4.4          0          100      0      i  4.4.4.4      VxLAN
*>i [2]:[0]:[201]:[48,0000:4444:1020]:[32,21.21.21.101]:[201]
      4.4.4.4          0          100      0      i  4.4.4.4      VxLAN
*>i [3]:[201]:[32,4.4.4.4]
      4.4.4.4          0          100      0      i  4.4.4.4      VxLAN

RD[5.5.5.5:11] VRF[L2VRF1]:
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]
      1.1.1.1          0          100      0      i  1.1.1.1      VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
      1.1.1.1          0          100      0      i  1.1.1.1      VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN
*> [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
      5.5.5.5          0          100      32768  i  -----      VxLAN
* i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
      4.4.4.4          0          100      0      i  4.4.4.4      VxLAN
* i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN
* i [2]:[0]:[101]:[48,0000:0000:1111]:[32,11.11.11.1]:[101]
      1.1.1.1          0          100      0      i  1.1.1.1      VxLAN
*> [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
      5.5.5.5          0          100      32768  i  -----      VxLAN
* i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
      4.4.4.4          0          100      0      i  4.4.4.4      VxLAN
* i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN
* i [2]:[0]:[101]:[48,0000:0000:1111]:[128,11:11::11:1]:[101]
      1.1.1.1          0          100      0      i  1.1.1.1      VxLAN
* i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101]
      1.1.1.1          0          100      0      i  1.1.1.1      VxLAN
* i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101]
      2.2.2.2          0          100      0      i  2.2.2.2      VxLAN
*> [2]:[0]:[101]:[48,0000:5555:1010]:[32,11.11.11.201]:[101]
      5.5.5.5          0          100      32768  i  -----      VxLAN
* i [3]:[101]:[32,1.1.1.1]
      1.1.1.1          0          100      0      i  1.1.1.1      VxLAN

```

```

* i [3]:[101]:[32,2.2.2.2]
    2.2.2.2          0      100      0      i  2.2.2.2          VxLAN
* i [3]:[101]:[32,4.4.4.4]
    4.4.4.4          0      100      0      i  4.4.4.4          VxLAN
*> [3]:[101]:[32,5.5.5.5]
    5.5.5.5          0      100      32768 i  -----          VxLAN

RD[5.5.5.5:21] VRF[L2VRF2]:
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]
    1.1.1.1          0      100      0      i  1.1.1.1          VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
    2.2.2.2          0      100      0      i  2.2.2.2          VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
    1.1.1.1          0      100      0      i  1.1.1.1          VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
    2.2.2.2          0      100      0      i  2.2.2.2          VxLAN
*> [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
    5.5.5.5          0      100      32768 i  -----          VxLAN
* i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
    4.4.4.4          0      100      0      i  4.4.4.4          VxLAN
* i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
    2.2.2.2          0      100      0      i  2.2.2.2          VxLAN
* i [2]:[0]:[201]:[48,0000:0000:1111]:[32,21.21.21.1]:[201]
    1.1.1.1          0      100      0      i  1.1.1.1          VxLAN
*> [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
    5.5.5.5          0      100      32768 i  -----          VxLAN
* i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
    4.4.4.4          0      100      0      i  4.4.4.4          VxLAN
* i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
    2.2.2.2          0      100      0      i  2.2.2.2          VxLAN
* i [2]:[0]:[201]:[48,0000:0000:1111]:[128,21:21::21:1]:[201]
    1.1.1.1          0      100      0      i  1.1.1.1          VxLAN
* i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201]
    1.1.1.1          0      100      0      i  1.1.1.1          VxLAN
* i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201]
    2.2.2.2          0      100      0      i  2.2.2.2          VxLAN
* i [2]:[0]:[201]:[48,0000:4444:1020]:[32,21.21.21.101]:[201]
    4.4.4.4          0      100      0      i  4.4.4.4          VxLAN
* i [3]:[201]:[32,1.1.1.1]
    1.1.1.1          0      100      0      i  1.1.1.1          VxLAN
* i [3]:[201]:[32,2.2.2.2]
    2.2.2.2          0      100      0      i  2.2.2.2          VxLAN
* i [3]:[201]:[32,4.4.4.4]
    4.4.4.4          0      100      0      i  4.4.4.4          VxLAN
*> [3]:[201]:[32,5.5.5.5]
    5.5.5.5          0      100      32768 i  -----          VxLAN

```

Total number of prefixes 57  
TB2-VTEP5#

## Distributed Gateway

In distributed gateway approach, VTEP will act as default gateways for one or more VNIDs, Each VTEP having its own default gateway IP and MAC configuration for a given VNID.

## IRB Configuration for Distributed

Configure from Base Configuration-L2 VxLAN section, then configure below commands for centralized distributed approach.

### VTEP4

|   |   |
|---|---|
| (config)#nvo vxlan irb                  | Enable VxLAN irb  |
| (config)#commit                         | Commit the candidate configuration to running configuration                     |
| (config)#ip vrf L3VRF1                  | Create MAC routing/forwarding instance with L3VRF1 name and enter into VRF mode |
| (config-vrf)#rd 41000:11                | Assign RD value   |
| (config-vrf)# route-target both 100:100 | Assign route-target value for same for import and export.                       |

|  |   |
|--|---|
| (config-vrf)# l3vni 1000   | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit  | Exit from VRF mode  |
| (config)# interface irb2001                                      | Configure IRB interface 2001  |
| (config-if)ip vrf forwarding L3VRF1                              | Configure L3VRF1  |
| (config-if)ip address 21.21.21.1/24                              | Configure IP address  |
| (config-if)ipv6 address 21:21::21:1/48                           | Configure IPv6 address  |
| (config-if)exit  | Exit from interface config mode   |
| (config)#commit  | Commit the candidate configuration to running configuration   |
| (config)router bgp 5000  | Enter into BGP router mode  |
| (config-router)#address-family ipv4 vrf L3VRF1                   | Enter into address-family mode for L3VRF1   |
| (config-router-af)#redistribute connected                        | Redistribute connected  |
| (config-router-af)#exit-address-family                           | Exit from address-family  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2    | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# evpn irb2001                                       | Configure IRB2001 under VxLAN id 201  |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#commit  | Commit the candidate configuration to running configuration   |

## VTEP5

Unconfigure vnid 201 from nvo vxlan.

|  |   |
|--|---|
| (config)#nvo vxlan irb                         | Enable VxLAN IRB  |
| (config)#commit                                | Commit the candidate configuration to running configuration                     |
| (config)#ip vrf L3VRF1                         | Create mac routing/forwarding instance with L3VRF1 name and enter into VRF mode |
| (config-vrf)#rd 51000:11                       | Assign RD value   |
| (config-vrf)# route-target both 100:100        | Assign route-target value for same for import and export.                       |
| (config-vrf)# l3vni 1000                       | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit                              | Exit from VRF mode  |
| (config)# interface irb1001                    | Configure IRB interface 1001  |
| (config-if)ip vrf forwarding L3VRF1            | Configure L3VRF1  |
| (config-if)ip address 11.11.11.1/24            | Configure IP address  |
| (config-if)ipv6 address 11:11::11:1/48         | Configure IPv6 address  |
| (config-if)exit                                | Exit from interface config mode   |
| (config)#commit                                | Commit the candidate configuration to running configuration                     |
| (config)router bgp 5000                        | Enter into BGP router mode  |
| (config-router)#address-family ipv4 vrf L3VRF1 | Enter into address-family mode for L3VRF1                                       |
| (config-router-af)#redistribute connected      | Redistribute connected  |

|   |   |
|---|---|
| (config-router-af)#exit-address-family                            | Exit from address-family  |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1     | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)# evpn irb1001  | Configure IRB under VxLAN id 101  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#commit   | Commit the candidate configuration to running configuration   |

## Validations

### VTEP4

TB2-VTEP4#show nvo vxlan tunnel

```
VxLAN Network tunnel Entries
```

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 4.4.4.4 | 2.2.2.2     | Installed | 00:01:17 | 00:01:17 |
| 4.4.4.4 | 1.1.1.1     | Installed | 00:01:17 | 00:01:17 |
| 4.4.4.4 | 5.5.5.5     | Installed | 00:02:22 | 00:02:22 |

Total number of entries are 3

TB2-VTEP4#show nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port  
 AC - Access Port  
 (u) - Untagged

| VNID | VNI-Name | VNI-Type | Type | Interface | ESI  | VLAN | DF-Status | Src-Addr | Dst-Addr |
|------|----------|----------|------|-----------|------|------|-----------|----------|----------|
| 201  | VNI-201  | L2       | NW   | ----      | ---- | ---- | ----      | 4.4.4.4  | 2.2.2.2  |
| 201  | VNI-201  | L2       | NW   | ----      | ---- | ---- | ----      | 4.4.4.4  | 1.1.1.1  |
| 201  | VNI-201  | --       | AC   | sa1       | ---  | 20   | ----      | ----     | ----     |
| 1000 | ----     | L3       | NW   | ----      | ---- | ---- | ----      | 4.4.4.4  | 5.5.5.5  |

Total number of entries are 4

TB2-VTEP4#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

| VNID | Ip-Addr      | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|--------------|----------------|---------------|---------|--------------|
| 201  | 21.21.21.51  | 0000.2222.1020 | Static Remote | ----    | ----         |
| 201  | 21.21.21.1   | 3c2c.99c7.077a | Static Local  | ----    | ----         |
| 201  | 21.21.21.101 | 0000.4444.1020 | Static Local  | ----    | ----         |

Total number of entries are 3

TB2-VTEP4#show nvo vxlan l3vni-map

L3VNI L2VNI IRB-interface

=====

|      |     |         |
|------|-----|---------|
| 1000 | 201 | irb2001 |
|------|-----|---------|

TB2-VTEP4#show ip route vrf L3VRF1

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP

O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,

ia - IS-IS inter area, E - EVPN,

v - vrf leaked

\* - candidate default

IP Route Table for VRF "L3VRF1"

B 5.5.5.5/32 [0/0] is directly connected, tunvxlan2, 00:02:23

B 11.11.11.0/24 [200/0] via 5.5.5.5 (recursive is directly connected, tunvxlan2), 00:01:26



```
C      21.21.21.0/24 is directly connected, irb2001, 00:01:18
C      127.0.0.0/8 is directly connected, lo.L3VRF1, 00:02:23
```

```
Gateway of last resort is not set
TB2-VTEP4#show ip route summary
```

```
-----
IP routing table name is Default-IP-Routing-Table(0)
-----
```

```
IP routing table maximum-paths   : 8
Total number of IPv4 routes      : 12
Total number of IPv4 paths       : 12
Pending routes (due to route max reached): 0
Route Source   Networks
connected      3
ospf           9
Total          12
FIB            12
```

```
ECMP statistics (active in ASIC):
```

```
Total number of IPv4 ECMP routes : 0
Total number of IPv4 ECMP paths  : 0
```

```
TB2-VTEP4#show bgp l2vpn evpn
```

```
BGP table version is 13, local router ID is 4.4.4.4
```

```
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
               l - labeled, S Stale
```

```
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]
```

```
1 - Ethernet Auto-discovery Route
2 - MAC/IP Route
3 - Inclusive Multicast Route
4 - Ethernet Segment Route
5 - Prefix Route
```

| Network  | Next Hop | Metric | LocPrf | Weight | Path      | Peer | Encap |
|--|----------|--------|--------|--------|-----------|------|-------|
| RD[51000:11]   |          |        |        |        |           |      |       |
| *>i [5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]                                    | 5.5.5.5  | 0      | 100    | 0      | ? 5.5.5.5 |      | VxLAN |
| RD[1.1.1.1:1]  |          |        |        |        |           |      |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]                                 | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| *>i [4]:[00:00:00:00:00:22:22:00:00:00]:[32,1.1.1.1]                                     | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| RD[1.1.1.1:11]   |          |        |        |        |           |      |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]                                      | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| *>i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101] | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| *>i [3]:[101]:[32,1.1.1.1]   | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| RD[1.1.1.1:21]   |          |        |        |        |           |      |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]                                      | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| *>i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201] | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| *>i [3]:[201]:[32,1.1.1.1]   | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 |      | VxLAN |
| RD[2.2.2.2:1]  |          |        |        |        |           |      |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]                                 | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 |      | VxLAN |
| *>i [4]:[00:00:00:00:00:22:22:00:00:00]:[32,2.2.2.2]                                     | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 |      | VxLAN |
| RD[2.2.2.2:11]   |          |        |        |        |           |      |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]                                      | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 |      | VxLAN |

## VxLAN-EVPN with IRB

```

*>i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101]
    2.2.2.2          0          100          0          i 2.2.2.2          VxLAN
*>i [3]:[101]:[32,2.2.2.2]
    2.2.2.2          0          100          0          i 2.2.2.2          VxLAN

RD[2.2.2.2:21]
*>i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]
    2.2.2.2          0          100          0          i 2.2.2.2          VxLAN
*>i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201]
    2.2.2.2          0          100          0          i 2.2.2.2          VxLAN
*>i [3]:[201]:[32,2.2.2.2]
    2.2.2.2          0          100          0          i 2.2.2.2          VxLAN

RD[4.4.4.4:11] VRF[L2VRF1]:
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]
    1.1.1.1          0          100          0          i 1.1.1.1          VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
    1.1.1.1          0          100          0          i 1.1.1.1          VxLAN
    2.2.2.2          0          100          0          i 2.2.2.2          VxLAN
* i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101]
    1.1.1.1          0          100          0          i 1.1.1.1          VxLAN
    2.2.2.2          0          100          0          i 2.2.2.2          VxLAN
* i [2]:[0]:[101]:[48,0000:5555:1010]:[32,11.11.11.201]:[101]
    5.5.5.5          0          100          0          i 5.5.5.5          VxLAN
* i [2]:[0]:[101]:[48,3c2c:99d6:167a]:[32,11.11.11.1]:[101]
    5.5.5.5          0          100          0          i 5.5.5.5          VxLAN
* i [2]:[0]:[101]:[48,3c2c:99d6:167a]:[128,11:11::11:1]:[101]
    5.5.5.5          0          100          0          i 5.5.5.5          VxLAN
* i [3]:[101]:[32,1.1.1.1]
    1.1.1.1          0          100          0          i 1.1.1.1          VxLAN
* i [3]:[101]:[32,2.2.2.2]
    2.2.2.2          0          100          0          i 2.2.2.2          VxLAN
* i [3]:[101]:[32,5.5.5.5]
    5.5.5.5          0          100          0          i 5.5.5.5          VxLAN

RD[4.4.4.4:21] VRF[L2VRF2]:
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]
    1.1.1.1          0          100          0          i 1.1.1.1          VxLAN
    2.2.2.2          0          100          0          i 2.2.2.2          VxLAN
* i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
    1.1.1.1          0          100          0          i 1.1.1.1          VxLAN
    2.2.2.2          0          100          0          i 2.2.2.2          VxLAN
* i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201]
    1.1.1.1          0          100          0          i 1.1.1.1          VxLAN
    2.2.2.2          0          100          0          i 2.2.2.2          VxLAN
*> [2]:[0]:[201]:[48,0000:4444:1020]:[32,21.21.21.101]:[201]
    4.4.4.4          0          100          32768      i -----          VxLAN
*> [2]:[0]:[201]:[48,3c2c:99c7:077a]:[32,21.21.21.1]:[201]
    4.4.4.4          0          100          32768      i -----          VxLAN
*> [2]:[0]:[201]:[48,3c2c:99c7:077a]:[128,21:21::21:1]:[201]
    4.4.4.4          0          100          32768      i -----          VxLAN
* i [3]:[201]:[32,1.1.1.1]
    1.1.1.1          0          100          0          i 1.1.1.1          VxLAN
* i [3]:[201]:[32,2.2.2.2]
    2.2.2.2          0          100          0          i 2.2.2.2          VxLAN
*> [3]:[201]:[32,4.4.4.4]
    4.4.4.4          0          100          32768      i -----          VxLAN

RD[5.5.5.5:11]
*>i [2]:[0]:[101]:[48,0000:5555:1010]:[32,11.11.11.201]:[101]
    5.5.5.5          0          100          0          i 5.5.5.5          VxLAN
*>i [2]:[0]:[101]:[48,3c2c:99d6:167a]:[32,11.11.11.1]:[101]
    5.5.5.5          0          100          0          i 5.5.5.5          VxLAN
*>i [2]:[0]:[101]:[48,3c2c:99d6:167a]:[128,11:11::11:1]:[101]
    5.5.5.5          0          100          0          i 5.5.5.5          VxLAN
*>i [3]:[101]:[32,5.5.5.5]
    5.5.5.5          0          100          0          i 5.5.5.5          VxLAN

Total number of prefixes 39
TB2-VTEP4#

```

**VTEP5**

```
TB2-VTEP5#show nvo vxlan tunnel
```

```
VxLAN Network tunnel Entries
```

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 5.5.5.5 | 2.2.2.2     | Installed | 00:34:13 | 00:34:13 |
| 5.5.5.5 | 4.4.4.4     | Installed | 00:01:26 | 00:01:26 |
| 5.5.5.5 | 1.1.1.1     | Installed | 00:34:13 | 00:34:13 |

```
Total number of entries are 3
```

```
TB2-VTEP5#show nvo vxlan
```

```
VxLAN Information
```

```
=====
```

```
Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged
```

| VNID | VNI-Name | VNI-Type | Type | Interface | ESI  | VLAN | DF-Status | Src-Addr | Dst-Addr |
|------|----------|----------|------|-----------|------|------|-----------|----------|----------|
| 101  | VNI-101  | L2       | NW   | ----      | ---- | ---- | ----      | 5.5.5.5  | 2.2.2.2  |
| 101  | VNI-101  | L2       | NW   | ----      | ---- | ---- | ----      | 5.5.5.5  | 1.1.1.1  |
| 101  | VNI-101  | --       | AC   | xe48      | ---  | 10   | ----      | ----     | ----     |
| 1000 | ----     | L3       | NW   | ----      | ---- | ---- | ----      | 5.5.5.5  | 4.4.4.4  |

```
Total number of entries are 4
```

```
TB2-VTEP5#show nvo vxlan arp-cache
```

```
VxLAN ARP-CACHE Information
```

```
=====
```

| VNID | Ip-Addr      | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|--------------|----------------|---------------|---------|--------------|
| 101  | 11.11.11.51  | 0000.2222.1010 | Static Remote | ----    | ----         |
| 101  | 11.11.11.1   | 3c2c.99d6.167a | Static Local  | ----    | ----         |
| 101  | 11.11.11.201 | 0000.5555.1010 | Static Local  | ----    | ----         |

```
Total number of entries are 3
```

```
Total number of entries are 1
```

```
TB2-VTEP5#show nvo vxlan l3vni-map
```

```
L3VNI      L2VNI      IRB-interface
```

```
=====
```

```
1000      101      irb1001
```

```
TB2-VTEP5#show ip route vrf L3VRF1
```

```
Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP
```

```
O - OSPF, IA - OSPF inter area
```

```
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
```

```
E1 - OSPF external type 1, E2 - OSPF external type 2
```

```
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,
```

```
ia - IS-IS inter area, E - EVPN,
```

```
v - vrf leaked
```

```
* - candidate default
```

```
IP Route Table for VRF "L3VRF1"
```

```
B      4.4.4.4/32 [0/0] is directly connected, tunvxlan2, 00:01:26
```

```
C      11.11.11.0/24 is directly connected, irb1001, 00:34:43
```

```
B      21.21.21.0/24 [200/0] via 4.4.4.4 (recursive is directly connected, tunvxlan2), 00:01:26
```

```
C      127.0.0.0/8 is directly connected, lo.L3VRF1, 00:40:36
```

```
Gateway of last resort is not set
```

```
TB2-VTEP5#show ip route summary
```

```
-----
IP routing table name is Default-IP-Routing-Table(0)
-----
```

```
IP routing table maximum-paths : 8
Total number of IPv4 routes : 12
Total number of IPv4 paths : 12
Pending routes (due to route max reached): 0
Route Source Networks
connected 3
ospf 9
Total 12
FIB 12
```

## VxLAN-EVPN with IRB

ECMP statistics (active in ASIC):

Total number of IPv4 ECMP routes : 0

Total number of IPv4 ECMP paths : 0

TB2-VTEP5#show bgp l2vpn evpn

BGP table version is 13, local router ID is 5.5.5.5

Status codes: s suppressed, d damped, h history, \* valid, > best, i - internal,  
l - labeled, S Stale

Origin codes: i - IGP, e - EGP, ? - incomplete

[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]

1 - Ethernet Auto-discovery Route

2 - MAC/IP Route

3 - Inclusive Multicast Route

4 - Ethernet Segment Route

5 - Prefix Route

| Network  | Next Hop | Metric | LocPrf | Weight | Path | Peer    | Encap |
|--|----------|--------|--------|--------|------|---------|-------|
| RD[41000:11]   |          |        |        |        |      |         |       |
| *>i [5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]                                    | 4.4.4.4  | 0      | 100    | 0      | ?    | 4.4.4.4 | VxLAN |
| RD[1.1.1.1:1]  |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]                                 | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [4]:[00:00:00:00:00:22:22:00:00:00]:[32,1.1.1.1]                                     | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[1.1.1.1:11]   |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]                                      | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101] | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [3]:[101]:[32,1.1.1.1]   | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[1.1.1.1:21]   |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]                                      | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201] | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| *>i [3]:[201]:[32,1.1.1.1]   | 1.1.1.1  | 0      | 100    | 0      | i    | 1.1.1.1 | VxLAN |
| RD[2.2.2.2:1]  |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]                                 | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *>i [4]:[00:00:00:00:00:22:22:00:00:00]:[32,2.2.2.2]                                     | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| RD[2.2.2.2:11]   |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]                                      | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *>i [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101] | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *>i [3]:[101]:[32,2.2.2.2]   | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| RD[2.2.2.2:21]   |          |        |        |        |      |         |       |
| *>i [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]                                      | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *>i [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201] | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| *>i [3]:[201]:[32,2.2.2.2]   | 2.2.2.2  | 0      | 100    | 0      | i    | 2.2.2.2 | VxLAN |
| RD[4.4.4.4:21]   |          |        |        |        |      |         |       |
| *>i [2]:[0]:[201]:[48,0000:4444:1020]:[32,21.21.21.101]:[201]                            | 4.4.4.4  | 0      | 100    | 0      | i    | 4.4.4.4 | VxLAN |
| *>i [2]:[0]:[201]:[48,3c2c:99c7:077a]:[32,21.21.21.1]:[201]                              | 4.4.4.4  | 0      | 100    | 0      | i    | 4.4.4.4 | VxLAN |
| *>i [2]:[0]:[201]:[48,3c2c:99c7:077a]:[128,21:21::21:1]:[201]                            |          |        |        |        |      |         |       |

```

      4.4.4.4          0          100          0          i          4.4.4.4          VxLAN
*>i  [3]:[201]:[32,4.4.4.4]
      4.4.4.4          0          100          0          i          4.4.4.4          VxLAN

RD[5.5.5.5:11] VRF[L2VRF1]:
* i  [1]:[00:00:00:00:00:22:22:00:00:00]:[101]:[101]
      1.1.1.1          0          100          0          i          1.1.1.1          VxLAN
* i  [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
      2.2.2.2          0          100          0          i          2.2.2.2          VxLAN
* i  [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
      1.1.1.1          0          100          0          i          1.1.1.1          VxLAN
* i  [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
      2.2.2.2          0          100          0          i          2.2.2.2          VxLAN
* i  [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101]
      1.1.1.1          0          100          0          i          1.1.1.1          VxLAN
* i  [2]:[00:00:00:00:00:22:22:00:00:00]:[101]:[48,0000:2222:1010]:[32,11.11.11.51]:[101]
      2.2.2.2          0          100          0          i          2.2.2.2          VxLAN
*>  [2]:[0]:[101]:[48,0000:5555:1010]:[32,11.11.11.201]:[101]
      5.5.5.5          0          100          32768          i          -----          VxLAN
*>  [2]:[0]:[101]:[48,3c2c:99d6:167a]:[32,11.11.11.1]:[101]
      5.5.5.5          0          100          32768          i          -----          VxLAN
*>  [2]:[0]:[101]:[48,3c2c:99d6:167a]:[128,11:11::11:1]:[101]
      5.5.5.5          0          100          32768          i          -----          VxLAN
* i  [3]:[101]:[32,1.1.1.1]
      1.1.1.1          0          100          0          i          1.1.1.1          VxLAN
* i  [3]:[101]:[32,2.2.2.2]
      2.2.2.2          0          100          0          i          2.2.2.2          VxLAN
*>  [3]:[101]:[32,5.5.5.5]
      5.5.5.5          0          100          32768          i          -----          VxLAN

RD[5.5.5.5:21] VRF[L2VRF2]:
* i  [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]
      1.1.1.1          0          100          0          i          1.1.1.1          VxLAN
* i  [1]:[00:00:00:00:00:22:22:00:00:00]:[201]:[201]
      2.2.2.2          0          100          0          i          2.2.2.2          VxLAN
* i  [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
      1.1.1.1          0          100          0          i          1.1.1.1          VxLAN
* i  [1]:[00:00:00:00:00:22:22:00:00:00]:[4294967295]:[0]
      2.2.2.2          0          100          0          i          2.2.2.2          VxLAN
* i  [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201]
      1.1.1.1          0          100          0          i          1.1.1.1          VxLAN
* i  [2]:[00:00:00:00:00:22:22:00:00:00]:[201]:[48,0000:2222:1020]:[32,21.21.21.51]:[201]
      2.2.2.2          0          100          0          i          2.2.2.2          VxLAN
* i  [2]:[0]:[201]:[48,0000:4444:1020]:[32,21.21.21.101]:[201]
      4.4.4.4          0          100          0          i          4.4.4.4          VxLAN
* i  [2]:[0]:[201]:[48,3c2c:99c7:077a]:[32,21.21.21.1]:[201]
      4.4.4.4          0          100          0          i          4.4.4.4          VxLAN
* i  [2]:[0]:[201]:[48,3c2c:99c7:077a]:[128,21:21::21:1]:[201]
      4.4.4.4          0          100          0          i          4.4.4.4          VxLAN
* i  [3]:[201]:[32,1.1.1.1]
      1.1.1.1          0          100          0          i          1.1.1.1          VxLAN
* i  [3]:[201]:[32,2.2.2.2]
      2.2.2.2          0          100          0          i          2.2.2.2          VxLAN
* i  [3]:[201]:[32,4.4.4.4]
      4.4.4.4          0          100          0          i          4.4.4.4          VxLAN

Total number of prefixes 39
TB2-VTEP5#

```

## VxLAN IRB ECMP

In multihoming, anycast-IP and the same subnet is configured on the multihomed devices within the same VPN on IRB interfaces connected to the multihomed CE. Both VTEP's will advertise same connected prefix route, remote VTEP need to understand this and treat the traffic destined to multihomed CE as ECMP traffic i.e Routed traffic should loadshare to both the VTEP's.

## IRB ECMP Configuration

Configure from base configuration-L2 VxLAN section and perform commit after configuration, then configure below commands for ECMP approach.

**VTEP1**

Configure max-path ibgp 2 on VTEP1 under BGP IPv4 VRF address family.

|  |   |
|--|---|
| (config)router bgp 5000                        | Enter into BGP router mode                |
| (config-router)#address-family ipv4 vrf L3VRF1 | Enter into address-family mode for L3VRF1 |
| (config-router)# max-paths ibgp 2              | Configure BGP max-path .                  |
| (config-router-af)#redistribute connected      | Redistribute connected                    |
| (config-router-af)#exit-address-family         | Exit form address-family                  |
| (config-router-af)#commit                      | Commit the transaction                    |

**VTEP1 IRB configuration**

|  |   |
|--|---|
| (config)#nvo vxlan irb   | Enable VxLAN IRB  |
| (config)#commit  | Commit the candidate configuration to running configuration                     |
| (config)#ip vrf L3VRF1   | Create MAC routing/forwarding instance with L3VRF1 name and enter into VRF mode |
| (config-vrf)#rd 11000:11   | Assign RD value   |
| (config-vrf)# route-target both 100:100                          | Assign route-target value for same for import and export.                       |
| (config-vrf)# l3vni 1000   | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit  | Exit from VRF mode  |
| (config)# evpn irb-forwarding anycast-gateway-mac 0000.0000.1111 | Configure anycast MAC address   |
| (config)#commit  | Commit the candidate configuration to running configuration                     |
| (config)# interface irb1001                                      | Configure IRV interface 1001  |
| (config-if)ip vrf forwarding L3VRF1                              | Configure L3VRF1  |
| (config-if)ip address 11.11.11.1/24                              | Configure IP address  |
| (config-if)ipv6 address 11:11::11:1/48                           | Configure IPv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac           | Configure anycast MAC address   |
| (config-if)exit  | Exit from interface config mode   |
| (config)# interface irb 2001                                     | Configure IRB interface 2001  |
| (config-if)ip vrf forwarding L3VRF1                              | Configure L3VRF1  |
| (config-if)ip address 21.21.21.1/24                              | Configure IP address  |
| (config-if)ipv6 address 21:21::21:1/48                           | Configure IPv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac           | Configure anycast MAC address   |
| (config-if)exit  | Exit from interface config mode   |
| (config)#commit  | Commit the candidate configuration to running configuration                     |
| (config)router bgp 5000  | Enter into BGP router mode  |
| (config-router)#address-family ipv4 vrf L3VRF1                   | Enter into address-family mode for L3VRF1                                       |
| (config-router-af)#redistribute connected                        | Redistribute connected  |

|   |   |
|---|---|
| (config-router-af)#exit-address-family                            | Exit form address-family  |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1     | Assign VRF for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb1001  | Configure IRB1001 under VxLAN ID 101  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled  | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2     | Assign VRF for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb2001  | Configure irb2001 under VxLAN ID 201  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#commit   | Commit the candidate configuration to running configuration   |

## VTEP2

Configure max-path ibgp 2 on VTEP1 under BGP IPv4 VRF address family.

|  |   |
|--|---|
| (config)router bgp 5000                        | Enter into BGP router mode                |
| (config-router)#address-family ipv4 vrf L3VRF1 | Enter into address-family mode for L3VRF1 |
| (config-router-af)# max-paths ibgp 2           | Configure BGP max-path .                  |
| (config-router-af)#redistribute connected      | Redistribute connected                    |
| (config-router-af)#exit-address-family         | Exit form address-family                  |
| (config-router-af)#commit                      | Commit the transaction                    |

## VTEP2 IRB configuration

|  |   |
|--|---|
| (config)#nvo vxlan irb   | Enable VxLAN irb  |
| (config)#commit  | Commit the candidate configuration to running configuration                     |
| (config)#ip vrf L3VRF1   | Create MAC routing/forwarding instance with L3VRF1 name and enter into VRF mode |
| (config-vrf)#rd 21000:11   | Assign RD value   |
| (config-vrf)# route-target both 100:100                          | Assign route-target value for same for import and export.                       |
| (config-vrf)# l3vni 1000   | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit  | Exit from VRF mode  |
| (config)# evpn irb-forwarding anycast-gateway-mac 0000.0000.1111 | Configure anycast MAC address   |
| (config)#commit  | Commit the candidate configuration to running configuration                     |
| (config)# interface irb 1001                                     | Configure IRB interface 1001  |
| (config-if)ip vrf forwarding L3VRF1                              | Configure L3VRF1  |
| (config-if)ip address 11.11.11.1/24                              | Configure IP address  |
| (config-if)ipv6 address 11:11::11:1/48                           | Configure IPv6 address  |

|   |   |
|---|---|
| (config-if) evpn irb-if-forwarding anycast-gateway-mac            | Configure anycast MAC address   |
| (config-if)exit   | Exit from interface config mode   |
| (config)# interface irb 2001                                      | Configure IRB interface 2001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 21.21.21.1/24                               | Configure IP address  |
| (config-if)ipv6 address 21:21::21:1/48                            | Configure IPv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac            | Configure anycast MAC address   |
| (config-if)exit   | Exit from interface config mode   |
| (config)#commit   | Commit the candidate configuration to running configuration   |
| (config)router bgp 5000   | Enter into BGP router mode  |
| (config-router)#address-family ipv4 vrf L3VRF1                    | Enter into address-family mode for L3VRF1   |
| (config-router-af)#redistribute connected                         | Redistribute connected  |
| (config-router-af)#exit-address-family                            | Exit form address-family  |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1     | Assign VRF for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb1001  | Configure irb1001 under VxLAN ID 101  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled  | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2     | Assign VRF for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb2001  | Configure irb2001 under VxLAN id 201  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#commit   | Commit the candidate configuration to running configuration   |

## VTEP5

Unconfigure - evpn irb-forwarding anycast-gateway-mac and assign different IP address and IPv6 address to IRB interfaces on VTEP1. Resolve the ARP on Traffic generator and verify the learnt MAC is same as IRB interface MAC not the anycast MAC (0000.0000.1111). Configure BGP max-path under BGP process.

Enable VxLAN Multihoming on VTEP5 and reboot the node to apply the Multihoming configuration to hardware.

|   |  |
|---|--|
| (config)#hardware-profile filter vxlan enable       | Enable hardware-profile filter for VxLAN.              |
| (config)#hardware-profile filter vxlan-mh enable    | Enable hardware-profile filter for VxLAN multi-homing. |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4.        |
| (config)#commit                                     | Commit the transaction                                 |



|   |   |
|---|---|
| (config)#evpn vxlan multihoming enable                            | Enable Multihoming, save configs and reboot the board for multihoming to be effective                         |
| (config)#commit   | Commit the transaction  |
| (config)#nvo vxlan irb  | Enable VxLAN IRB  |
| (config)#commit   | Commit the transaction  |
| (config)#ip vrf L3VRF1  | Create MAC routing/forwarding instance with L3VRF1 name and enter into VRF mode                               |
| (config-vrf)#rd 51000:11  | Assign RD value   |
| (config-vrf)# route-target both 100:100                           | Assign route-target value for same for import and export.   |
| (config-vrf)# l3vni 1000  | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#commit   | Commit the transaction  |
| (config)# no evpn irb-forwarding anycast-gateway-mac              | Delete EVPN irb-forwarding anycast-gateway-MAC address  |
| (config)#commit   | Commit the transaction  |
| (config)# interface irb1001                                       | Configure IRB interface 1001  |
| (config-irb-if)ip vrf forwarding L3VRF1                           | Configure L3VRF1  |
| (config-irb-if)ip address 101.11.11.1/24                          | Configure IP address  |
| (config-irb-if)ipv6 address 101:11::11:1/48                       | Configure IPv6 address  |
| (config-irb-if)#commit  | Commit the transaction  |
| (config)router bgp 5000   | Enter into BGP router mode  |
| (config-router)#address-family ipv4 vrf L3VRF1                    | Enter into address-family mode for L3VRF1   |
| (config-router-af)# max-paths ibgp 2                              | Configure BGP max-path .  |
| (config-router-af)#redistribute connected                         | Redistribute connected  |
| (config-router-af)#exit-address-family                            | Exit form address-family  |
| (config-router-af)#commit   | Commit the transaction  |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1     | Assign VRF for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb1001  | Configure irb1001 under VxLAN ID 101  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config-nvo)#commit   | Commit the transaction  |

## Validations

On VTEP5, verify that in the VRF routing table , ECMP path for the IRB address (11.11.11.1) is via VTEP1 - 1.1.1.1 and VTEP2 -2.2.2.2 . Send the Traffic from VTEP5 Single homed to Multihomed. Traffic should be forwarded via VTEP1 and VTEP2 and is load shared between the Multihome VTEPs.

## VTEP5

```
TB2-VTEP5#show nvo vxlan tunnel
```

```
VxLAN Network tunnel Entries
```

```
Source          Destination      Status          Up/Down         Update
```

```
=====
```

## VxLAN-EVPN with IRB

```

5.5.5.5          2.2.2.2          Installed          00:34:13          00:34:13
5.5.5.5          4.4.4.4          Installed          00:01:26          00:01:26
5.5.5.5          1.1.1.1          Installed          00:34:13          00:34:13
  
```

Total number of entries are 3

TB2-VTEP5#show nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port  
 AC - Access Port  
 (u) - Untagged

| VNID | VNI-Name | VNI-Type | Type | Interface | ESI  | VLAN | DF-Status | Src-Addr | Dst-Addr |
|------|----------|----------|------|-----------|------|------|-----------|----------|----------|
| 101  | VNI-101  | L2       | NW   | ----      | ---- | ---- | ----      | 5.5.5.5  | 2.2.2.2  |
| 101  | VNI-101  | L2       | NW   | ----      | ---- | ---- | ----      | 5.5.5.5  | 1.1.1.1  |
| 101  | VNI-101  | --       | AC   | xe48      | ---  | 10   | ----      | ----     | ----     |
| 1000 | ----     | L3       | NW   | ----      | ---- | ---- | ----      | 5.5.5.5  | 4.4.4.4  |

Total number of entries are 4

TB2-VTEP5#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

| VNID | Ip-Addr      | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|--------------|----------------|---------------|---------|--------------|
| 101  | 11.11.11.1   | 0000.0000.1111 | Static Remote | ----    |              |
| 101  | 101.11.11.1  | 3c2c.99d6.168a | Static Local  | ----    |              |
| 101  | 11.11.11.201 | 0000.5555.1010 | Static Local  | ----    |              |

Total number of entries are 3

Total number of entries are 1

TB2-VTEP5#show nvo vxlan l3vni-map

L3VNI L2VNI IRB-interface

=====

|      |     |         |
|------|-----|---------|
| 1000 | 101 | irb1001 |
|------|-----|---------|

TB2-VTEP5#show ip route vrf L3VRF1

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP

O - OSPF, IA - OSPF inter area  
 N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
 E1 - OSPF external type 1, E2 - OSPF external type 2  
 i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,  
 ia - IS-IS inter area, E - EVPN,  
 v - vrf leaked  
 \* - candidate default

IP Route Table for VRF "L3VRF1"

```

C      101.11.11.0/24 is directly connected, irb1001, 00:34:43
B      11.11.11.0/24 [200/0] via 1.1.1.1 (recursive is directly connected, tunvxlan1001), 00:01:26
      [200/0] via 2.2.2.2 (recursive is directly connected, tunvxlan1001), 00:01:26
C      127.0.0.0/8 is directly connected, lo.L3VRF1, 00:40:36
  
```

Gateway of last resort is not set

Send 10000 pps from VTEP5 (Traffic generator- SH5) and verify the counters on VTEP5, VTEP1, VTEP2 and Switch

TB2-VTEP5#show interface counter rate mbps

```

+-----+-----+-----+-----+
| Interface | Rx mbps | Rx pps | Tx mbps | Tx pps |
+-----+-----+-----+-----+
  
```

```

xe48          100          10000          0.01          8
xe40          0.00          0          106.76         10000

```

On VTEP1 and VTEP2, verify that traffic is load-balanced on ECMP path from VTEP5.

### VTEP1

```
TB2-VTEP1#show interface counter rate mbps
```

```

+-----+-----+-----+-----+-----+
| Interface | Rx mbps | Rx pps | Tx mbps | Tx pps |
+-----+-----+-----+-----+-----+
po2         62.75   5000    0.01     8
po1         0.00     0       62.98   5000
xe25        31.98   2500    0        0
xe26        30.95   2501    0        0
xe2         0.00     0       31.53   2500
xe3         0.00     0       30.53   2500

```

### VTEP2

```
TB2-VTEP2#show interface counter rate mbps
```

```

+-----+-----+-----+-----+-----+
| Interface | Rx mbps | Rx pps | Tx mbps | Tx pps |
+-----+-----+-----+-----+-----+
po3         62.75   5000    0.01     8
po1         0.00     0       62.98   5000
xe27        31.98   2500    0        0
xe28        30.95   2501    0        0
xe8         0.00     0       31.53   2500
xe9         0.00     0       30.53   2500

```

Verify the Traffic on Multihomed Switch :

### SW1(Multihomed)

```
TB2-SW1#show interface counter rate mbps
```

```

+-----+-----+-----+-----+-----+
| Interface | Rx mbps | Rx pps | Tx mbps | Tx pps |
+-----+-----+-----+-----+-----+
po1         100          10000          0.01          8
xe7         0.00          0          100          10000
xe8         25.01          2501          0            0
xe9         24.99          2499          0            0
xe2         24.98          2499          0            0
xe3         25.02          2501          0            0

```



## CHAPTER 10 VxLAN-EVPN with IRB QoS

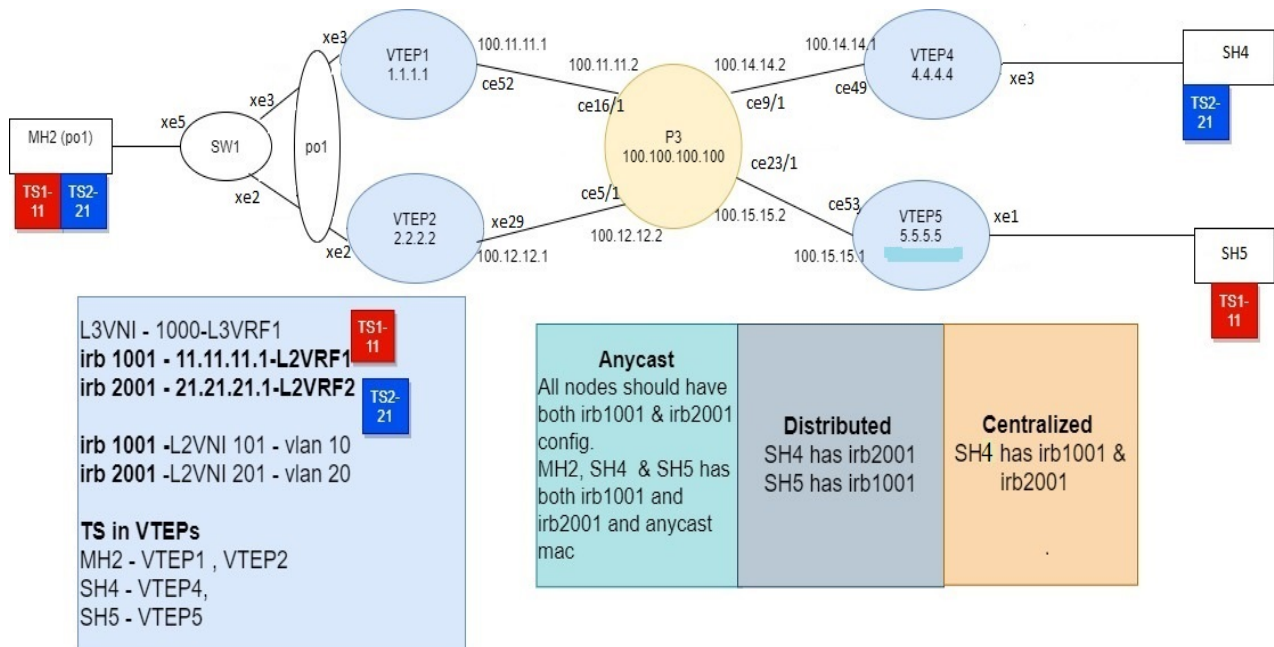
### Overview

An EVPN-based Integrated Routing and Bridging solution used for forwarding of intra-subnets and inter-subnets traffic. Here QoS is applied on IRB solution for L3 packets.

VxLAN quality of service (QoS) provides differentiated service in VxLAN applications. A device implements mapping between QoS priorities in original packets, internal priorities (local precedence assigned by the device to differentiate service classes of packets), and priorities of encapsulated packets. In this way, the switch provides the differentiated QoS service based on original packets.

### Topology

The procedures in this section use the topology in [Figure 10-11](#)



**Figure 10-11: VxLAN\_EVPN\_IRB**

Note: In the above topology TS1, TS2 are the tenant systems. The blue and red color denotes different subnets in the Tenant systems.

### Base Configuration - L2 VxLAN

#### VTEP1

(Multi-homed group1) - Part of both Multi-homed with po1(MH2).

## Hardware profile and generic configuration:

|   |   |
|---|---|
| #configure terminal                                 | Enter Configure mode.   |
| (config)#hardware-profile filter vxlan enable       | Enable hardware-profile filter for VxLAN.   |
| (config)#hardware-profile filter vxlan-mh enable    | Enable hardware-profile filter for VxLAN multi-homing.                                |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4.                                       |
| (config)#evpn vxlan multihoming enable              | Enable Multihoming, save configs and reboot the board for multihoming to be effective |
| (config)#hardware-profile statistics ac-lif enable  | Enable ac-lif for vxlan access-if port counters                                       |
| (config)#qos enable                                 | Enabling qos  |

## Interface and loopback configuration:

|   |   |
|---|---|
| (config)#interface po1                                  | Enter Interface mode for po1 (MH2)  |
| (config-if)#switchport                                  | Make it L2 interface  |
| (config-if)# evpn multi-homed system-mac 0000.0000.2222 | Configure system mac as ESI value for Lag (po1) interface. VTEP1 and VTEP2 should have same ESI value |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface xe3                                  | Enter Interface mode for xe3  |
| (config-if)#channel-group 1 mode active                 | Make it member port of po1  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface lo                                   | Enter Interface mode for lo   |
| (config-if)#ip address 1.1.1.1/32 secondary             | Configure loopback ip address as 1.1.1.1 for VTEP1  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface ce52                                 | Enter Interface mode for network side port  |
| (config-if)#ip address 100.11.11.1/24                   | Configure ip address as 100.11.11.1 on network side of Spine-P3                                       |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |

## OSPF configuration:

|   |   |
|---|---|
| (config)#router ospf 100                            | Enter into router OSPF mode                             |
| (config-router)#ospf router-id 1.1.1.1              | Configure router-id as 1.1.1.1 (lo ip address)          |
| (config-router)#network 1.1.1.1/32 area 0.0.0.0     | Add 1.1.1.1 (lo ip address) network into area 0         |
| (config-router)#network 100.11.11.0/24 area 0.0.0.0 | Add 100.11.11.0(Spine-P3) network into area 0           |
| (config-router)#bfd all-interfaces                  | Enabling bfd on all ospf interface for fast convergence |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.       |

**BGP configuration:**

|   |  |
|---|--|
| (config)#router bgp 5000                                  | Enter into Router BGP mode   |
| (config-router)#bgp router-id 1.1.1.1                     | Configure router-id as 1.1.1.1 (lo ip address)                       |
| (config-router)#neighbor 2.2.2.2 remote-as 5000           | Specify a VTEP2 loopback ip address and remote-as defined            |
| (config-router)#neighbor 2.2.2.2 update-source lo         | Configure update as loopback for VTEP2                               |
| (config-router)#neighbor 2.2.2.2 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP2 |
| (config-router)#neighbor 4.4.4.4 remote-as 5000           | Specify a VTEP4 loopback ip address and remote-as defined            |
| (config-router)#neighbor 4.4.4.4 update-source lo         | Configure update as loopback for VTEP4                               |
| (config-router)#neighbor 4.4.4.4 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP4 |
| (config-router)#neighbor 5.5.5.5 remote-as 5000           | Specify a VTEP5 loopback ip address and remote-as defined            |
| (config-router)#neighbor 5.5.5.5 update-source lo         | Configure update as loopback for VTEP5                               |
| (config-router)#neighbor 5.5.5.5 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP5 |
| (config-router)#address-family l2vpn evpn                 | Enter into l2vpn EVPN address family mode                            |
| (config-router-af)#neighbor 2.2.2.2 activate              | Activate 2.2.2.2(VTEP2) into l2vpn evpn address family mode          |
| (config-router-af)#neighbor 4.4.4.4 activate              | Activate 3.3.3.3(VTEP4) into l2vpn evpn address family mode          |
| (config-router-af)#neighbor 5.5.5.5 activate              | Activate 5.5.5.5(VTEP5) into l2vpn evpn address family mode          |
| (config-router-af)#exit-address-family                    | Exit from l2vpn address family mode                                  |
| (config-router)#exit                                      | Exit from Router BGP mode and enter into config mode                 |

**L2 MAC VRF Configuration:**

|  |   |
|--|---|
| (config)#mac vrf L2VRF1                        | Create mac routing/forwarding instance with L2VRF1 name and enter into vrf mode                 |
| (config-vrf)#rd 1.1.1.1:11                     | Assign RD value   |
| (config-vrf)#description MAC VRF RED           | Give description to L2VRF1 as RED   |
| (config-vrf)#route-target both 9.9.9.9:100     | Assign route-target value for same for import and export. Should be same on all node for L2VRF1 |
| (config-vrf)#exit                              | Exit from vrf mode  |
| (config)#mac vrf L2VRF2                        | Create mac routing/forwarding instance with L2VRF2 name and enter into vrf mode                 |
| (config-vrf)#rd 1.1.1.1:21                     | Assign RD value   |
| (config-vrf)#route-target both 90.90.90.90:100 | Assign route-target value for same for import and export  |
| (config-vrf)#description MAC VRF BLUE          | Give description to L2VRF2 as BLUE  |
| (config-vrf)#exit                              | Exit from vrf mode  |

## L2 VxLAN configuration:

|  |  |
|--|--|
| (config)#nvo vxlan enable  | Enable VxLAN   |
| (config)#evpn esi hold-time 90                                   | Configure ESI hold time to allow tunnel to come up at the time of vxlan initialization before making the ESI up. It should be same on both VTEP1 and VTEP2 |
| (config)#nvo vxlan vtep-ip-global 1.1.1.1                        | Configure Source vtep-ip-global configuration - Use loopback ip address  |
| (config)#nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode  |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1    | Assign vrf for evpn-bgp to carry EVPN route  |
| (config-nvo)# vni-name VNI-101                                   | Configure VNI name as VNI-101  |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.   |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode  |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2    | Assign vrf for evpn-bgp to carry EVPN route  |
| (config-nvo)# vni-name VNI-201                                   | Configure VNI name as VNI-201  |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.   |
| (config)#nvo vxlan access-if port-vlan po1 10                    | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN) - Multihomed access port   |
| (config-nvo-acc-if)#map vnid 101                                 | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)# mac 0000.2222.1010 ip 11.11.11.51           | Configure static mac-ip  |
| (config-nvo-acc-if)#exit   | Exit from VxLAN access-interface mode and enter into configuration mode  |
| (config)#nvo vxlan access-if port-vlan po1 20                    | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN) - Multihomed access port   |
| (config-nvo-acc-if)#map vnid 201                                 | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)# mac 0000.2222.1020 ip 21.21.21.51           | Configure static mac-ip  |
| (config-nvo-acc-if)#commit                                       | Commit the candidate configuration to the running configuration  |
| (config-nvo-acc-if)#exit   | Exit from VxLAN access-interface mode and enter into configuration mode  |
| (config)#exit  | Exit from configuration mode   |

## VTEP2

(Multi-homed group1) - Part of both Multi-homed with po1(MH1).

## Hardware profile and generic configuration:

|   |   |
|---|---|
| #configure terminal                           | Enter Configure mode.                     |
| (config)#hardware-profile filter vxlan enable | Enable hardware-profile filter for VxLAN. |



|   |   |
|---|---|
| (config)#hardware-profile filter vxlan-mh enable    | Enable hardware-profile filter for VxLAN multi-homing.                                |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4.                                       |
| (config)#evpn vxlan multihoming enable              | Enable Multihoming, save configs and reboot the board for multihoming to be effective |
| (config)#hardware-profile statistics ac-lif enable  | Enable ac-lif for vxlan access-if port counters                                       |
| (config)#qos enable                                 | Enabling qos  |

### Interface and loopback configuration:

|   |   |
|---|---|
| (config)#interface po1                                  | Enter Interface mode for po1 (MH2)  |
| (config-if)#switchport                                  | Make it L2 interface  |
| (config-if)# evpn multi-homed system-mac 0000.0000.2222 | Configure system mac as ESI value for Lag (po1) interface. VTEP1 and VTEP2 should have same ESI value |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface xe2                                  | Enter Interface mode for xe2  |
| (config-if)#channel-group 1 mode active                 | Make it member port of po1  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config)#interface lo                                   | Enter Interface mode for lo   |
| (config-if)#ip address 2.2.2.2/32 secondary             | Configure loopback ip address as 2.2.2.2 for VTEP2  |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |
| (config) interface xe29                                 | Enter into network side interface   |
| (config-if)#ip address 100.12.12.1/24                   | Configure ip address as 100.12.12.1 on network side of Spine-P3                                       |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.   |

### OSPF configuration:

|   |   |
|---|---|
| (config)#router ospf 100                            | Enter into router OSPF mode                             |
| (config-router)#ospf router-id 2.2.2.2              | Configure router-id as 2.2.2.2 (lo ip address)          |
| (config-router)#network 2.2.2.2/32 area 0.0.0.0     | Add 2.2.2.2 (lo ip address) network into area 0         |
| (config-router)#network 100.12.12.0/24 area 0.0.0.0 | Add 100.12.12.0(Spine-P3) network into area 0           |
| (config-router)#bfd all-interfaces                  | Enabling bfd on all ospf interface for fast convergence |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.       |

### BGP configuration:

|   |   |
|---|---|
| (config)#router bgp 5000                        | Enter into Router BGP mode                                |
| (config-router)#bgp router-id 2.2.2.2           | Configure router-id as 2.2.2.2 (lo ip address)            |
| (config-router)#neighbor 1.1.1.1 remote-as 5000 | Specify a VTEP1 loopback ip address and remote-as defined |

## VxLAN-EVPN with IRB QoS

|   |  |
|---|--|
| (config-router)#neighbor 1.1.1.1 update-source lo         | Configure update as loopback for VTEP1                               |
| (config-router)#neighbor 1.1.1.1 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP1 |
| (config-router)#neighbor 4.4.4.4 remote-as 5000           | Specify a VTEP4 loopback ip address and remote-as defined            |
| (config-router)#neighbor 4.4.4.4 update-source lo         | Configure update as loopback for VTEP4                               |
| (config-router)#neighbor 4.4.4.4 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP4 |
| (config-router)#neighbor 5.5.5.5 remote-as 5000           | Specify a VTEP5 loopback ip address and remote-as defined            |
| (config-router)#neighbor 5.5.5.5 update-source lo         | Configure update as loopback for VTEP5                               |
| (config-router)#neighbor 5.5.5.5 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP5 |
| (config-router)#address-family l2vpn evpn                 | Enter into l2vpn EVPN address family mode                            |
| (config-router-af)#neighbor 1.1.1.1 activate              | Activate 1.1.1.1(VTEP1) into l2vpn evpn address family mode          |
| (config-router-af)#neighbor 4.4.4.4 activate              | Activate 4.4.4.4(VTEP4) into l2vpn evpn address family mode          |
| (config-router-af)#neighbor 5.5.5.5 activate              | Activate 5.5.5.5(VTEP5) into l2vpn evpn address family mode          |
| (config-router-af)#exit-address-family                    | Exit from l2vpn address family mode                                  |
| (config-router)#exit                                      | Exit from Router BGP mode and enter into config mode                 |

## VRF Configuration:

|  |   |
|--|---|
| (config)#mac vrf L2VRF1                        | Create mac routing/forwarding instance with L2VRF1 name and enter into vrf mode                 |
| (config-vrf)#rd 2.2.2.2:11                     | Assign RD value   |
| (config-vrf)#description MAC VRF RED           | Give description to L2VRF1 as RED   |
| (config-vrf)#route-target both 9.9.9.9:100     | Assign route-target value for same for import and export. Should be same on all node for L2VRF1 |
| (config-vrf)#exit                              | Exit from vrf mode  |
| (config)#mac vrf L2VRF2                        | Create mac routing/forwarding instance with L2VRF2 name and enter into vrf mode                 |
| (config-vrf)#rd 2.2.2.2:21                     | Assign RD value   |
| (config-vrf)#route-target both 90.90.90.90:100 | Assign route-target value for same for import and export  |
| (config-vrf)#description MAC VRF BLUE          | Give description to L2VRF2 as BLUE  |
| (config-vrf)#exit                              | Exit from vrf mode  |

## VxLAN configuration:

|                                |   |
|--------------------------------|---|
| (config)#nvo vxlan enable      | Enable VxLAN  |
| (config)#evpn esi hold-time 90 | Configure ESI hold time to allow tunnel to come up at the time of vxlan initialization before making the ESI up.It should be same on both VTEP1 and VTEP2 |

|  |   |
|--|---|
| (config)#nvo vxlan vtep-ip-global 2.2.2.2                        | Configure Source vtep-ip-global configuration - Use loopback ip address                                       |
| (config)#nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1    | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# vni-name VNI-101                                   | Configure VNI name as VNI-101   |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2    | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# vni-name VNI-201                                   | Configure VNI name as VNI-201   |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan access-if port-vlan po1 10                    | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN) - Multihomed access port                      |
| (config-nvo-acc-if)#map vnid 101                                 | Map VxLAN Identified to access-port for VxLAN   |
| (config-nvo-acc-if)# mac 0000.2222.1010 ip 11.11.11.51           | Configure static mac-ip   |
| (config-nvo-acc-if)#exit   | Exit from VxLAN access-interface mode and enter into configuration mode                                       |
| (config)#nvo vxlan access-if port-vlan po1 20                    | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN) - Multihomed access port                      |
| (config-nvo-acc-if)#map vnid 201                                 | Map VxLAN Identified to access-port for VxLAN   |
| (config-nvo-acc-if)# mac 0000.2222.1020 ip 21.21.21.51           | Configure static mac-ip   |
| (config-nvo-acc-if)#commit                                       | Commit the candidate configuration to the running configuration   |
| (config-nvo-acc-if)#exit   | Exit from VxLAN access-interface mode and enter into configuration mode                                       |
| (config)#exit  | Exit from configuration mode  |

## VTEP4

Single Home -SH5.

Hardware profile and generic configuration:

|   |   |
|---|---|
| #configure terminal                                 | Enter Configure mode.                           |
| (config)#hardware-profile filter vxlan enable       | Enable hardware-profile filter for VxLAN.       |
| (config)#hardware-profile filter vxlan-mh enable    | Enable hardware profile mh in SH VTEP also      |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4. |
| (config)#hardware-profile statistics ac-lif enable  | Enable ac-lif for vxlan access-if port counters |

|  |   |
|--|---|
| (config)#evpn vxlan multihoming enable | Enable Multihoming, save configs and reboot the board for multihoming to be effective |
| (config)#qos enable                    | Enabling qos  |

### Interface and loopback configuration:

|   |   |
|---|---|
| (config)#interface xe3                      | Enter Interface mode for xe3                                    |
| (config-if)#switchport                      | Make it L2 interface  |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.               |
| (config)#interface lo                       | Enter Interface mode for lo                                     |
| (config-if)#ip address 4.4.4.4/32 secondary | Configure loopback ip address as 4.4.4.4 for VTEP4              |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.               |
| (config) interface ce49                     | Enter interface towards network side                            |
| (config-if)#ip address 100.14.14.1/24       | Configure ip address as 100.14.14.1 on network side of Spine-P3 |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.               |

### OSPF configuration:

|   |   |
|---|---|
| (config)#router ospf 100                            | Enter into router OSPF mode                             |
| (config-router)#ospf router-id 4.4.4.4              | Configure router-id as 4.4.4.4 (lo ip address)          |
| (config-router)#network 4.4.4.4/32 area 0.0.0.0     | Add 4.4.4.4 (lo ip address) network into area 0         |
| (config-router)#network 100.14.14.0/24 area 0.0.0.0 | Add 100.14.14.0(Spine-P3) network into area 0           |
| (config-router)#bfd all-interfaces                  | Enabling bfd on all ospf interface for fast convergence |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.       |

### BGP configuration:

|   |  |
|---|--|
| (config)#router bgp 5000                                  | Enter into Router BGP mode   |
| (config-router)#bgp router-id 4.4.4.4                     | Configure router-id as 4.4.4.4 (lo ip address)                       |
| (config-router)#neighbor 1.1.1.1 remote-as 5000           | Specify a VTEP1 loopback ip address and remote-as defined            |
| (config-router)#neighbor 1.1.1.1 update-source lo         | Configure update as loopback for VTEP1                               |
| (config-router)#neighbor 1.1.1.1 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP1 |
| (config-router)#neighbor 2.2.2.2 remote-as 5000           | Specify a VTEP2 loopback ip address and remote-as defined            |
| (config-router)#neighbor 2.2.2.2 update-source lo         | Configure update as loopback for VTEP2                               |
| (config-router)#neighbor 2.2.2.2 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP2 |

|   |  |
|---|--|
| (config-router)#neighbor 5.5.5.5 remote-as 5000           | Specify a VTEP5 loopback ip address and remote-as defined            |
| (config-router)#neighbor 5.5.5.5 update-source lo         | Configure update as loopback for VTEP5                               |
| (config-router)#neighbor 5.5.5.5 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP5 |
| (config-router)#address-family l2vpn evpn                 | Enter into l2vpn EVPN address family mode                            |
| (config-router-af)#neighbor 1.1.1.1 activate              | Activate 1.1.1.1(VTEP1) into l2vpn evpn address family mode          |
| (config-router-af)#neighbor 2.2.2.2 activate              | Activate 2.2.2.2(VTEP2) into l2vpn evpn address family mode          |
| (config-router-af)#neighbor 5.5.5.5 activate              | Activate 5.5.5.5(VTEP5) into l2vpn evpn address family mode          |
| (config-router-af)#exit-address-family                    | Exit from l2vpn address family mode                                  |
| (config-router)#exit                                      | Exit from Router BGP mode and enter into config mode                 |

### VRF Configuration:

|  |   |
|--|---|
| (config)#mac vrf L2VRF1                        | Create mac routing/forwarding instance with L2VRF1 name and enter into vrf mode                 |
| (config-vrf)#rd 4.4.4.4:11                     | Assign RD value   |
| (config-vrf)#description MAC VRF RED           | Give description to L2VRF1 as RED   |
| (config-vrf)#route-target both 9.9.9.9:100     | Assign route-target value for same for import and export. Should be same on all node for L2VRF1 |
| (config-vrf)#exit                              | Exit from vrf mode  |
| (config)#mac vrf L2VRF2                        | Create mac routing/forwarding instance with L2VRF2 name and enter into vrf mode                 |
| (config-vrf)#rd 4.4.4.4:21                     | Assign RD value   |
| (config-vrf)#route-target both 90.90.90.90:100 | Assign route-target value for same for import and export  |
| (config-vrf)#description MAC VRF BLUE          | Give description to L2VRF2 as BLUE  |
| (config-vrf)#exit                              | Exit from vrf mode  |

### VxLAN configuration:

|  |   |
|--|---|
| (config)#nvo vxlan enable  | Enable VxLAN  |
| (config)#nvo vxlan vtep-ip-global 4.4.4.4                        | Configure Source vtep-ip-global configuration. Use loopback ip address  |
| (config)#nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1    | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# vni-name VNI-101                                   | Configure VNI name as VNI-101   |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2    | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# vni-name VNI-201                                   | Configure VNI name as VNI-201   |

|   |   |
|---|---|
| (config-nvo)#exit                                       | Exit from VxLAN tenant mode and enter into configuration mode.          |
| (config)# nvo vxlan access-if port-vlan xe3 20          | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN)         |
| (config-nvo-acc-if)#map vnid 201                        | Map VxLAN Identified to access-port for VxLAN                           |
| (config-nvo-acc-if)# mac 0000.5555.1020 ip 21.21.21.101 | Configure static mac-ip   |
| (config-nvo-acc-if)#commit                              | Commit the candidate configuration to the running configuration         |
| (config-nvo-acc-if)#exit                                | Exit from VxLAN access-interface mode and enter into configuration mode |
| (config)#exit   | Exit from configuration mode  |

**VTEP5**

## Single Home -SH3

## Hardware profile and generic configuration:

|   |   |
|---|---|
| #configure terminal                                 | Enter Configure mode.   |
| (config)#hardware-profile filter vxlan enable       | Enable hardware-profile filter for VxLAN.   |
| (config)#hardware-profile filter vxlan-mh enable    | Enable hardware profile mh in SH VTEP also  |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4.                                       |
| (config)#hardware-profile statistics ac-lif enable  | Enable ac-lif for vxlan access-if port counters                                       |
| (config)#evpn vxlan multihoming enable              | Enable Multihoming, save configs and reboot the board for multihoming to be effective |
| (config)#qos enable                                 | Enabling qos  |

## Interface and loopback configuration:

|   |   |
|---|---|
| (config)#interface xe1                      | Enter Interface mode for xe1 (SH5)                              |
| (config-if)#switchport                      | Make it L2 interface  |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.               |
| (config)#interface lo                       | Enter Interface mode for lo                                     |
| (config-if)#ip address 5.5.5.5/32 secondary | Configure loopback ip address as 5.5.5.5 for VTEP5              |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.               |
| (config) interface ce53                     | Enter interface mode  |
| (config-if)#ip address 100.15.15.1/24       | Configure ip address as 100.15.15.1 on network side of Spine-P3 |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.               |

**OSPF configuration:**

|   |   |
|---|---|
| (config)#router ospf 100                            | Enter into router OSPF mode                             |
| (config-router)#ospf router-id 5.5.5.5              | Configure router-id as 5.5.5.5 (lo ip address)          |
| (config-router)#network 5.5.5.5/32 area 0.0.0.0     | Add 5.5.5.5 (lo ip address) network into area 0         |
| (config-router)#network 100.15.15.0/24 area 0.0.0.0 | Add 100.15.15.0(Spine-P3) network into area 0           |
| (config-router)#bfd all-interfaces                  | Enabling bfd on all ospf interface for fast convergence |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.       |

**BGP configuration:**

|   |  |
|---|--|
| (config)#router bgp 5000                                  | Enter into Router BGP mode   |
| (config-router)#bgp router-id 5.5.5.5                     | Configure router-id as 5.5.5.5(lo ip address)                        |
| (config-router)#neighbor 1.1.1.1 remote-as 5000           | Specify a VTEP1 loopback ip address and remote-as defined            |
| (config-router)#neighbor 1.1.1.1 update-source lo         | Configure update as loopback for VTEP1                               |
| (config-router)#neighbor 1.1.1.1 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP1 |
| (config-router)#neighbor 2.2.2.2 remote-as 5000           | Specify a VTEP2 loopback ip address and remote-as defined            |
| (config-router)#neighbor 2.2.2.2 update-source lo         | Configure update as loopback for VTEP2                               |
| (config-router)#neighbor 2.2.2.2 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP2 |
| (config-router)#neighbor 4.4.4.4 remote-as 5000           | Specify a VTEP4 loopback ip address and remote-as defined            |
| (config-router)#neighbor 4.4.4.4 update-source lo         | Configure update as loopback for VTEP4                               |
| (config-router)#neighbor 4.4.4.4 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP4 |
| (config-router)#address-family l2vpn evpn                 | Enter into l2vpn EVPN address family mode                            |
| (config-router-af)#neighbor 1.1.1.1 activate              | Activate 1.1.1.1(VTEP1) into l2vpn evpn address family mode          |
| (config-router-af)#neighbor 2.2.2.2 activate              | Activate 2.2.2.2(VTEP2) into l2vpn evpn address family mode          |
| (config-router-af)#neighbor 4.4.4.4 activate              | Activate 4.4.4.4(VTEP4) into l2vpn evpn address family mode          |
| (config-router-af)#exit-address-family                    | Exit from l2vpn address family mode                                  |
| (config-router)#exit                                      | Exit from Router BGP mode and enter into config mode                 |

**VRF Configuration:**

|                                      |   |
|--------------------------------------|---|
| (config)#mac vrf L2VRF1              | Create mac routing/forwarding instance with L2VRF1 name and enter into vrf mode |
| (config-vrf)#rd 5.5.5.5:11           | Assign RD value   |
| (config-vrf)#description MAC VRF RED | Give description to L2VRF1 as RED   |

## VxLAN-EVPN with IRB QoS

|  |   |
|--|---|
| (config-vrf)#route-target both 9.9.9.9:100     | Assign route-target value for same for import and export. Should be same on all node for L2VRF1 |
| (config-vrf)#exit                              | Exit from vrf mode  |
| (config)#mac vrf L2VRF2                        | Create mac routing/forwarding instance with L2VRF2 name and enter into vrf mode                 |
| (config-vrf)#rd 5.5.5.5:21                     | Assign RD value   |
| (config-vrf)#route-target both 90.90.90.90:100 | Assign route-target value for same for import and export  |
| (config-vrf)#description MAC VRF BLUE          | Give description to L2VRF2 as BLUE  |
| (config-vrf)#exit                              | Exit from vrf mode  |

## VxLAN configuration:

|  |   |
|--|---|
| (config)#nvo vxlan enable  | Enable VxLAN  |
| (config)#nvo vxlan vtep-ip-global 5.5.5.5                        | Configure Source vtep-ip-global configuration. Use loopback ip address  |
| (config)#nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1    | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# vni-name VNI-101                                   | Configure VNI name as VNI-101   |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2    | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# vni-name VNI-201                                   | Configure VNI name as VNI-201   |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)# nvo vxlan access-if port-vlan xe1 10                   | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN)   |
| (config-nvo-acc-if)#map vnid 101                                 | Map VxLAN Identified to access-port for VxLAN   |
| (config-nvo-acc-if)# mac 0000.4444.1010 ip 11.11.11.201          | Configure static mac-ip   |
| (config-nvo-acc-if)#commit                                       | Commit the candidate configuration to the running configuration   |
| (config-nvo-acc-if)#exit   | Exit from VxLAN access-interface mode and enter into configuration mode                                       |
| (config)#exit  | Exit from configuration mode  |

## Switch1 (MH2)

Multihomed to 2-VTEPs (VTEP1 and VTEP2). It acts as Tenant system for vlan1.20.

|  |                                 |
|--|---------------------------------|
| #configure terminal                          | Enter Configure mode.           |
| (config)# bridge 1 protocol rstp vlan-bridge | Configure rstp vlan bridge      |
| (config)# vlan database                      | Enter vlan database config mode |



|  |   |
|--|---|
| (config)#vlan 2-20 bridge 1 state enable             | Configure vlans from 2-20 and associate with bridge 1           |
| (config)#interface xe5                               | Enter Interface mode for xe5 which is connected to TG           |
| (config-if)#switchport                               | Make as L2 port by configuring switchport                       |
| (config-if)#bridge-group 1                           | Associate bridge 1 into interface                               |
| (config-if)# bridge-group 1 spanning-tree disable    | Configure interface as stp disable                              |
| (config-if)# switchport mode trunk                   | Mode as trunk   |
| (config-if)# switchport trunk allowed vlan add 10,20 | Trunk allowed vlan as 10.20                                     |
| (config-if)#exit                                     | Exit Interface mode and return to Configure mode.               |
| (config)#interface po1                               | Enter Interface mode for po1                                    |
| (config-if)#switchport                               | Make po1 as L2 port by configuring switchport                   |
| (config-if)#bridge-group 1                           | Associate po1 to bridge 1                                       |
| (config-if)# bridge-group 1 spanning-tree disable    | Configure po1 as stp disable                                    |
| (config-if)# switchport mode trunk                   | Mode as trunk   |
| (config-if)# switchport trunk allowed vlan add 10,20 | Trunk allowed vlan as 2.10.20                                   |
| (config-if)#exit                                     | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe3                               | Enter Interface mode for xe3                                    |
| (config-if)#channel-group 1 mode active              | Make it member port of po1                                      |
| (config)#interface xe2                               | Enter Interface mode for xe2                                    |
| (config-if)#channel-group 1 mode active              | Make it member port of po1                                      |
| (config-if)#commit                                   | Commit the candidate configuration to the running configuration |
| (config-if)#exit                                     | Exit from configuration mode                                    |

### Spine-P3

Spine node where all VTEPs are connected.

#### Generic configuration:

|                     |                       |
|---------------------|-----------------------|
| #configure terminal | Enter Configure mode. |
| (Config)#qos enable | Enabling qos          |

#### Interface and loopback configuration:

|   |   |
|---|---|
| (config)#interface lo                               | Enter Interface mode for lo                                   |
| (config-if)#ip address 100.100.100.100/32 secondary | Configure loopback ip address as 100.100.100.100 for Spine-P3 |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.             |
| (config)#interface ce16/1                           | Enter Interface mode for ce16/1                               |
| (config-if)#ip address 100.11.11.2/24               | Configure ip address as 100.11.11.2 on network side of VTEP1  |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.             |

|                                       |   |
|---------------------------------------|---|
| (config) interface ce5/1              | Enter into ce5/1 interface mode                               |
| (config-if)#ip address 100.12.12.2/24 | Configure ip address as 100.12.12.2 on network side of VTEP2  |
| (config-if)#exit                      | Exit Interface mode and return to Configure mode.             |
| (config) interface ce9/1              | Enter ce9/1 interface mode                                    |
| (config-if)#ip address 100.14.14.2/24 | Configure ip address as 100.14.14.12 on network side of VTEP4 |
| (config-if)#exit                      | Exit Interface mode and return to Configure mode.             |
| (config) interface ce23/1             | Enter interface mode  |
| (config-if)#ip address 100.15.15.1/24 | Configure ip address as 100.15.15.1 on network side of VTEP5  |
| (config-if)#exit                      | Exit Interface mode and return to Configure mode.             |

### OSPF configuration:

|   |   |
|---|---|
| (config)#router ospf 100                                | Enter into router OSPF mode                                     |
| (config-router)#ospf router-id 100.100.100.100          | Configure router-id as 100.100.100.100 (lo ip address)          |
| (config-router)#network 100.100.100.100/32 area 0.0.0.0 | Add 100.100.100.100 (lo ip address) network into area 0         |
| (config-router)#network 100.11.11.0/24 area 0.0.0.0     | Add 100.11.11.0 (VTEP1) network into area 0                     |
| (config-router)#network 100.12.12.0/24 area 0.0.0.0     | Add 100.12.12.0 (VTEP2) network into area 0                     |
| (config-router)#network 100.14.14.0/24 area 0.0.0.0     | Add 100.14.14.0 (VTEP4) network into area 0                     |
| (config-router)#network 100.15.15.0/24 area 0.0.0.0     | Add 100.15.15.0 (VTEP5) network into area 0                     |
| (config-router)#bfd all-interfaces                      | Enabling bfd on all ospf interface for fast convergence         |
| (config-router)#commit                                  | Commit the candidate configuration to the running configuration |
| (config-router)#exit                                    | Exit Interface mode and return to Configure mode.               |

## Centralized Gateway

In Centralized gateway approach, when two TS belonging to two different subnets connected to the same/different VTEP node, wanted to communicate with each other, their traffic needed to be back hauled from the VTEP node to the centralized gateway node where inter-subnet switching is performed and then back to the VTEP node.

## IRB Configuration for Centralized Gateway

Configure from Base Configuration-L2 VxLAN section, then configure below commands for centralized gateway approach. Here VTEP4 is the centralized GW. In VTEP4, dscp-to-queue qos profile should be applied on the particular incoming L2VNID IRB interface and dscp-encap qos profile should be applied on vxlan tunnel egress.

Note: For L3 traffic, when L2VNID is sent in the traffic, then dscp-to-queue qos profile mapped at IRB interface of that particular L2VNID takes effect.

**VSTEP1**

|   |  |
|---|--|
| (config)#qos profile cos-to-queue COS_QUEUE                       | Create QoS profile for mapping traffic towards tunnel from access-if |
| (config-ingress-cos-map)#cos 1 queue 5                            | Configure particular COS value to queue value for the profile        |
| (config-ingress-cos-map)#exit                                     | Exit from qos profile mode   |
| (config)#qos profile queue-color-to-dscp QUEUE_DSCP               | Create QoS profile for attaching in vxlan tunnel egress              |
| (config-egress-dscp-map)#queue 5 dscp 34                          | Configure queue value to DSCP value for the profile                  |
| (config)#nvo vxlan tunnel qos-map-mode cos-dscp egress QUEUE_DSCP | Map the configured QoS profile to vxlan tunnel egress                |
| (config)#nvo vxlan access-if port-vlan po1 20                     | Enter into vxlan access port mode                                    |
| (config-nvo-acc-if)#map qos-profile cos-to-queue COS_QUEUE        | Map the qos profile in vxlan access-if                               |
| (config-nvo-acc-if)#commit  | Commit the candidate configuration to the running configuration      |
| (config-nvo-acc-if)#end   | Exit from vxlan access port  |

**VSTEP2**

|   |  |
|---|--|
| (config)#qos profile cos-to-queue COS_QUEUE                       | Create QoS profile for mapping traffic towards tunnel from access-if |
| (config-ingress-cos-map)#cos 1 queue 5                            | Configure particular COS value to queue value for the profile        |
| (config-ingress-cos-map)#exit                                     | Exit from qos profile mode   |
| (config)#qos profile queue-color-to-dscp QUEUE_DSCP               | Create QoS profile for attaching in vxlan tunnel egress              |
| (config-egress-dscp-map)#queue 5 dscp 34                          | Configure queue value to DSCP value for the profile                  |
| (config)#nvo vxlan tunnel qos-map-mode cos-dscp egress QUEUE_DSCP | Map the configured QoS profile to vxlan tunnel egress                |
| (config)#nvo vxlan access-if port-vlan po1 20                     | Enter into vxlan access port mode                                    |
| (config-nvo-acc-if)#map qos-profile cos-to-queue COS_QUEUE        | Map the qos profile in vxlan access-if                               |
| (config-nvo-acc-if)#commit  | Commit the candidate configuration to the running configuration      |
| (config-nvo-acc-if)#end   | Exit from vxlan access port  |

**VSTEP4**

|   |   |
|---|---|
| (config)#nvo vxlan irb                  | Enable VxLAN irb  |
| (config)#ip vrf L3VRF1                  | Create mac routing/forwarding instance with L3VRF1 name and enter into vrf mode |
| (config-vrf)#rd 51000:11                | Assign RD value   |
| (config-vrf)# route-target both 100:100 | Assign route-target value for same for import and export.                       |
| (config-vrf)# l3vni 1000                | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit                       | Exit from vrf mode  |

|  |  |
|--|--|
| (config)# interface irb1001  | Configure IRB interface 1001   |
| (config-if) ip vrf forwarding L3VRF1                               | Configure L3VRF1   |
| (config-if) ip address 11.11.11.1/24                               | Configure ip address   |
| (config-if) ipv6 address 1111::1/64                                | Configure ipv6 address   |
| (config-if) exit   | Exit from interface config mode  |
| (config)# interface irb2001  | Configure IRB interface 2001   |
| (config-if) ip vrf forwarding L3VRF1                               | Configure L3VRF1   |
| (config-if) ip address 21.21.21.1/24                               | Configure ip address   |
| (config-if) ipv6 address 2121::1/64                                | Configure ipv6 address   |
| (config-if) exit   | Exit from interface config mode  |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled  | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode  |
| (config-nvo)# vxlan host-reachability-protocol evpn-bgp L2VRF1     | Assign vrf for evpn-bgp to carry EVPN route  |
| (config-nvo)# evpn irb1001   | Configure irb1001 under vxlan id 101   |
| (config-nvo)# exit   | Exit from VxLAN tenant mode and enter into configuration mode.   |
| (config)# nvo vxlan id 201 ingress-replication inner-vid-disabled  | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode  |
| (config-nvo)# vxlan host-reachability-protocol evpn-bgp L2VRF2     | Assign vrf for evpn-bgp to carry EVPN route  |
| (config-nvo)# evpn irb2001   | Configure irb2001 under vxlan id 201   |
| (config-nvo)# exit   | Exit from VxLAN tenant mode and enter into configuration mode.   |
| (config)# qos profile dscp-to-queue DSCP_QUEUE                     | Configure the QoS profile to match the inner dscp value of the traffic at the IRB interface  |
| (config-ingress-dscp-map)# dscp 20 queue 1                         | Configure particular dscp to a queue value. Configure particular dscp to a queue value. Here classification at the IRB L3 interface is based on customer dscp value. |
| (config-ingress-dscp-map)# exit                                    | Exit from qos profile config mode  |
| (config)# qos profile dscp-encap DSCP_ENCAP                        | Configure the QoS profile to remark the overlay dscp value of the traffic in vxlan tunnel egress.  |
| (config-egress-dscp-encap-map)# 13 dscp 20 dscpEncap 56            | Egress remarking of the customer dscp packet to overlay dscp. Here classification at the egress vtep is based on customer dscp value                                 |
| (config-egress-dscp-encap-map)# exit                               | Exit from qos profile mode   |
| config)# int irb2001   | Enter IRB L3 interface mode  |
| (config-irb-if)# qos map-profile dscp-to-queue DSCP_QUEUE          | Map the qos profile in the IRB interface   |
| (config-irb-if)# exit  | Exit from interface mode   |
| (config)# nvo vxlan tunnel qos-map-mode cos-dscp egress DSCP_ENCAP | Map the qos profile in vxlan tunnel egress   |
| (config)# commit   | Commit the candidate configuration to the running configuration  |
| (config)# end  | Exit from global config mode   |

**VTEP5**

|  |   |
|--|---|
| (config)#qos profile queue-color-to-cos QUEUE_COS                  | Create QoS profile for remark the queue value to COS value      |
| VTEP5(config-egress-cos-map)#queue 2 cos 5                         | Configure particular queue value to COS value for the profile   |
| (config-ingress-cos-map)#exit                                      | Exit from qos profile mode                                      |
| (config)# qos profile dscp-to-queue DSCP_QUEUE                     | Create QoS profile for attaching in vxlan tunnel ingress        |
| (config-ingress-dscp-map)#dscp 56 queue 2                          | Configure DSCP value to queue value for the profile             |
| (config)#nvo vxlan tunnel qos-map-mode cos-dscp ingress DSCP_QUEUE | Map the configured QoS profile to vxlan tunnel ingress          |
| (config)#nvo vxlan access-if port-vlan xe1 10                      | Enter into vxlan access port mode                               |
| (config-nvo-acc-if)#map qos-profile queue-color-to-cos QUEUE_COS   | Map the qos profile in vxlan access-if                          |
| (config-nvo-acc-if)#commit   | Commit the candidate configuration to the running configuration |
| (config-nvo-acc-if)#end  | Exit from vxlan access port                                     |

**Validation**

Send traffic from TS2-21 to MH2 access-if with dscp value 20 and COS value 1(vlan20) and verify traffic received at TS1-11 with dscp value 32 and COS value 5(vlan10) at the VTEP5 access-if.

**VTEP1**

```
VTEP1#show running-config qos
qos enable
!
qos profile cos-to-queue COS_QUEUE
  cos 1 queue 5
!
qos profile queue-color-to-dscp QUEUE_DSCP
  queue 5 color all dscp 34
!
!
!
VTEP1#show running-config nvo vxlan
!
nvo vxlan enable
!
evpn vxlan multihoming enable
!
nvo vxlan vtep-ip-global 1.1.1.1
!
nvo vxlan tunnel qos-map-mode cos-dscp egress QUEUE_DSCP
!
nvo vxlan id 101 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp L2VRF1
  vni-name VNI-101
!
nvo vxlan id 201 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp L2VRF2
  vni-name VNI-201
!
nvo vxlan access-if port-vlan po1 10
  map vnid 101
  mac 0000.2222.1010 ip 11.11.11.51
!
```

## VxLAN-EVPN with IRB QoS

```
nvo vxlan access-if port-vlan po1 20
map vnid 201
mac 0000.2222.1020 ip 21.21.21.51
map qos-profile cos-to-queue COS_QUEUE
!
```

```
VTEP1#show nvo vxlan tunnel
VxLAN Network tunnel Entries
Source          Destination      Status           Up/Down          Update
=====
1.1.1.1         5.5.5.5         Installed        01:15:13         01:15:13
1.1.1.1         4.4.4.4         Installed        01:15:28         01:15:28
1.1.1.1         2.2.2.2         Installed        01:11:40         01:11:40
```

```
Total number of entries are 3
VTEP1#show interface ce52 counters queue-stats
E - Egress, I - Ingress, Q-Size is in bytes
```

| Queue/Class-map | Q-Size        | Tx pkts | Tx bytes   | Dropped pkts | Dropped bytes |
|-----------------|---------------|---------|------------|--------------|---------------|
| q0              | (E) 125304832 | 0       | 0          | 0            | 0             |
| q1              | (E) 125304832 | 0       | 0          | 0            | 0             |
| q2              | (E) 125304832 | 0       | 0          | 0            | 0             |
| q3              | (E) 125304832 | 0       | 0          | 0            | 0             |
| q4              | (E) 125304832 | 0       | 0          | 0            | 0             |
| q5              | (E) 125304832 | 1316880 | 1316879000 | 0            | 0             |
| q6              | (E) 125304832 | 0       | 0          | 0            | 0             |
| q7              | (E) 125304832 | 0       | 0          | 0            | 0             |

```
VTEP1#show qos-profile COS_QUEUE
profile name: COS_QUEUE
profile type: cos-to-queue
profile attached to 1 instances
configured mapping:
cos 1 queue 5
Detailed mapping:
```

| INPUT |     |       |       | OUTPUT |     |       |        |
|-------|-----|-------|-------|--------|-----|-------|--------|
| COS   | DEI | Queue | Color | COS    | DEI | Queue | Color  |
| 0     | 0   | 0     | green | 0      | 1   | 0     | yellow |
| 1     | 0   | 5     | green | 1      | 1   | 5     | yellow |
| 2     | 0   | 2     | green | 2      | 1   | 2     | yellow |
| 3     | 0   | 3     | green | 3      | 1   | 3     | yellow |
| 4     | 0   | 4     | green | 4      | 1   | 4     | yellow |
| 5     | 0   | 5     | green | 5      | 1   | 5     | yellow |
| 6     | 0   | 6     | green | 6      | 1   | 6     | yellow |
| 7     | 0   | 7     | green | 7      | 1   | 7     | yellow |

```
VTEP1#show qos-profile QUEUE_DSCP
profile name: QUEUE_DSCP
profile type: queue-color-to-dscp
profile attached to 1 instances
configured mapping:
queue 5 color all dscp 34
Detailed mapping:
```

| INPUT |       |      | OUTPUT |        |      | INPUT |       |      | OUTPUT |       |      |
|-------|-------|------|--------|--------|------|-------|-------|------|--------|-------|------|
| Queue | Color | DSCP | Queue  | Color  | DSCP | Queue | Color | DSCP | Queue  | Color | DSCP |
| 0     | green | 0    | 0      | yellow | 0    | 0     | red   | 0    | 0      | red   | 0    |
| 1     | green | 10   | 1      | yellow | 12   | 1     | red   | 14   | 1      | red   | 14   |
| 2     | green | 18   | 2      | yellow | 20   | 2     | red   | 22   | 2      | red   | 22   |
| 3     | green | 26   | 3      | yellow | 28   | 3     | red   | 30   | 3      | red   | 30   |
| 4     | green | 34   | 4      | yellow | 36   | 4     | red   | 38   | 4      | red   | 38   |
| 5     | green | 34   | 5      | yellow | 34   | 5     | red   | 34   | 5      | red   | 34   |
| 6     | green | 48   | 6      | yellow | 48   | 6     | red   | 48   | 6      | red   | 48   |
| 7     | green | 56   | 7      | yellow | 56   | 7     | red   | 56   | 7      | red   | 56   |

**VTEP4**

```

VTEP4#show running-config qos
qos enable
!
qos profile dscp-to-queue DSCP_QUEUE
  dscp 20 queue 1
!
qos profile dscp-encap DSCP_ENCAP
  13 dscp 20 dscpEncap 56
!
!
!
interface irb2001
  qos map-profile dscp-to-queue DSCP_QUEUE
!
VTEP4#show running-config nvo vxlan
!
nvo vxlan enable
!
nvo vxlan irb
!
evpn vxlan multihoming enable
!
nvo vxlan vtep-ip-global 4.4.4.4
!
nvo vxlan tunnel qos-map-mode cos-dscp egress DSCP_ENCAP
!
nvo vxlan id 101 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp L2VRF1
  evpn irb1001
  vni-name VNI-101
!
nvo vxlan id 201 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp L2VRF2
  evpn irb2001
  vni-name VNI-201
!
nvo vxlan access-if port-vlan xe3 20
  map vnid 201
  mac 0000.5555.1020 ip 21.21.21.101
!
!

```

```

VTEP4#show nvo vxlan tunnel
VxLAN Network tunnel Entries
Source          Destination      Status           Up/Down          Update
=====
4.4.4.4         2.2.2.2         Installed        00:08:40         00:08:40
4.4.4.4         1.1.1.1         Installed        00:12:28         00:12:28
4.4.4.4         5.5.5.5         Installed        00:12:13         00:12:13

```

Total number of entries are 3

```

VTEP4#show nvo vxlan
VxLAN Information
=====

```

```

Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged

```

| VNID | VNI-Name | VNI-Type | Type | Interface | ESI  | VLAN              | DF-Status | Src-Addr | Dst-Addr |
|------|----------|----------|------|-----------|------|-------------------|-----------|----------|----------|
| 101  | VNI-101  | L2       | NW   | ----      | ---- | ----              | ----      | 4.4.4.4  | 2.2.2.2  |
| 101  | VNI-101  | L2       | NW   | ----      | ---- | ----              | ----      | 4.4.4.4  | 1.1.1.1  |
| 101  | VNI-101  | L2       | NW   | ----      | ---- | ----              | ----      | 4.4.4.4  | 5.5.5.5  |
| 201  | VNI-201  | L2       | NW   | ----      | ---- | ----              | ----      | 4.4.4.4  | 2.2.2.2  |
| 201  | VNI-201  | L2       | NW   | ----      | ---- | ----              | ----      | 4.4.4.4  | 1.1.1.1  |
| 201  | VNI-201  | L2       | NW   | ----      | ---- | ----              | ----      | 4.4.4.4  | 5.5.5.5  |
| 201  | VNI-201  | --       | AC   | xe3       | ---  | Single Homed Port | ---       | 20       | ----     |

Total number of entries are 7

```

VTEP4#show nvo vxlan arp-cache

```

# VxLAN-EVPN with IRB QoS

## VxLAN ARP-CACHE Information

```

=====
VNID      Ip-Addr      Mac-Addr      Type      Age-Out      Retries-Left
-----
201      21.21.21.51  0000.2222.1020 Static Remote ----
201      21.21.21.1   3c2c.991a.da7a Static Local  ----
201      21.21.21.101 0000.5555.1020 Static Local  ----
101      11.11.11.51  0000.2222.1010 Static Remote ----
101      11.11.11.1   3c2c.991a.da7a Static Local  ----
101      11.11.11.201 0000.4444.1010 Static Remote ----

```

Total number of entries are 6

VTEP4#show nvo vxlan nd-cache

## VxLAN ND-CACHE Information

```

=====
VNID      Ip-Addr      Mac-Addr      Type      Age-Out      Retries-Left
-----
201      2121::1      3c2c.991a.da7a Static Local  ----
101      1111::1      3c2c.991a.da7a Static Local  ----

```

Total number of entries are 2

VTEP4#show nvo vxlan l3vni-map

```

L3VNI      L2VNI      IRB-interface
-----
1000      101        irb1001
1000      201        irb2001

```

VTEP4#show ipv4 route vrf L3VRF1

```

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP
       O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,
       ia - IS-IS inter area, E - EVPN,
       v - vrf leaked
       * - candidate default

```

IP Route Table for VRF "L3VRF1"

```

C      11.11.11.0/24 is directly connected, irb1001, 00:01:35
C      21.21.21.0/24 is directly connected, irb2001, 00:01:16
C      127.0.0.0/8 is directly connected, lo.L3VRF1, 00:06:12

```

Gateway of last resort is not set

VTEP4#show ipv6 route vrf L3VRF1

IPv6 Routing Table

```

Codes: K - kernel route, C - connected, S - static, D- DHCP, R - RIP,
       O - OSPF, IA - OSPF inter area, E1 - OSPF external type 1,
       E2 - OSPF external type 2, E - EVPN N1 - OSPF NSSA external type 1,
       N2 - OSPF NSSA external type 2, i - IS-IS, B - BGP,
       v - vrf leaked

```

Timers: Uptime

IP Route Table for VRF "L3VRF1"

```

C      ::1/128 via ::, lo.L3VRF1, 00:06:29
C      1111::/64 via ::, irb1001, 00:01:52
C      2121::/64 via ::, irb2001, 00:01:33
C      fe80::/64 via ::, irb2001, 00:01:33

```

VTEP4#show interface ce49 counters queue-stats

E - Egress, I - Ingress, Q-Size is in bytes

```

+-----+-----+-----+-----+-----+-----+
| Queue/Class-map | Q-Size | Tx pkts | Tx bytes | Dropped pkts | Dropped bytes |
+-----+-----+-----+-----+-----+-----+
q0      (E) 125304832 0          0          0          0
q1      (E) 125304832 1422755    1488201730 0          0
q2      (E) 125304832 0          0          0          0
q3      (E) 125304832 0          0          0          0
q4      (E) 125304832 0          0          0          0
q5      (E) 125304832 0          0          0          0
q6      (E) 125304832 0          0          0          0
q7      (E) 125304832 0          0          0          0

```

VTEP4#show qos-profile DSCP\_QUEUE

```

profile name: DSCP_QUEUE
profile type: dscp-to-queue
profile attached to 1 instances
configured mapping:

```



dscp 20 queue 1  
Detailed mapping:

| INPUT OUTPUT |       |          |       | INPUT OUTPUT |       |          |       | INPUT OUTPUT |       |          |       | INPUT OUTPUT |       |
|--------------|-------|----------|-------|--------------|-------|----------|-------|--------------|-------|----------|-------|--------------|-------|
| DSCP Queue   | Color | Out DSCP | Color | DSCP Queue   | Color | Out DSCP | Color | DSCP Queue   | Color | Out DSCP | Color | DSCP Queue   | Color |
| 0            | 0     | green    | 0     | 16           | 2     | green    | 16    | 32           | 4     | green    | 32    | 48           | 6     |
| green        | 48    |          |       |              |       |          |       |              |       |          |       |              |       |
| 1            | 0     | green    | 1     | 17           | 2     | green    | 17    | 33           | 4     | green    | 33    | 49           | 6     |
| green        | 49    |          |       |              |       |          |       |              |       |          |       |              |       |
| 2            | 0     | green    | 2     | 18           | 2     | green    | 18    | 34           | 4     | green    | 34    | 50           | 6     |
| green        | 50    |          |       |              |       |          |       |              |       |          |       |              |       |
| 3            | 0     | green    | 3     | 19           | 2     | green    | 19    | 35           | 4     | green    | 35    | 51           | 6     |
| green        | 51    |          |       |              |       |          |       |              |       |          |       |              |       |
| 4            | 0     | green    | 4     | 20           | 1     | yellow   | 20    | 36           | 4     | yellow   | 36    | 52           | 6     |
| green        | 52    |          |       |              |       |          |       |              |       |          |       |              |       |
| 5            | 0     | green    | 5     | 21           | 2     | green    | 21    | 37           | 4     | green    | 37    | 53           | 6     |
| green        | 53    |          |       |              |       |          |       |              |       |          |       |              |       |
| 6            | 0     | green    | 6     | 22           | 2     | yellow   | 22    | 38           | 4     | yellow   | 38    | 54           | 6     |
| green        | 54    |          |       |              |       |          |       |              |       |          |       |              |       |
| 7            | 0     | green    | 7     | 23           | 2     | green    | 23    | 39           | 4     | green    | 39    | 55           | 6     |
| green        | 55    |          |       |              |       |          |       |              |       |          |       |              |       |
| 8            | 1     | green    | 8     | 24           | 3     | green    | 24    | 40           | 5     | green    | 40    | 56           | 7     |
| green        | 56    |          |       |              |       |          |       |              |       |          |       |              |       |
| 9            | 1     | green    | 9     | 25           | 3     | green    | 25    | 41           | 5     | green    | 41    | 57           | 7     |
| green        | 57    |          |       |              |       |          |       |              |       |          |       |              |       |
| 10           | 1     | green    | 10    | 26           | 3     | green    | 26    | 42           | 5     | green    | 42    | 58           | 7     |
| green        | 58    |          |       |              |       |          |       |              |       |          |       |              |       |
| 11           | 1     | green    | 11    | 27           | 3     | green    | 27    | 43           | 5     | green    | 43    | 59           | 7     |
| green        | 59    |          |       |              |       |          |       |              |       |          |       |              |       |
| 12           | 1     | yellow   | 12    | 28           | 3     | yellow   | 28    | 44           | 5     | green    | 44    | 60           | 7     |
| green        | 60    |          |       |              |       |          |       |              |       |          |       |              |       |
| 13           | 1     | green    | 13    | 29           | 3     | green    | 29    | 45           | 5     | green    | 45    | 61           | 7     |
| green        | 61    |          |       |              |       |          |       |              |       |          |       |              |       |
| 14           | 1     | yellow   | 14    | 30           | 3     | yellow   | 30    | 46           | 5     | green    | 46    | 62           | 7     |
| green        | 62    |          |       |              |       |          |       |              |       |          |       |              |       |
| 15           | 1     | green    | 15    | 31           | 3     | green    | 31    | 47           | 5     | green    | 47    | 63           | 7     |
| green        | 63    |          |       |              |       |          |       |              |       |          |       |              |       |

VTEP4#show qos-profile DSCP\_ENCAP

profile name: DSCP\_ENCAP  
profile type: dscp-encap  
profile attached to 1 instances  
configured mapping:

13 dscp 20 dscpEncap 56

Detailed mapping:

L3 DSCP to DSCP-ENCAP

| INPUT OUTPUT |      | INPUT OUTPUT |      | INPUT OUTPUT |      | INPUT OUTPUT |      |
|--------------|------|--------------|------|--------------|------|--------------|------|
| DSCP         | DSCP | DSCP         | DSCP | DSCP         | DSCP | DSCP         | DSCP |
| 0            | 0    | 16           | 16   | 32           | 32   | 48           | 48   |
| 1            | 1    | 17           | 17   | 33           | 33   | 49           | 49   |
| 2            | 2    | 18           | 18   | 34           | 34   | 50           | 50   |
| 3            | 3    | 19           | 19   | 35           | 35   | 51           | 51   |
| 4            | 4    | 20           | 56   | 36           | 36   | 52           | 52   |
| 5            | 5    | 21           | 21   | 37           | 37   | 53           | 53   |
| 6            | 6    | 22           | 22   | 38           | 38   | 54           | 54   |
| 7            | 7    | 23           | 23   | 39           | 39   | 55           | 55   |
| 8            | 8    | 24           | 24   | 40           | 40   | 56           | 56   |
| 9            | 9    | 25           | 25   | 41           | 41   | 57           | 57   |
| 10           | 10   | 26           | 26   | 42           | 42   | 58           | 58   |
| 11           | 11   | 27           | 27   | 43           | 43   | 59           | 59   |
| 12           | 12   | 28           | 28   | 44           | 44   | 60           | 60   |
| 13           | 13   | 29           | 29   | 45           | 45   | 61           | 61   |
| 14           | 14   | 30           | 30   | 46           | 46   | 62           | 62   |
| 15           | 15   | 31           | 31   | 47           | 47   | 63           | 63   |

L2 Queue + Color to DSCP-ENCAP

| INPUT OUTPUT |  | INPUT OUTPUT |  | INPUT OUTPUT |  | INPUT OUTPUT |  |
|--------------|--|--------------|--|--------------|--|--------------|--|
|--------------|--|--------------|--|--------------|--|--------------|--|

# VxLAN-EVPN with IRB QoS

| INPUT |       |      | OUTPUT |        |      | INPUT |       |      | OUTPUT |       |      |
|-------|-------|------|--------|--------|------|-------|-------|------|--------|-------|------|
| Queue | Color | DSCP | Queue  | Color  | DSCP | Queue | Color | DSCP | Queue  | Color | DSCP |
| 0     | green | 0    | 0      | yellow | 0    | 0     | red   | 0    |        |       |      |
| 1     | green | 8    | 1      | yellow | 8    | 1     | red   | 8    |        |       |      |
| 2     | green | 16   | 2      | yellow | 16   | 2     | red   | 16   |        |       |      |
| 3     | green | 24   | 3      | yellow | 24   | 3     | red   | 24   |        |       |      |
| 4     | green | 32   | 4      | yellow | 32   | 4     | red   | 32   |        |       |      |
| 5     | green | 40   | 5      | yellow | 40   | 5     | red   | 40   |        |       |      |
| 6     | green | 48   | 6      | yellow | 48   | 6     | red   | 48   |        |       |      |
| 7     | green | 56   | 7      | yellow | 56   | 7     | red   | 56   |        |       |      |

```
VTEP4#show qos-profile interface irb2001
profile name: DSCP_QUEUE
profile type: dscp-to-queue (Ingress)
mapping:
```

| INPUT |       |        |          | OUTPUT |       |        |          | INPUT |       |        |          | OUTPUT |       |       |          |
|-------|-------|--------|----------|--------|-------|--------|----------|-------|-------|--------|----------|--------|-------|-------|----------|
| DSCP  | Queue | Color  | Out DSCP | DSCP   | Queue | Color  | Out DSCP | DSCP  | Queue | Color  | Out DSCP | DSCP   | Queue | Color | Out DSCP |
| 0     | 0     | green  | 0        | 16     | 2     | green  | 16       | 32    | 4     | green  | 32       | 48     | 6     |       |          |
| green | 48    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 1     | 0     | green  | 1        | 17     | 2     | green  | 17       | 33    | 4     | green  | 33       | 49     | 6     |       |          |
| green | 49    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 2     | 0     | green  | 2        | 18     | 2     | green  | 18       | 34    | 4     | green  | 34       | 50     | 6     |       |          |
| green | 50    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 3     | 0     | green  | 3        | 19     | 2     | green  | 19       | 35    | 4     | green  | 35       | 51     | 6     |       |          |
| green | 51    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 4     | 0     | green  | 4        | 20     | 1     | yellow | 20       | 36    | 4     | yellow | 36       | 52     | 6     |       |          |
| green | 52    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 5     | 0     | green  | 5        | 21     | 2     | green  | 21       | 37    | 4     | green  | 37       | 53     | 6     |       |          |
| green | 53    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 6     | 0     | green  | 6        | 22     | 2     | yellow | 22       | 38    | 4     | yellow | 38       | 54     | 6     |       |          |
| green | 54    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 7     | 0     | green  | 7        | 23     | 2     | green  | 23       | 39    | 4     | green  | 39       | 55     | 6     |       |          |
| green | 55    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 8     | 1     | green  | 8        | 24     | 3     | green  | 24       | 40    | 5     | green  | 40       | 56     | 7     |       |          |
| green | 56    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 9     | 1     | green  | 9        | 25     | 3     | green  | 25       | 41    | 5     | green  | 41       | 57     | 7     |       |          |
| green | 57    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 10    | 1     | green  | 10       | 26     | 3     | green  | 26       | 42    | 5     | green  | 42       | 58     | 7     |       |          |
| green | 58    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 11    | 1     | green  | 11       | 27     | 3     | green  | 27       | 43    | 5     | green  | 43       | 59     | 7     |       |          |
| green | 59    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 12    | 1     | yellow | 12       | 28     | 3     | yellow | 28       | 44    | 5     | green  | 44       | 60     | 7     |       |          |
| green | 60    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 13    | 1     | green  | 13       | 29     | 3     | green  | 29       | 45    | 5     | green  | 45       | 61     | 7     |       |          |
| green | 61    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 14    | 1     | yellow | 14       | 30     | 3     | yellow | 30       | 46    | 5     | green  | 46       | 62     | 7     |       |          |
| green | 62    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |
| 15    | 1     | green  | 15       | 31     | 3     | green  | 31       | 47    | 5     | green  | 47       | 63     | 7     |       |          |
| green | 63    |        |          |        |       |        |          |       |       |        |          |        |       |       |          |

```
profile name: default
profile type: dscp-to-dscp (Egress)
Status: Inactive
mapping:
```

| INPUT |       |          | OUTPUT |        |          | INPUT |       |          | OUTPUT |       |          |
|-------|-------|----------|--------|--------|----------|-------|-------|----------|--------|-------|----------|
| DSCP  | Color | Out DSCP | DSCP   | Color  | Out DSCP | DSCP  | Color | Out DSCP | DSCP   | Color | Out DSCP |
| 0     | green | 0        | 0      | yellow | 0        | 0     | red   | 0        |        |       |          |
| 1     | green | 1        | 1      | yellow | 1        | 1     | red   | 1        |        |       |          |
| 2     | green | 2        | 2      | yellow | 2        | 2     | red   | 2        |        |       |          |
| 3     | green | 3        | 3      | yellow | 3        | 3     | red   | 3        |        |       |          |
| 4     | green | 4        | 4      | yellow | 4        | 4     | red   | 4        |        |       |          |
| 5     | green | 5        | 5      | yellow | 5        | 5     | red   | 5        |        |       |          |
| 6     | green | 6        | 6      | yellow | 6        | 6     | red   | 6        |        |       |          |
| 7     | green | 7        | 7      | yellow | 7        | 7     | red   | 7        |        |       |          |

|    |       |    |  |    |        |    |  |    |     |    |
|----|-------|----|--|----|--------|----|--|----|-----|----|
| 8  | green | 8  |  | 8  | yellow | 8  |  | 8  | red | 8  |
| 9  | green | 9  |  | 9  | yellow | 9  |  | 9  | red | 9  |
| 10 | green | 10 |  | 10 | yellow | 12 |  | 10 | red | 14 |
| 11 | green | 11 |  | 11 | yellow | 11 |  | 11 | red | 11 |
| 12 | green | 12 |  | 12 | yellow | 12 |  | 12 | red | 14 |
| 13 | green | 13 |  | 13 | yellow | 13 |  | 13 | red | 13 |
| 14 | green | 14 |  | 14 | yellow | 14 |  | 14 | red | 14 |
| 15 | green | 15 |  | 15 | yellow | 15 |  | 15 | red | 15 |
| 16 | green | 16 |  | 16 | yellow | 16 |  | 16 | red | 16 |
| 17 | green | 17 |  | 17 | yellow | 17 |  | 17 | red | 17 |
| 18 | green | 18 |  | 18 | yellow | 20 |  | 18 | red | 22 |
| 19 | green | 19 |  | 19 | yellow | 19 |  | 19 | red | 19 |
| 20 | green | 20 |  | 20 | yellow | 20 |  | 20 | red | 22 |
| 21 | green | 21 |  | 21 | yellow | 21 |  | 21 | red | 21 |
| 22 | green | 22 |  | 22 | yellow | 22 |  | 22 | red | 22 |
| 23 | green | 23 |  | 23 | yellow | 23 |  | 23 | red | 23 |
| 24 | green | 24 |  | 24 | yellow | 24 |  | 24 | red | 24 |
| 25 | green | 25 |  | 25 | yellow | 25 |  | 25 | red | 25 |
| 26 | green | 26 |  | 26 | yellow | 28 |  | 26 | red | 30 |
| 27 | green | 27 |  | 27 | yellow | 27 |  | 27 | red | 27 |
| 28 | green | 28 |  | 28 | yellow | 28 |  | 28 | red | 30 |
| 29 | green | 29 |  | 29 | yellow | 29 |  | 29 | red | 29 |
| 30 | green | 30 |  | 30 | yellow | 30 |  | 30 | red | 30 |
| 31 | green | 31 |  | 31 | yellow | 31 |  | 31 | red | 31 |
| 32 | green | 32 |  | 32 | yellow | 32 |  | 32 | red | 32 |
| 33 | green | 33 |  | 33 | yellow | 33 |  | 33 | red | 33 |
| 34 | green | 34 |  | 34 | yellow | 36 |  | 34 | red | 38 |
| 35 | green | 35 |  | 35 | yellow | 35 |  | 35 | red | 35 |
| 36 | green | 36 |  | 36 | yellow | 36 |  | 36 | red | 38 |
| 37 | green | 37 |  | 37 | yellow | 37 |  | 37 | red | 37 |
| 38 | green | 38 |  | 38 | yellow | 38 |  | 38 | red | 38 |
| 39 | green | 39 |  | 39 | yellow | 39 |  | 39 | red | 39 |
| 40 | green | 40 |  | 40 | yellow | 40 |  | 40 | red | 40 |
| 41 | green | 41 |  | 41 | yellow | 41 |  | 41 | red | 41 |
| 42 | green | 42 |  | 42 | yellow | 42 |  | 42 | red | 42 |
| 43 | green | 43 |  | 43 | yellow | 43 |  | 43 | red | 43 |
| 44 | green | 44 |  | 44 | yellow | 44 |  | 44 | red | 44 |
| 45 | green | 45 |  | 45 | yellow | 45 |  | 45 | red | 45 |
| 46 | green | 46 |  | 46 | yellow | 46 |  | 46 | red | 46 |
| 47 | green | 47 |  | 47 | yellow | 47 |  | 47 | red | 47 |
| 48 | green | 48 |  | 48 | yellow | 48 |  | 48 | red | 48 |
| 49 | green | 49 |  | 49 | yellow | 49 |  | 49 | red | 49 |
| 50 | green | 50 |  | 50 | yellow | 50 |  | 50 | red | 50 |
| 51 | green | 51 |  | 51 | yellow | 51 |  | 51 | red | 51 |
| 52 | green | 52 |  | 52 | yellow | 52 |  | 52 | red | 52 |
| 53 | green | 53 |  | 53 | yellow | 53 |  | 53 | red | 53 |
| 54 | green | 54 |  | 54 | yellow | 54 |  | 54 | red | 54 |
| 55 | green | 55 |  | 55 | yellow | 55 |  | 55 | red | 55 |
| 56 | green | 56 |  | 56 | yellow | 56 |  | 56 | red | 56 |
| 57 | green | 57 |  | 57 | yellow | 57 |  | 57 | red | 57 |
| 58 | green | 58 |  | 58 | yellow | 58 |  | 58 | red | 58 |
| 59 | green | 59 |  | 59 | yellow | 59 |  | 59 | red | 59 |
| 60 | green | 60 |  | 60 | yellow | 60 |  | 60 | red | 60 |
| 61 | green | 61 |  | 61 | yellow | 61 |  | 61 | red | 61 |
| 62 | green | 62 |  | 62 | yellow | 62 |  | 62 | red | 62 |
| 63 | green | 63 |  | 63 | yellow | 63 |  | 63 | red | 63 |

**VTEP5**

```

VTEP5#show running-config qos
qos enable
!
qos profile queue-color-to-cos QUEUE_COS
  queue 2 color all cos 5
!
qos profile dscp-to-queue DSCP_QUEUE
  dscp 56 queue 2
!
!
!
VTEP5#show running-config nvo vxlan
!

```

## VxLAN-EVPN with IRB QoS

```
nvo vxlan enable
!
evpn vxlan multihoming enable
!
nvo vxlan vtep-ip-global 5.5.5.5
!
nvo vxlan tunnel qos-map-mode cos-dscp ingress DSCP_QUEUE
!
nvo vxlan id 101 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp L2VRF1
vni-name VNI-101
!
nvo vxlan id 201 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp L2VRF2
vni-name VNI-201
!
nvo vxlan access-if port-vlan xe1 10
map vnid 101
mac 0000.4444.1010 ip 11.11.11.201
map qos-profile queue-color-to-cos QUEUE_COS
!
!
```

```
VTEP5#show nvo vxlan tunnel
VxLAN Network tunnel Entries
Source          Destination      Status           Up/Down          Update
=====
5.5.5.5         2.2.2.2         Installed        01:11:17         01:11:17
5.5.5.5         4.4.4.4         Installed        01:14:50         01:14:50
5.5.5.5         1.1.1.1         Installed        01:14:50         01:14:50
```

Total number of entries are 3

```
VTEP5#show interface xe1 counters queue-stats
E - Egress, I - Ingress, Q-Size is in bytes
```

| Queue/Class-map | Q-Size       | Tx pkts | Tx bytes   | Dropped pkts | Dropped bytes |
|-----------------|--------------|---------|------------|--------------|---------------|
| q0              | (E) 12517376 | 0       | 0          | 0            | 0             |
| q1              | (E) 12517376 | 0       | 0          | 0            | 0             |
| q2              | (E) 12517376 | 1005800 | 1052066800 | 0            | 0             |
| q3              | (E) 12517376 | 0       | 0          | 0            | 0             |
| q4              | (E) 12517376 | 0       | 0          | 0            | 0             |
| q5              | (E) 12517376 | 0       | 0          | 0            | 0             |
| q6              | (E) 12517376 | 0       | 0          | 0            | 0             |
| q7              | (E) 12517376 | 0       | 0          | 0            | 0             |

```
VTEP5#sh qos-profile QUEUE_COS
```

```
profile name: QUEUE_COS
profile type: queue-color-to-cos
profile attached to 1 instances
configured mapping:
queue 2 color all cos 5
Detailed mapping:
```

| INPUT |       |     | OUTPUT |        |     | INPUT |       |     | OUTPUT |       |     |
|-------|-------|-----|--------|--------|-----|-------|-------|-----|--------|-------|-----|
| Queue | Color | COS | Queue  | Color  | COS | Queue | Color | COS | Queue  | Color | COS |
| 0     | green | 0   | 0      | yellow | 0   | 0     | red   | 0   | 0      | red   | 0   |
| 1     | green | 1   | 1      | yellow | 1   | 1     | red   | 1   | 1      | red   | 1   |
| 2     | green | 5   | 2      | yellow | 5   | 2     | red   | 5   | 2      | red   | 5   |
| 3     | green | 3   | 3      | yellow | 3   | 3     | red   | 3   | 3      | red   | 3   |
| 4     | green | 4   | 4      | yellow | 4   | 4     | red   | 4   | 4      | red   | 4   |
| 5     | green | 5   | 5      | yellow | 5   | 5     | red   | 5   | 5      | red   | 5   |
| 6     | green | 6   | 6      | yellow | 6   | 6     | red   | 6   | 6      | red   | 6   |
| 7     | green | 7   | 7      | yellow | 7   | 7     | red   | 7   | 7      | red   | 7   |

```
VTEP5#show qos-profile DSCP_QUEUE
```

```
profile name: DSCP_QUEUE
profile type: dscp-to-queue
profile attached to 1 instances
configured mapping:
dscp 56 queue 2
Detailed mapping:
```

| INPUT OUTPUT |       |        |          | INPUT OUTPUT |       |        |          | INPUT OUTPUT |       |        |          | INPUT |   |
|--------------|-------|--------|----------|--------------|-------|--------|----------|--------------|-------|--------|----------|-------|---|
| DSCP         | Queue | Color  | Out DSCP | DSCP         | Queue | Color  | Out DSCP | DSCP         | Queue | Color  | Out DSCP | DSCP  |   |
| 0            | 0     | green  | 0        | 16           | 2     | green  | 16       | 32           | 4     | green  | 32       | 48    | 6 |
| green        | 48    |        |          |              |       |        |          |              |       |        |          |       |   |
| 1            | 0     | green  | 1        | 17           | 2     | green  | 17       | 33           | 4     | green  | 33       | 49    | 6 |
| green        | 49    |        |          |              |       |        |          |              |       |        |          |       |   |
| 2            | 0     | green  | 2        | 18           | 2     | green  | 18       | 34           | 4     | green  | 34       | 50    | 6 |
| green        | 50    |        |          |              |       |        |          |              |       |        |          |       |   |
| 3            | 0     | green  | 3        | 19           | 2     | green  | 19       | 35           | 4     | green  | 35       | 51    | 6 |
| green        | 51    |        |          |              |       |        |          |              |       |        |          |       |   |
| 4            | 0     | green  | 4        | 20           | 2     | yellow | 20       | 36           | 4     | yellow | 36       | 52    | 6 |
| green        | 52    |        |          |              |       |        |          |              |       |        |          |       |   |
| 5            | 0     | green  | 5        | 21           | 2     | green  | 21       | 37           | 4     | green  | 37       | 53    | 6 |
| green        | 53    |        |          |              |       |        |          |              |       |        |          |       |   |
| 6            | 0     | green  | 6        | 22           | 2     | yellow | 22       | 38           | 4     | yellow | 38       | 54    | 6 |
| green        | 54    |        |          |              |       |        |          |              |       |        |          |       |   |
| 7            | 0     | green  | 7        | 23           | 2     | green  | 23       | 39           | 4     | green  | 39       | 55    | 6 |
| green        | 55    |        |          |              |       |        |          |              |       |        |          |       |   |
| 8            | 1     | green  | 8        | 24           | 3     | green  | 24       | 40           | 5     | green  | 40       | 56    | 2 |
| green        | 56    |        |          |              |       |        |          |              |       |        |          |       |   |
| 9            | 1     | green  | 9        | 25           | 3     | green  | 25       | 41           | 5     | green  | 41       | 57    | 7 |
| green        | 57    |        |          |              |       |        |          |              |       |        |          |       |   |
| 10           | 1     | green  | 10       | 26           | 3     | green  | 26       | 42           | 5     | green  | 42       | 58    | 7 |
| green        | 58    |        |          |              |       |        |          |              |       |        |          |       |   |
| 11           | 1     | green  | 11       | 27           | 3     | green  | 27       | 43           | 5     | green  | 43       | 59    | 7 |
| green        | 59    |        |          |              |       |        |          |              |       |        |          |       |   |
| 12           | 1     | yellow | 12       | 28           | 3     | yellow | 28       | 44           | 5     | green  | 44       | 60    | 7 |
| green        | 60    |        |          |              |       |        |          |              |       |        |          |       |   |
| 13           | 1     | green  | 13       | 29           | 3     | green  | 29       | 45           | 5     | green  | 45       | 61    | 7 |
| green        | 61    |        |          |              |       |        |          |              |       |        |          |       |   |
| 14           | 1     | yellow | 14       | 30           | 3     | yellow | 30       | 46           | 5     | green  | 46       | 62    | 7 |
| green        | 62    |        |          |              |       |        |          |              |       |        |          |       |   |
| 15           | 1     | green  | 15       | 31           | 3     | green  | 31       | 47           | 5     | green  | 47       | 63    | 7 |
| green        | 63    |        |          |              |       |        |          |              |       |        |          |       |   |

## Anycast Gateway

For today's large multi-tenant data center, centralized L3 gateway scheme is very inefficient and sometimes impractical. In order to overcome the drawback of centralized L3GW approach, anycast mode is used.

In Anycast gateway approach, all the VTEPs acts as default gateway for all the VNIDs. We will configure same anycast mac in all VTEPs.

## IRB Configuration for Anycast

Configure from Base Configuration-L2 VxLAN section, then configure below commands for Anycast gateway approach.

Note: For L2 traffic, always dscp-to-queue qos profile at tunnel ingress takes effect.

Note: For L3 traffic in the local VTEP, routing is done at IRB level and also QoS applied at the IRB interface and it sends with l2vniid.

### VTEP1

|                        |   |
|------------------------|---|
| (config)#nvo vxlan irb | Enable VxLAN irb  |
| (config)#ip vrf L3VRF1 | Create mac routing/forwarding instance with L3VRF1 name and enter into vrf mode |

|   |   |
|---|---|
| (config-vrf)#rd 11000:11  | Assign RD value   |
| (config-vrf)# route-target both 100:100                           | Assign route-target value for same for import and export.   |
| (config-vrf)# l3vni 1000  | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit   | Exit from vrf mode  |
| (config)# evpn irb-forwarding anycast-gateway-mac 0000.0000.1111  | Configure anycast mac address   |
| (config)# interface irb1001                                       | Configure IRB interface 1001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 11.11.11.1/24                               | Configure ip address  |
| (config-if)ipv6 address 1111::1/64                                | Configure ipv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac            | Configure anycast mac address   |
| (config-if)exit   | Exit from interface config mode   |
| (config)# interface irb2001                                       | Configure IRB interface 2001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 21.21.21.1/24                               | Configure ip address  |
| (config-if)ipv6 address 2121::1/64                                | Configure ipv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac            | Configure anycast mac address   |
| (config-if)exit   | Exit from interface config mode   |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1     | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb1001  | Configure irb1001 under vxlan id 101  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled  | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2     | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb2001  | Configure irb2001 under vxlan id 201  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#qos profile dscp-to-queue DSCP_QUEUE                     | Configure QoS profile to remark the traffic received from access-if   |
| (config-ingress-dscp-map)#dscp 20 queue 4                         | Configure particular dscp value to queue value in the profile   |
| (config-ingress-dscp-map)#exit                                    | Exit from qos profile mode  |
| (config)#qos profile dscp-encap DSCP_ENCAP                        | Configure the qos profile to map the overlay dscp value at tunnel egress                                      |
| (config-egress-dscp-encap-map)#13 dscp 20 dscpEncap 34            | Egress remarking of the customer dscp packet to overlay dscp  |
| (config-egress-dscp-encap-map)#exit                               | Exit from the qos profile mode  |
| (config)#int irb2001  | Enter IRB L3 interface  |

|   |   |
|---|---|
| (config-irb-if)#qos map-profile dscp-to-queue DSCP_QUEUE          | Map the qos profile   |
| (config-irb-if)#exit  | Exit from interface mode  |
| (config)#nvo vxlan tunnel qos-map-mode cos-dscp egress DSCP_ENCAP | Map the qos profile at vxlan tunnel egress                      |
| (config)#commit   | Commit the candidate configuration to the running configuration |
| (config)#end  | Exit from global config mode                                    |

**VSTEP2**

|   |   |
|---|---|
| (config)#nvo vxlan irb  | Enable VxLAN IRB  |
| (config)#ip vrf L3VRF1  | Create mac routing/forwarding instance with L3VRF1 name and enter into vrf mode                               |
| (config-vrf)#rd 21000:11  | Assign RD value   |
| (config-vrf)# route-target both 100:100                           | Assign route-target value for same for import and export.   |
| (config-vrf)# l3vni 1000  | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit   | Exit from vrf mode  |
| (config)# evpn irb-forwarding anycast-gateway-mac 0000.0000.1111  | Configure anycast mac address   |
| (config)# interface irb1001                                       | Configure IRB interface 1001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 11.11.11.1/24                               | Configure ip address  |
| (config-if)ipv6 address 1111::1/64                                | Configure ipv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac            | Configure anycast mac address   |
| (config-if)exit   | Exit from interface config mode   |
| (config)# interface irb2001                                       | Configure IRB interface 2001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 21.21.21.1/24                               | Configure ip address  |
| (config-if)ipv6 address 2121::1/64                                | Configure ipv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac            | Configure anycast mac address   |
| (config-if)exit   | Exit from interface config mode   |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1     | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb1001  | Configure irb1001 under vxlan id 101  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled  | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2     | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb2001  | Configure irb2001 under vxlan id 201  |

|   |   |
|---|---|
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.                    |
| (config)#qos profile dscp-to-queue DSCP_QUEUE                     | Configure QoS profile to remark the traffic at remote vtep at the ingress tunnel. |
| (config-ingress-dscp-map)#dscp 20 queue 4                         | Configure particular dscp value to queue value in the profile                     |
| (config-ingress-dscp-map)#exit                                    | Exit from qos profile mode  |
| (config)#qos profile dscp-encap DSCP_ENCAP                        | Configure the qos profile to map the overlay dscp value at tunnel egress          |
| (config-egress-dscp-encap-map)#13 dscp 20 dscpEncap 34            | Egress remarking of the customer dscp packet to overlay dscp                      |
| (config-egress-dscp-encap-map)#exit                               | Exit from the qos profile mode  |
| (config)#int irb2001  | Enter IRB L3 interface  |
| (config-irb-if)#qos map-profile dscp-to-queue DSCP_QUEUE          | Map the qos profile   |
| (config-irb-if)#exit  | Exit from interface mode  |
| (config)#nvo vxlan tunnel qos-map-mode cos-dscp egress DSCP_ENCAP | Map the qos profile at vxlan tunnel egress  |
| (config)#commit   | Commit the candidate configuration to the running configuration                   |
| (config)#end  | Exit from global config mode  |

**VTEP4**

|  |   |
|--|---|
| (config)#nvo vxlan irb   | Enable VxLAN IRB  |
| (config)#ip vrf L3VRF1   | Create mac routing/forwarding instance with L3VRF1 name and enter into vrf mode |
| (config-vrf)#rd 41000:11   | Assign RD value   |
| (config-vrf)# route-target both 100:100                          | Assign route-target value for same for import and export.                       |
| (config-vrf)# l3vni 1000   | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit  | Exit from vrf mode  |
| (config)# evpn irb-forwarding anycast-gateway-mac 0000.0000.1111 | Configure anycast mac address   |
| (config)# interface irb1001                                      | Configure IRB interface 1001  |
| (config-if)ip vrf forwarding L3VRF1                              | Configure L3VRF1  |
| (config-if)ip address 11.11.11.1/24                              | Configure ip address  |
| (config-if)ipv6 address 1111::1/64                               | Configure ipv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac           | Configure anycast mac address   |
| (config-if)exit  | Exit from interface config mode   |
| (config)# interface irb2001                                      | Configure IRB interface 2001  |
| (config-if)ip vrf forwarding L3VRF1                              | Configure L3VRF1  |
| (config-if)ip address 21.21.21.1/24                              | Configure ip address  |
| (config-if)ipv6 address 2121::1/64                               | Configure ipv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac           | Configure anycast mac address   |



|   |   |
|---|---|
| (config-if)exit   | Exit from interface config mode   |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1     | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb1001  | Configure irb1001 under vxlan id 101  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled  | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2     | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb2001  | Configure irb2001 under vxlan id 201  |
| (config-nvo)#commit   | Commit the candidate configuration to the running configuration   |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |

**VTEP5**

|   |   |
|---|---|
| (config)#nvo vxlan irb  | Enable VxLAN IRB  |
| (config)#ip vrf L3VRF1  | Create mac routing/forwarding instance with L3VRF1 name and enter into vrf mode                               |
| (config-vrf)#rd 51000:11  | Assign RD value   |
| (config-vrf)# route-target both 100:100                           | Assign route-target value for same for import and export.   |
| (config-vrf)# l3vni 1000  | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit   | Exit from vrf mode  |
| (config)# evpn irb-forwarding anycast-gateway-mac 0000.0000.1111  | Configure anycast mac address   |
| (config)# interface irb1001                                       | Configure IRB interface 1001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 11.11.11.1/24                               | Configure ip address  |
| (config-if)ipv6 address 1111::1/64                                | Configure ipv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac            | Configure anycast mac address   |
| (config-if)exit   | Exit from interface config mode   |
| (config)# interface irb2001                                       | Configure IRB interface 2001  |
| (config-if)ip vrf forwarding L3VRF1                               | Configure L3VRF1  |
| (config-if)ip address 21.21.21.1/24                               | Configure ip address  |
| (config-if)ipv6 address 2121::1/64                                | Configure ipv6 address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac            | Configure anycast mac address   |
| (config-if)exit   | Exit from interface config mode   |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |

|  |   |
|--|---|
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1      | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb1001   | Configure irb1001 under vxlan id 101  |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled   | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode   |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2      | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb2001   | Configure irb2001 under vxlan id 201  |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#qos profile dscp-to-queue DSCP_QUEUE                      | Configure the qos profile to remark outer dscp to queue of the the ingress tunnel traffic. Here classification at the ingress vtep is based on overlay dscp value.                  |
| (config-ingress-dscp-map)#dscp 34 queue 2                          | Configure particular dscp value to queue value in the profile. Here dscp to <queue, dscp> is not applicable. I.e ingress remarking of dscp at the ingress tunnel is not applicable. |
| (config-ingress-dscp-map)#exit                                     | Exit from qos profile mode  |
| (config)#qos profile queue-color-to-cos QUEUE_COS                  | Configure qos profile to remark the queue value to COS value  |
| (config-egress-cos-map)#queue 2 cos 6                              | Configure particular queue value to COS value   |
| (config-egress-cos-map)#exit                                       | Exit from qos profile config mode   |
| (config)#nvo vxlan tunnel qos-map-mode cos-dscp ingress DSCP_QUEUE | Map the qos profile in tunnel ingress   |
| (config)#nvo vxlan access-if port-vlan xe1 10                      | Enter to vxlan access port config mode  |
| (config-nvo-acc-if)#map qos-profile queue-color-to-cos QUEUE_COS   | Map the qos profile in vxlan access port  |
| (config-nvo-acc-if)#commit   | Commit the candidate configuration to the running configuration   |
| (config-nvo-acc-if)#end  | Exit from config mode   |

## Validations

Send traffic from TS2-21 to MH2 access-if with dscp value 20 and COS value 1(vlan20) and verify traffic received at TS1-11 with dscp value 20 and COS value 6(vlan10) at the VTEP5 access-if.

### VTEP1

```
VTEP1#show running-config qos
qos enable
!
qos profile dscp-to-queue DSCP_QUEUE
  dscp 20 queue 4
!
qos profile dscp-encap DSCP_ENCAP
  13 dscp 20 dscpEncap 34
!
!
```

```

!
!
interface irb2001
  qos map-profile dscp-to-queue DSCP_QUEUE
!
VTEP1#show running-config nvo vxlan
!
nvo vxlan enable
!
nvo vxlan irb
!
evpn vxlan multihoming enable
!
evpn irb-forwarding anycast-gateway-mac 0000.0000.1111
!
nvo vxlan vtep-ip-global 1.1.1.1
!
nvo vxlan tunnel qos-map-mode cos-dscp egress DSCP_ENCAP
!
nvo vxlan id 101 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp L2VRF1
  evpn irb1001
  vni-name VNI-101
!
nvo vxlan id 201 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp L2VRF2
  evpn irb2001
  vni-name VNI-201
!
nvo vxlan access-if port-vlan po1 10
  map vnid 101
  mac 0000.2222.1010 ip 11.11.11.51
!
nvo vxlan access-if port-vlan po1 20
  map vnid 201
  mac 0000.2222.1020 ip 21.21.21.51
!
!
VTEP1#show nvo vxlan tunnel
VxLAN Network tunnel Entries
Source          Destination      Status           Up/Down          Update
=====
1.1.1.1         5.5.5.5         Installed        01:15:13        01:15:13
1.1.1.1         4.4.4.4         Installed        01:15:28        01:15:28
1.1.1.1         2.2.2.2         Installed        01:11:40        01:11:40

Total number of entries are 3
VTEP1#show nvo vxlan
VxLAN Information
=====

```

VxLAN-EVPN with IRB QoS

Codes: NW - Network Port  
 AC - Access Port  
 (u) - Untagged

| VNID     | VNI-Name | VNI-Type | Type | Interface | ESI                           | VLAN | DF-Status |
|----------|----------|----------|------|-----------|-------------------------------|------|-----------|
| Src-Addr | Dst-Addr |          |      |           |                               |      |           |
| 101      | VNI-101  | L2       | NW   | ----      | ----                          | ---- | ----      |
| 1.1.1.1  | 5.5.5.5  |          |      |           |                               |      |           |
| 101      | VNI-101  | L2       | NW   | ----      | ----                          | ---- | ----      |
| 1.1.1.1  | 4.4.4.4  |          |      |           |                               |      |           |
| 101      | VNI-101  | L2       | NW   | ----      | ----                          | ---- | ----      |
| 1.1.1.1  | 2.2.2.2  |          |      |           |                               |      |           |
| 101      | VNI-101  | --       | AC   | po1       | 00:00:00:00:00:22:22:00:00:00 | 10   | DF        |
| ----     | ----     |          |      |           |                               |      |           |
| 201      | VNI-201  | L2       | NW   | ----      | ----                          | ---- | ----      |
| 1.1.1.1  | 5.5.5.5  |          |      |           |                               |      |           |
| 201      | VNI-201  | L2       | NW   | ----      | ----                          | ---- | ----      |
| 1.1.1.1  | 4.4.4.4  |          |      |           |                               |      |           |
| 201      | VNI-201  | L2       | NW   | ----      | ----                          | ---- | ----      |
| 1.1.1.1  | 2.2.2.2  |          |      |           |                               |      |           |
| 201      | VNI-201  | --       | AC   | po1       | 00:00:00:00:00:22:22:00:00:00 | 20   | DF        |
| ----     | ----     |          |      |           |                               |      |           |

Total number of entries are 8

VTEP1#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

| VNID | Ip-Addr      | Mac-Addr       | Type           | Age-Out | Retries-Left |
|------|--------------|----------------|----------------|---------|--------------|
| 201  | 21.21.21.51  | 0000.2222.1020 | Static Local   | ----    |              |
| 201  | 21.21.21.1   | 0000.0000.1111 | Static Local   | ----    |              |
| 201  | 21.21.21.101 | 0000.5555.1020 | Static Remote  | ----    |              |
| 101  | 11.11.11.51  | 0000.2222.1010 | Static Local   | ----    |              |
| 101  | 11.11.11.10  | 0010.9400.0002 | Dynamic Remote | ----    |              |
| 101  | 11.11.11.1   | 0000.0000.1111 | Static Local   | ----    |              |
| 101  | 11.11.11.201 | 0000.4444.1010 | Static Remote  | ----    |              |

Total number of entries are 7

VTEP1#show nvo vxlan nd-cache

VxLAN ND-CACHE Information

=====

| VNID | Ip-Addr  | Mac-Addr       | Type           | Age-Out |
|------|----------|----------------|----------------|---------|
| 201  | 2121::1  | 0000.0000.1111 | Static Local   | ----    |
| 101  | 1111::10 | 0010.9400.0002 | Dynamic Remote | ----    |
| 101  | 1111::1  | 0000.0000.1111 | Static Local   | ----    |

Total number of entries are 3

VTEP1#show ipv4 route vrf L3VRF1

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP

O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
 E1 - OSPF external type 1, E2 - OSPF external type 2  
 i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,  
 ia - IS-IS inter area, E - EVPN,  
 v - vrf leaked  
 \* - candidate default

IP Route Table for VRF "L3VRF1"

```
C      11.11.11.0/24 is directly connected, irb1001, 00:13:19
C      21.21.21.0/24 is directly connected, irb2001, 00:12:56
C      127.0.0.0/8 is directly connected, lo.L3VRF1, 00:17:13
```

Gateway of last resort is not set

VTEP1#show ipv6 route vrf L3VRF1

IPv6 Routing Table

Codes: K - kernel route, C - connected, S - static, D- DHCP, R - RIP,  
 O - OSPF, IA - OSPF inter area, E1 - OSPF external type 1,  
 E2 - OSPF external type 2, E - EVPN N1 - OSPF NSSA external type 1,  
 N2 - OSPF NSSA external type 2, i - IS-IS, B - BGP,  
 v - vrf leaked

Timers: Uptime

IP Route Table for VRF "L3VRF1"

```
C      ::1/128 via ::, lo.L3VRF1, 00:17:23
C      1111::/64 via ::, irb1001, 00:13:29
C      2121::/64 via ::, irb2001, 00:13:06
C      fe80::/64 via ::, irb2001, 00:13:06
```

VTEP1#show interface ce52 counters queue-stats

E - Egress, I - Ingress, Q-Size is in bytes

| Queue/Class-map | Q-Size        | Tx pkts | Tx bytes | Dropped pkts | Dropped bytes |
|-----------------|---------------|---------|----------|--------------|---------------|
| q0              | (E) 125304832 | 0       | 0        | 0            | 0             |
| q1              | (E) 125304832 | 0       | 0        | 0            | 0             |
| q2              | (E) 125304832 | 0       | 0        | 0            | 0             |
| q3              | (E) 125304832 | 0       | 0        | 0            | 0             |
| q4              | (E) 125304832 | 0       | 0        | 0            | 0             |
| q5              | (E) 125304832 | 0       | 0        | 0            | 0             |
| q6              | (E) 125304832 | 0       | 0        | 0            | 0             |
| q7              | (E) 125304832 | 0       | 0        | 0            | 0             |

VTEP1#show nvo vxlan l3vni-map

| L3VNI | L2VNI | IRB-interface |
|-------|-------|---------------|
| 1000  | 101   | irb1001       |
| 1000  | 201   | irb2001       |

VTEP1#show qos-profile DSCP\_QUEUE

VxLAN-EVPN with IRB QoS

profile name: DSCP\_QUEUEE  
 profile type: dscp-to-queue  
 profile attached to 1 instances  
 configured mapping:  
 dscp 20 queue 4  
 Detailed mapping:

| INPUT OUTPUT |       |          |      | INPUT OUTPUT |       |          |      | INPUT OUTPUT |       |          |      |
|--------------|-------|----------|------|--------------|-------|----------|------|--------------|-------|----------|------|
| DSCP Queue   | Color | Out DSCP | DSCP | DSCP Queue   | Color | Out DSCP | DSCP | DSCP Queue   | Color | Out DSCP | DSCP |
| 0            | 0     | green    | 0    | 16           | 2     | green    | 16   | 32           | 4     |          |      |
| green        | 32    | 48       | 6    | green        | 48    |          |      |              |       |          |      |
| 1            | 0     | green    | 1    | 17           | 2     | green    | 17   | 33           | 4     |          |      |
| green        | 33    | 49       | 6    | green        | 49    |          |      |              |       |          |      |
| 2            | 0     | green    | 2    | 18           | 2     | green    | 18   | 34           | 4     |          |      |
| green        | 34    | 50       | 6    | green        | 50    |          |      |              |       |          |      |
| 3            | 0     | green    | 3    | 19           | 2     | green    | 19   | 35           | 4     |          |      |
| green        | 35    | 51       | 6    | green        | 51    |          |      |              |       |          |      |
| 4            | 0     | green    | 4    | 20           | 4     | yellow   | 20   | 36           | 4     |          |      |
| yellow       | 36    | 52       | 6    | green        | 52    |          |      |              |       |          |      |
| 5            | 0     | green    | 5    | 21           | 2     | green    | 21   | 37           | 4     |          |      |
| green        | 37    | 53       | 6    | green        | 53    |          |      |              |       |          |      |
| 6            | 0     | green    | 6    | 22           | 2     | yellow   | 22   | 38           | 4     |          |      |
| yellow       | 38    | 54       | 6    | green        | 54    |          |      |              |       |          |      |
| 7            | 0     | green    | 7    | 23           | 2     | green    | 23   | 39           | 4     |          |      |
| green        | 39    | 55       | 6    | green        | 55    |          |      |              |       |          |      |
| 8            | 1     | green    | 8    | 24           | 3     | green    | 24   | 40           | 5     |          |      |
| green        | 40    | 56       | 7    | green        | 56    |          |      |              |       |          |      |
| 9            | 1     | green    | 9    | 25           | 3     | green    | 25   | 41           | 5     |          |      |
| green        | 41    | 57       | 7    | green        | 57    |          |      |              |       |          |      |
| 10           | 1     | green    | 10   | 26           | 3     | green    | 26   | 42           | 5     |          |      |
| green        | 42    | 58       | 7    | green        | 58    |          |      |              |       |          |      |
| 11           | 1     | green    | 11   | 27           | 3     | green    | 27   | 43           | 5     |          |      |
| green        | 43    | 59       | 7    | green        | 59    |          |      |              |       |          |      |
| 12           | 1     | yellow   | 12   | 28           | 3     | yellow   | 28   | 44           | 5     |          |      |
| green        | 44    | 60       | 7    | green        | 60    |          |      |              |       |          |      |
| 13           | 1     | green    | 13   | 29           | 3     | green    | 29   | 45           | 5     |          |      |
| green        | 45    | 61       | 7    | green        | 61    |          |      |              |       |          |      |
| 14           | 1     | yellow   | 14   | 30           | 3     | yellow   | 30   | 46           | 5     |          |      |
| green        | 46    | 62       | 7    | green        | 62    |          |      |              |       |          |      |
| 15           | 1     | green    | 15   | 31           | 3     | green    | 31   | 47           | 5     |          |      |
| green        | 47    | 63       | 7    | green        | 63    |          |      |              |       |          |      |

VTEP1#show qos-profile DSCP\_ENCAP  
 profile name: DSCP\_ENCAP  
 profile type: dscp-encap  
 profile attached to 1 instances  
 configured mapping:  
 13 dscp 20 dscpEncap 34

Detailed mapping:

L3 DSCP to DSCP-ENCAP

| INPUT |      | OUTPUT |      | INPUT |      | OUTPUT |      | INPUT |      | OUTPUT |      |
|-------|------|--------|------|-------|------|--------|------|-------|------|--------|------|
| DSCP  | DSCP | DSCP   | DSCP | DSCP  | DSCP | DSCP   | DSCP | DSCP  | DSCP | DSCP   | DSCP |
| 0     | 0    | 16     | 16   | 32    | 32   | 48     | 48   |       |      |        |      |
| 1     | 1    | 17     | 17   | 33    | 33   | 49     | 49   |       |      |        |      |
| 2     | 2    | 18     | 18   | 34    | 34   | 50     | 50   |       |      |        |      |
| 3     | 3    | 19     | 19   | 35    | 35   | 51     | 51   |       |      |        |      |
| 4     | 4    | 20     | 34   | 36    | 36   | 52     | 52   |       |      |        |      |
| 5     | 5    | 21     | 21   | 37    | 37   | 53     | 53   |       |      |        |      |
| 6     | 6    | 22     | 22   | 38    | 38   | 54     | 54   |       |      |        |      |
| 7     | 7    | 23     | 23   | 39    | 39   | 55     | 55   |       |      |        |      |
| 8     | 8    | 24     | 24   | 40    | 40   | 56     | 56   |       |      |        |      |
| 9     | 9    | 25     | 25   | 41    | 41   | 57     | 57   |       |      |        |      |
| 10    | 10   | 26     | 26   | 42    | 42   | 58     | 58   |       |      |        |      |
| 11    | 11   | 27     | 27   | 43    | 43   | 59     | 59   |       |      |        |      |
| 12    | 12   | 28     | 28   | 44    | 44   | 60     | 60   |       |      |        |      |
| 13    | 13   | 29     | 29   | 45    | 45   | 61     | 61   |       |      |        |      |
| 14    | 14   | 30     | 30   | 46    | 46   | 62     | 62   |       |      |        |      |
| 15    | 15   | 31     | 31   | 47    | 47   | 63     | 63   |       |      |        |      |

L2 Queue + Color to DSCP-ENCAP

| INPUT |       |      | OUTPUT |        |      | INPUT |       |      | OUTPUT |       |      |
|-------|-------|------|--------|--------|------|-------|-------|------|--------|-------|------|
| Queue | Color | DSCP | Queue  | Color  | DSCP | Queue | Color | DSCP | Queue  | Color | DSCP |
| 0     | green | 0    | 0      | yellow | 0    | 0     | red   | 0    |        |       |      |
| 1     | green | 8    | 1      | yellow | 8    | 1     | red   | 8    |        |       |      |
| 2     | green | 16   | 2      | yellow | 16   | 2     | red   | 16   |        |       |      |
| 3     | green | 24   | 3      | yellow | 24   | 3     | red   | 24   |        |       |      |
| 4     | green | 32   | 4      | yellow | 32   | 4     | red   | 32   |        |       |      |
| 5     | green | 40   | 5      | yellow | 40   | 5     | red   | 40   |        |       |      |
| 6     | green | 48   | 6      | yellow | 48   | 6     | red   | 48   |        |       |      |
| 7     | green | 56   | 7      | yellow | 56   | 7     | red   | 56   |        |       |      |

VTEP1#show qos-profile interface irb2001

profile name: DSCP\_QUEUE

profile type: dscp-to-queue (Ingress)

mapping:

| INPUT  |       | OUTPUT   |          | INPUT  |       | OUTPUT   |          | INPUT  |       |
|--------|-------|----------|----------|--------|-------|----------|----------|--------|-------|
| OUTPUT | INPUT | OUTPUT   | INPUT    | OUTPUT | INPUT | OUTPUT   | INPUT    | OUTPUT | INPUT |
| DSCP   | Queue | Color    | Out DSCP | DSCP   | Queue | Color    | Out DSCP | DSCP   | Queue |
| Queue  | Color | Out DSCP | DSCP     | Queue  | Color | Out DSCP | DSCP     | Queue  | Color |

|        |    |        |    |   |       |    |        |    |  |    |   |
|--------|----|--------|----|---|-------|----|--------|----|--|----|---|
| 0      | 0  | green  | 0  |   | 16    | 2  | green  | 16 |  | 32 | 4 |
| green  | 32 |        | 48 | 6 | green | 48 |        |    |  |    |   |
| 1      | 0  | green  | 1  |   | 17    | 2  | green  | 17 |  | 33 | 4 |
| green  | 33 |        | 49 | 6 | green | 49 |        |    |  |    |   |
| 2      | 0  | green  | 2  |   | 18    | 2  | green  | 18 |  | 34 | 4 |
| green  | 34 |        | 50 | 6 | green | 50 |        |    |  |    |   |
| 3      | 0  | green  | 3  |   | 19    | 2  | green  | 19 |  | 35 | 4 |
| green  | 35 |        | 51 | 6 | green | 51 |        |    |  |    |   |
| 4      | 0  | green  | 4  |   | 20    | 4  | yellow | 20 |  | 36 | 4 |
| yellow | 36 |        | 52 | 6 | green | 52 |        |    |  |    |   |
| 5      | 0  | green  | 5  |   | 21    | 2  | green  | 21 |  | 37 | 4 |
| green  | 37 |        | 53 | 6 | green | 53 |        |    |  |    |   |
| 6      | 0  | green  | 6  |   | 22    | 2  | yellow | 22 |  | 38 | 4 |
| yellow | 38 |        | 54 | 6 | green | 54 |        |    |  |    |   |
| 7      | 0  | green  | 7  |   | 23    | 2  | green  | 23 |  | 39 | 4 |
| green  | 39 |        | 55 | 6 | green | 55 |        |    |  |    |   |
| 8      | 1  | green  | 8  |   | 24    | 3  | green  | 24 |  | 40 | 5 |
| green  | 40 |        | 56 | 7 | green | 56 |        |    |  |    |   |
| 9      | 1  | green  | 9  |   | 25    | 3  | green  | 25 |  | 41 | 5 |
| green  | 41 |        | 57 | 7 | green | 57 |        |    |  |    |   |
| 10     | 1  | green  | 10 |   | 26    | 3  | green  | 26 |  | 42 | 5 |
| green  | 42 |        | 58 | 7 | green | 58 |        |    |  |    |   |
| 11     | 1  | green  | 11 |   | 27    | 3  | green  | 27 |  | 43 | 5 |
| green  | 43 |        | 59 | 7 | green | 59 |        |    |  |    |   |
| 12     | 1  | yellow | 12 |   | 28    | 3  | yellow | 28 |  | 44 | 5 |
| green  | 44 |        | 60 | 7 | green | 60 |        |    |  |    |   |
| 13     | 1  | green  | 13 |   | 29    | 3  | green  | 29 |  | 45 | 5 |
| green  | 45 |        | 61 | 7 | green | 61 |        |    |  |    |   |
| 14     | 1  | yellow | 14 |   | 30    | 3  | yellow | 30 |  | 46 | 5 |
| green  | 46 |        | 62 | 7 | green | 62 |        |    |  |    |   |
| 15     | 1  | green  | 15 |   | 31    | 3  | green  | 31 |  | 47 | 5 |
| green  | 47 |        | 63 | 7 | green | 63 |        |    |  |    |   |

profile name: default  
 profile type: dscp-to-dscp (Egress)  
 Status: Inactive  
 mapping:

| INPUT |       |          | OUTPUT | INPUT |        |          | OUTPUT | INPUT |       |          | OUTPUT |
|-------|-------|----------|--------|-------|--------|----------|--------|-------|-------|----------|--------|
| DSCP  | Color | Out DSCP |        | DSCP  | Color  | Out DSCP |        | DSCP  | Color | Out DSCP |        |
| 0     | green | 0        |        | 0     | yellow | 0        |        | 0     | red   | 0        |        |
| 1     | green | 1        |        | 1     | yellow | 1        |        | 1     | red   | 1        |        |
| 2     | green | 2        |        | 2     | yellow | 2        |        | 2     | red   | 2        |        |
| 3     | green | 3        |        | 3     | yellow | 3        |        | 3     | red   | 3        |        |
| 4     | green | 4        |        | 4     | yellow | 4        |        | 4     | red   | 4        |        |
| 5     | green | 5        |        | 5     | yellow | 5        |        | 5     | red   | 5        |        |
| 6     | green | 6        |        | 6     | yellow | 6        |        | 6     | red   | 6        |        |
| 7     | green | 7        |        | 7     | yellow | 7        |        | 7     | red   | 7        |        |



---

|    |       |    |  |    |        |    |  |    |     |    |
|----|-------|----|--|----|--------|----|--|----|-----|----|
| 8  | green | 8  |  | 8  | yellow | 8  |  | 8  | red | 8  |
| 9  | green | 9  |  | 9  | yellow | 9  |  | 9  | red | 9  |
| 10 | green | 10 |  | 10 | yellow | 12 |  | 10 | red | 14 |
| 11 | green | 11 |  | 11 | yellow | 11 |  | 11 | red | 11 |
| 12 | green | 12 |  | 12 | yellow | 12 |  | 12 | red | 14 |
| 13 | green | 13 |  | 13 | yellow | 13 |  | 13 | red | 13 |
| 14 | green | 14 |  | 14 | yellow | 14 |  | 14 | red | 14 |
| 15 | green | 15 |  | 15 | yellow | 15 |  | 15 | red | 15 |
| 16 | green | 16 |  | 16 | yellow | 16 |  | 16 | red | 16 |
| 17 | green | 17 |  | 17 | yellow | 17 |  | 17 | red | 17 |
| 18 | green | 18 |  | 18 | yellow | 20 |  | 18 | red | 22 |
| 19 | green | 19 |  | 19 | yellow | 19 |  | 19 | red | 19 |
| 20 | green | 20 |  | 20 | yellow | 20 |  | 20 | red | 22 |
| 21 | green | 21 |  | 21 | yellow | 21 |  | 21 | red | 21 |
| 22 | green | 22 |  | 22 | yellow | 22 |  | 22 | red | 22 |
| 23 | green | 23 |  | 23 | yellow | 23 |  | 23 | red | 23 |
| 24 | green | 24 |  | 24 | yellow | 24 |  | 24 | red | 24 |
| 25 | green | 25 |  | 25 | yellow | 25 |  | 25 | red | 25 |
| 26 | green | 26 |  | 26 | yellow | 28 |  | 26 | red | 30 |
| 27 | green | 27 |  | 27 | yellow | 27 |  | 27 | red | 27 |
| 28 | green | 28 |  | 28 | yellow | 28 |  | 28 | red | 30 |
| 29 | green | 29 |  | 29 | yellow | 29 |  | 29 | red | 29 |
| 30 | green | 30 |  | 30 | yellow | 30 |  | 30 | red | 30 |
| 31 | green | 31 |  | 31 | yellow | 31 |  | 31 | red | 31 |
| 32 | green | 32 |  | 32 | yellow | 32 |  | 32 | red | 32 |
| 33 | green | 33 |  | 33 | yellow | 33 |  | 33 | red | 33 |
| 34 | green | 34 |  | 34 | yellow | 36 |  | 34 | red | 38 |
| 35 | green | 35 |  | 35 | yellow | 35 |  | 35 | red | 35 |
| 36 | green | 36 |  | 36 | yellow | 36 |  | 36 | red | 38 |
| 37 | green | 37 |  | 37 | yellow | 37 |  | 37 | red | 37 |
| 38 | green | 38 |  | 38 | yellow | 38 |  | 38 | red | 38 |
| 39 | green | 39 |  | 39 | yellow | 39 |  | 39 | red | 39 |
| 40 | green | 40 |  | 40 | yellow | 40 |  | 40 | red | 40 |
| 41 | green | 41 |  | 41 | yellow | 41 |  | 41 | red | 41 |
| 42 | green | 42 |  | 42 | yellow | 42 |  | 42 | red | 42 |
| 43 | green | 43 |  | 43 | yellow | 43 |  | 43 | red | 43 |
| 44 | green | 44 |  | 44 | yellow | 44 |  | 44 | red | 44 |
| 45 | green | 45 |  | 45 | yellow | 45 |  | 45 | red | 45 |
| 46 | green | 46 |  | 46 | yellow | 46 |  | 46 | red | 46 |
| 47 | green | 47 |  | 47 | yellow | 47 |  | 47 | red | 47 |
| 48 | green | 48 |  | 48 | yellow | 48 |  | 48 | red | 48 |
| 49 | green | 49 |  | 49 | yellow | 49 |  | 49 | red | 49 |
| 50 | green | 50 |  | 50 | yellow | 50 |  | 50 | red | 50 |
| 51 | green | 51 |  | 51 | yellow | 51 |  | 51 | red | 51 |
| 52 | green | 52 |  | 52 | yellow | 52 |  | 52 | red | 52 |
| 53 | green | 53 |  | 53 | yellow | 53 |  | 53 | red | 53 |
| 54 | green | 54 |  | 54 | yellow | 54 |  | 54 | red | 54 |
| 55 | green | 55 |  | 55 | yellow | 55 |  | 55 | red | 55 |
| 56 | green | 56 |  | 56 | yellow | 56 |  | 56 | red | 56 |
| 57 | green | 57 |  | 57 | yellow | 57 |  | 57 | red | 57 |

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## VxLAN-EVPN with IRB QoS

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|    |       |    |  |    |        |    |  |    |     |    |
|----|-------|----|--|----|--------|----|--|----|-----|----|
| 58 | green | 58 |  | 58 | yellow | 58 |  | 58 | red | 58 |
| 59 | green | 59 |  | 59 | yellow | 59 |  | 59 | red | 59 |
| 60 | green | 60 |  | 60 | yellow | 60 |  | 60 | red | 60 |
| 61 | green | 61 |  | 61 | yellow | 61 |  | 61 | red | 61 |
| 62 | green | 62 |  | 62 | yellow | 62 |  | 62 | red | 62 |
| 63 | green | 63 |  | 63 | yellow | 63 |  | 63 | red | 63 |

VTEP2

```
VTEP2#show running-config qos
```

```
qos enable
```

```
!
```

```
qos profile dscp-to-queue DSCP_QUEUE
```

```
  dscp 20 queue 4
```

```
!
```

```
qos profile dscp-encap DSCP_ENCAP
```

```
  13 dscp 20 dscpEncap 34
```

```
!
```

```
!
```

```
!
```

```
!
```

```
interface irb2001
```

```
  qos map-profile dscp-to-queue DSCP_QUEUE
```

```
!
```

```
VTEP2#show running-config nvo vxlan
```

```
!
```

```
nvo vxlan enable
```

```
!
```

```
nvo vxlan irb
```

```
!
```

```
evpn esi hold-time 90
```

```
!
```

```
evpn vxlan multihoming enable
```

```
!
```

```
evpn irb-forwarding anycast-gateway-mac 0000.0000.1111
```

```
!
```

```
nvo vxlan vtep-ip-global 2.2.2.2
```

```
!
```

```
nvo vxlan tunnel qos-map-mode cos-dscp egress DSCP_ENCAP
```

```
!
```

```
nvo vxlan id 101 ingress-replication inner-vid-disabled
```

```
  vxlan host-reachability-protocol evpn-bgp L2VRF1
```

```
  evpn irb1001
```

```
  vni-name VNI-101
```

```
!
```

```
nvo vxlan id 201 ingress-replication inner-vid-disabled
```

```
  vxlan host-reachability-protocol evpn-bgp L2VRF2
```

```
  evpn irb2001
```

```
  vni-name VNI-201
```

```
!
```

```

nvo vxlan access-if port-vlan po1 10
  map vnid 101
  mac 0000.2222.1010 ip 11.11.11.51
!
nvo vxlan access-if port-vlan po1 20
  map vnid 201
  mac 0000.2222.1020 ip 21.21.21.51
!
!

```

VTEP2#show nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 2.2.2.2 | 4.4.4.4     | Installed | 01:13:43 | 01:13:43 |
| 2.2.2.2 | 1.1.1.1     | Installed | 01:13:43 | 01:13:43 |
| 2.2.2.2 | 5.5.5.5     | Installed | 01:13:43 | 01:13:43 |

Total number of entries are 3

VTEP2#show nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port  
AC - Access Port  
(u) - Untagged

| VNID     | VNI-Name | VNI-Type | Type | Interface | ESI                           | VLAN | DF-Status |
|----------|----------|----------|------|-----------|-------------------------------|------|-----------|
| Src-Addr | Dst-Addr |          |      |           |                               |      |           |
| 101      | VNI-101  | L2       | NW   | ----      | ----                          | ---- | ----      |
| 2.2.2.2  |          | 4.4.4.4  |      |           |                               |      |           |
| 101      | VNI-101  | L2       | NW   | ----      | ----                          | ---- | ----      |
| 2.2.2.2  |          | 1.1.1.1  |      |           |                               |      |           |
| 101      | VNI-101  | L2       | NW   | ----      | ----                          | ---- | ----      |
| 2.2.2.2  |          | 5.5.5.5  |      |           |                               |      |           |
| 101      | VNI-101  | --       | AC   | po1       | 00:00:00:00:00:22:22:00:00:00 | 10   | NON-DF    |
| ----     | ----     | ----     |      |           |                               |      |           |
| 201      | VNI-201  | L2       | NW   | ----      | ----                          | ---- | ----      |
| 2.2.2.2  |          | 4.4.4.4  |      |           |                               |      |           |
| 201      | VNI-201  | L2       | NW   | ----      | ----                          | ---- | ----      |
| 2.2.2.2  |          | 1.1.1.1  |      |           |                               |      |           |
| 201      | VNI-201  | L2       | NW   | ----      | ----                          | ---- | ----      |
| 2.2.2.2  |          | 5.5.5.5  |      |           |                               |      |           |
| 201      | VNI-201  | --       | AC   | po1       | 00:00:00:00:00:22:22:00:00:00 | 20   | NON-DF    |
| ----     | ----     | ----     |      |           |                               |      |           |

Total number of entries are 8

VTEP2#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

| VNID | Ip-Addr     | Mac-Addr       | Type         | Age-Out | Retries-Left |
|------|-------------|----------------|--------------|---------|--------------|
| 201  | 21.21.21.51 | 0000.2222.1020 | Static Local | ----    |              |

## VxLAN-EVPN with IRB QoS

```
201      21.21.21.1      0000.0000.1111 Static Local  ----
201      21.21.21.101     0000.5555.1020 Static Remote ----
101      11.11.11.51      0000.2222.1010 Static Local  ----
101      11.11.11.10      0010.9400.0002 Dynamic Remote ----
101      11.11.11.1       0000.0000.1111 Static Local  ----
101      11.11.11.201     0000.4444.1010 Static Remote ----
```

Total number of entries are 7

VTEP2#show nvo vxlan nd-cache

VxLAN ND-CACHE Information

=====

| VNID | Ip-Addr | Mac-Addr | Type | Age-Out |
|------|---------|----------|------|---------|
|------|---------|----------|------|---------|

Retries-Left

---

|     |          |                |                |      |
|-----|----------|----------------|----------------|------|
| 201 | 2121::1  | 0000.0000.1111 | Static Local   | ---- |
| 101 | 1111::10 | 0010.9400.0002 | Dynamic Remote | ---- |
| 101 | 1111::1  | 0000.0000.1111 | Static Local   | ---- |

Total number of entries are 3

VTEP2#show ipv4 route vrf L3VRF1

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP

O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,

ia - IS-IS inter area, E - EVPN,

v - vrf leaked

\* - candidate default

IP Route Table for VRF "L3VRF1"

C 11.11.11.0/24 is directly connected, irb1001, 00:10:20

C 21.21.21.0/24 is directly connected, irb2001, 00:09:55

C 127.0.0.0/8 is directly connected, lo.L3VRF1, 00:13:30

Gateway of last resort is not set

VTEP2#show ipv6 route vrf L3VRF1

IPv6 Routing Table

Codes: K - kernel route, C - connected, S - static, D - DHCP, R - RIP,

O - OSPF, IA - OSPF inter area, E1 - OSPF external type 1,

E2 - OSPF external type 2, E - EVPN N1 - OSPF NSSA external type 1,

N2 - OSPF NSSA external type 2, i - IS-IS, B - BGP,

v - vrf leaked

Timers: Uptime

IP Route Table for VRF "L3VRF1"

C ::1/128 via ::, lo.L3VRF1, 00:13:36

C 1111::/64 via ::, irb1001, 00:10:26

C 2121::/64 via ::, irb2001, 00:10:01

C fe80::/64 via ::, irb2001, 00:10:01

VTEP2#show nvo vxlan l3vni-map

| L3VNI | L2VNI | IRB-interface |
|-------|-------|---------------|
|-------|-------|---------------|

=====

```
1000      101      irb1001
1000      201      irb2001
```

VTEP2#show interface xe29 counters queue-stats

E - Egress, I - Ingress, Q-Size is in bytes

```

+-----+-----+-----+-----+-----+
+-----+
| Queue/Class-map | Q-Size | Tx pkts | Tx bytes | Dropped pkts |
Dropped bytes |
+-----+-----+-----+-----+-----+
+-----+
q0      (E) 12517376 0          0          0          0
q1      (E) 12517376 0          0          0          0
q2      (E) 12517376 0          0          0          0
q3      (E) 12517376 0          0          0          0
q4      (E) 12517376 2998022    2998045000 0          0
q5      (E) 12517376 0          0          0          0
q6      (E) 12517376 0          0          0          0
q7      (E) 12517376 0          0          0          0

```

VTEP2#show qos-profile DSCP\_QUEUE

```
profile name: DSCP_QUEUE
profile type: dscp-to-queue
profile attached to 1 instances
configured mapping:
  dscp 20 queue 4
Detailed mapping:
```

```

-----+-----+-----+-----+-----+
-----+-----+-----+-----+-----+
INPUT | OUTPUT | INPUT | OUTPUT | INPUT |
OUTPUT | INPUT | OUTPUT | INPUT |
-----+-----+-----+-----+-----+
-----+-----+-----+-----+-----+
DSCP | Queue | Color | Out DSCP | DSCP | Queue | Color | Out DSCP | DSCP |
Queue | Color | Out DSCP | DSCP | Queue | Color | Out DSCP |
-----+-----+-----+-----+-----+
-----+-----+-----+-----+-----+
0      0      green  0          6 | 16     2      green  16         | 32     4
green  32     | 48     6          | green  48         |
1      0      green  1          6 | 17     2      green  17         | 33     4
green  33     | 49     6          | green  49         |
2      0      green  2          6 | 18     2      green  18         | 34     4
green  34     | 50     6          | green  50         |
3      0      green  3          6 | 19     2      green  19         | 35     4
green  35     | 51     6          | green  51         |
4      0      green  4          6 | 20     4      yellow 20         | 36     4
yellow 36     | 52     6          | green  52         |
5      0      green  5          6 | 21     2      green  21         | 37     4
green  37     | 53     6          | green  53         |
6      0      green  6          6 | 22     2      yellow 22         | 38     4
yellow 38     | 54     6          | green  54         |
7      0      green  7          6 | 23     2      green  23         | 39     4
green  39     | 55     6          | green  55         |

```

VxLAN-EVPN with IRB QoS

|       |    |        |    |   |  |       |    |        |    |  |    |   |
|-------|----|--------|----|---|--|-------|----|--------|----|--|----|---|
| 8     | 1  | green  | 8  | 7 |  | 24    | 3  | green  | 24 |  | 40 | 5 |
| green | 40 |        | 56 | 7 |  | green | 56 |        |    |  |    |   |
| 9     | 1  | green  | 9  | 7 |  | 25    | 3  | green  | 25 |  | 41 | 5 |
| green | 41 |        | 57 | 7 |  | green | 57 |        |    |  |    |   |
| 10    | 1  | green  | 10 | 7 |  | 26    | 3  | green  | 26 |  | 42 | 5 |
| green | 42 |        | 58 | 7 |  | green | 58 |        |    |  |    |   |
| 11    | 1  | green  | 11 | 7 |  | 27    | 3  | green  | 27 |  | 43 | 5 |
| green | 43 |        | 59 | 7 |  | green | 59 |        |    |  |    |   |
| 12    | 1  | yellow | 12 | 7 |  | 28    | 3  | yellow | 28 |  | 44 | 5 |
| green | 44 |        | 60 | 7 |  | green | 60 |        |    |  |    |   |
| 13    | 1  | green  | 13 | 7 |  | 29    | 3  | green  | 29 |  | 45 | 5 |
| green | 45 |        | 61 | 7 |  | green | 61 |        |    |  |    |   |
| 14    | 1  | yellow | 14 | 7 |  | 30    | 3  | yellow | 30 |  | 46 | 5 |
| green | 46 |        | 62 | 7 |  | green | 62 |        |    |  |    |   |
| 15    | 1  | green  | 15 | 7 |  | 31    | 3  | green  | 31 |  | 47 | 5 |
| green | 47 |        | 63 | 7 |  | green | 63 |        |    |  |    |   |

VTEP2#show qos-profile DSCP\_ENCAP

profile name: DSCP\_ENCAP

profile type: dscp-encap

profile attached to 1 instances

configured mapping:

l3 dscp 20 dscpEncap 34

Detailed mapping:

L3 DSCP to DSCP-ENCAP

| INPUT |      | OUTPUT |      | INPUT |      | OUTPUT |      | INPUT |      | OUTPUT |      | INPUT |      | OUTPUT |  |
|-------|------|--------|------|-------|------|--------|------|-------|------|--------|------|-------|------|--------|--|
| DSCP  | DSCP | DSCP   | DSCP | DSCP  | DSCP | DSCP   | DSCP | DSCP  | DSCP | DSCP   | DSCP | DSCP  | DSCP | DSCP   |  |
| 0     | 0    |        | 16   | 16    |      | 32     | 32   |       | 48   | 48     |      |       |      |        |  |
| 1     | 1    |        | 17   | 17    |      | 33     | 33   |       | 49   | 49     |      |       |      |        |  |
| 2     | 2    |        | 18   | 18    |      | 34     | 34   |       | 50   | 50     |      |       |      |        |  |
| 3     | 3    |        | 19   | 19    |      | 35     | 35   |       | 51   | 51     |      |       |      |        |  |
| 4     | 4    |        | 20   | 34    |      | 36     | 36   |       | 52   | 52     |      |       |      |        |  |
| 5     | 5    |        | 21   | 21    |      | 37     | 37   |       | 53   | 53     |      |       |      |        |  |
| 6     | 6    |        | 22   | 22    |      | 38     | 38   |       | 54   | 54     |      |       |      |        |  |
| 7     | 7    |        | 23   | 23    |      | 39     | 39   |       | 55   | 55     |      |       |      |        |  |
| 8     | 8    |        | 24   | 24    |      | 40     | 40   |       | 56   | 56     |      |       |      |        |  |
| 9     | 9    |        | 25   | 25    |      | 41     | 41   |       | 57   | 57     |      |       |      |        |  |
| 10    | 10   |        | 26   | 26    |      | 42     | 42   |       | 58   | 58     |      |       |      |        |  |
| 11    | 11   |        | 27   | 27    |      | 43     | 43   |       | 59   | 59     |      |       |      |        |  |
| 12    | 12   |        | 28   | 28    |      | 44     | 44   |       | 60   | 60     |      |       |      |        |  |
| 13    | 13   |        | 29   | 29    |      | 45     | 45   |       | 61   | 61     |      |       |      |        |  |
| 14    | 14   |        | 30   | 30    |      | 46     | 46   |       | 62   | 62     |      |       |      |        |  |
| 15    | 15   |        | 31   | 31    |      | 47     | 47   |       | 63   | 63     |      |       |      |        |  |

L2 Queue + Color to DSCP-ENCAP

| INPUT |       |      | OUTPUT |       |      | INPUT |       |      | OUTPUT |       |      | INPUT |       |      | OUTPUT |  |  |
|-------|-------|------|--------|-------|------|-------|-------|------|--------|-------|------|-------|-------|------|--------|--|--|
| Queue | Color | DSCP | Queue  | Color | DSCP | Queue | Color | DSCP | Queue  | Color | DSCP | Queue | Color | DSCP |        |  |  |

|   |       |    |  |   |        |    |  |   |     |    |
|---|-------|----|--|---|--------|----|--|---|-----|----|
| 0 | green | 0  |  | 0 | yellow | 0  |  | 0 | red | 0  |
| 1 | green | 8  |  | 1 | yellow | 8  |  | 1 | red | 8  |
| 2 | green | 16 |  | 2 | yellow | 16 |  | 2 | red | 16 |
| 3 | green | 24 |  | 3 | yellow | 24 |  | 3 | red | 24 |
| 4 | green | 32 |  | 4 | yellow | 32 |  | 4 | red | 32 |
| 5 | green | 40 |  | 5 | yellow | 40 |  | 5 | red | 40 |
| 6 | green | 48 |  | 6 | yellow | 48 |  | 6 | red | 48 |
| 7 | green | 56 |  | 7 | yellow | 56 |  | 7 | red | 56 |

VTEP2#show qos-profile interface irb2001

profile name: DSCP\_QUEUE

profile type: dscp-to-queue (Ingress)

mapping:

| INPUT  |       | OUTPUT   |          | INPUT  |       | OUTPUT   |          | INPUT  |       |
|--------|-------|----------|----------|--------|-------|----------|----------|--------|-------|
| OUTPUT |       | INPUT    |          | OUTPUT |       | OUTPUT   |          | OUTPUT |       |
| DSCP   | Queue | Color    | Out DSCP | DSCP   | Queue | Color    | Out DSCP | DSCP   | Queue |
| Queue  | Color | Out DSCP | DSCP     | Queue  | Color | Out DSCP | DSCP     | Queue  | Color |
| 0      | 0     | green    | 0        | 16     | 2     | green    | 16       | 32     | 4     |
| green  | 32    | 48       | 6        | green  | 48    |          |          |        |       |
| 1      | 0     | green    | 1        | 17     | 2     | green    | 17       | 33     | 4     |
| green  | 33    | 49       | 6        | green  | 49    |          |          |        |       |
| 2      | 0     | green    | 2        | 18     | 2     | green    | 18       | 34     | 4     |
| green  | 34    | 50       | 6        | green  | 50    |          |          |        |       |
| 3      | 0     | green    | 3        | 19     | 2     | green    | 19       | 35     | 4     |
| green  | 35    | 51       | 6        | green  | 51    |          |          |        |       |
| 4      | 0     | green    | 4        | 20     | 4     | yellow   | 20       | 36     | 4     |
| yellow | 36    | 52       | 6        | green  | 52    |          |          |        |       |
| 5      | 0     | green    | 5        | 21     | 2     | green    | 21       | 37     | 4     |
| green  | 37    | 53       | 6        | green  | 53    |          |          |        |       |
| 6      | 0     | green    | 6        | 22     | 2     | yellow   | 22       | 38     | 4     |
| yellow | 38    | 54       | 6        | green  | 54    |          |          |        |       |
| 7      | 0     | green    | 7        | 23     | 2     | green    | 23       | 39     | 4     |
| green  | 39    | 55       | 6        | green  | 55    |          |          |        |       |
| 8      | 1     | green    | 8        | 24     | 3     | green    | 24       | 40     | 5     |
| green  | 40    | 56       | 7        | green  | 56    |          |          |        |       |
| 9      | 1     | green    | 9        | 25     | 3     | green    | 25       | 41     | 5     |
| green  | 41    | 57       | 7        | green  | 57    |          |          |        |       |
| 10     | 1     | green    | 10       | 26     | 3     | green    | 26       | 42     | 5     |
| green  | 42    | 58       | 7        | green  | 58    |          |          |        |       |
| 11     | 1     | green    | 11       | 27     | 3     | green    | 27       | 43     | 5     |
| green  | 43    | 59       | 7        | green  | 59    |          |          |        |       |
| 12     | 1     | yellow   | 12       | 28     | 3     | yellow   | 28       | 44     | 5     |
| green  | 44    | 60       | 7        | green  | 60    |          |          |        |       |
| 13     | 1     | green    | 13       | 29     | 3     | green    | 29       | 45     | 5     |
| green  | 45    | 61       | 7        | green  | 61    |          |          |        |       |
| 14     | 1     | yellow   | 14       | 30     | 3     | yellow   | 30       | 46     | 5     |
| green  | 46    | 62       | 7        | green  | 62    |          |          |        |       |

VxLAN-EVPN with IRB QoS

```

15      1      green  15      | 31      3      green  31      | 47      5
green   47      | 63      7      | green   63

```

```

profile name: default
profile type: dscp-to-dscp (Egress)
Status: Inactive

```

mapping:

| -----+----- |       |          | -----+----- |        |          | -----+----- |       |          |
|-------------|-------|----------|-------------|--------|----------|-------------|-------|----------|
| INPUT       |       |          | INPUT       |        |          | INPUT       |       |          |
| -----+----- |       |          | -----+----- |        |          | -----+----- |       |          |
| DSCP        | Color | Out DSCP | DSCP        | Color  | Out DSCP | DSCP        | Color | Out DSCP |
| -----+----- |       |          | -----+----- |        |          | -----+----- |       |          |
| 0           | green | 0        | 0           | yellow | 0        | 0           | red   | 0        |
| 1           | green | 1        | 1           | yellow | 1        | 1           | red   | 1        |
| 2           | green | 2        | 2           | yellow | 2        | 2           | red   | 2        |
| 3           | green | 3        | 3           | yellow | 3        | 3           | red   | 3        |
| 4           | green | 4        | 4           | yellow | 4        | 4           | red   | 4        |
| 5           | green | 5        | 5           | yellow | 5        | 5           | red   | 5        |
| 6           | green | 6        | 6           | yellow | 6        | 6           | red   | 6        |
| 7           | green | 7        | 7           | yellow | 7        | 7           | red   | 7        |
| 8           | green | 8        | 8           | yellow | 8        | 8           | red   | 8        |
| 9           | green | 9        | 9           | yellow | 9        | 9           | red   | 9        |
| 10          | green | 10       | 10          | yellow | 12       | 10          | red   | 14       |
| 11          | green | 11       | 11          | yellow | 11       | 11          | red   | 11       |
| 12          | green | 12       | 12          | yellow | 12       | 12          | red   | 14       |
| 13          | green | 13       | 13          | yellow | 13       | 13          | red   | 13       |
| 14          | green | 14       | 14          | yellow | 14       | 14          | red   | 14       |
| 15          | green | 15       | 15          | yellow | 15       | 15          | red   | 15       |
| 16          | green | 16       | 16          | yellow | 16       | 16          | red   | 16       |
| 17          | green | 17       | 17          | yellow | 17       | 17          | red   | 17       |
| 18          | green | 18       | 18          | yellow | 20       | 18          | red   | 22       |
| 19          | green | 19       | 19          | yellow | 19       | 19          | red   | 19       |
| 20          | green | 20       | 20          | yellow | 20       | 20          | red   | 22       |
| 21          | green | 21       | 21          | yellow | 21       | 21          | red   | 21       |
| 22          | green | 22       | 22          | yellow | 22       | 22          | red   | 22       |
| 23          | green | 23       | 23          | yellow | 23       | 23          | red   | 23       |
| 24          | green | 24       | 24          | yellow | 24       | 24          | red   | 24       |
| 25          | green | 25       | 25          | yellow | 25       | 25          | red   | 25       |
| 26          | green | 26       | 26          | yellow | 28       | 26          | red   | 30       |
| 27          | green | 27       | 27          | yellow | 27       | 27          | red   | 27       |
| 28          | green | 28       | 28          | yellow | 28       | 28          | red   | 30       |
| 29          | green | 29       | 29          | yellow | 29       | 29          | red   | 29       |
| 30          | green | 30       | 30          | yellow | 30       | 30          | red   | 30       |
| 31          | green | 31       | 31          | yellow | 31       | 31          | red   | 31       |
| 32          | green | 32       | 32          | yellow | 32       | 32          | red   | 32       |
| 33          | green | 33       | 33          | yellow | 33       | 33          | red   | 33       |
| 34          | green | 34       | 34          | yellow | 36       | 34          | red   | 38       |
| 35          | green | 35       | 35          | yellow | 35       | 35          | red   | 35       |



|    |       |    |  |    |        |    |  |    |     |    |
|----|-------|----|--|----|--------|----|--|----|-----|----|
| 36 | green | 36 |  | 36 | yellow | 36 |  | 36 | red | 38 |
| 37 | green | 37 |  | 37 | yellow | 37 |  | 37 | red | 37 |
| 38 | green | 38 |  | 38 | yellow | 38 |  | 38 | red | 38 |
| 39 | green | 39 |  | 39 | yellow | 39 |  | 39 | red | 39 |
| 40 | green | 40 |  | 40 | yellow | 40 |  | 40 | red | 40 |
| 41 | green | 41 |  | 41 | yellow | 41 |  | 41 | red | 41 |
| 42 | green | 42 |  | 42 | yellow | 42 |  | 42 | red | 42 |
| 43 | green | 43 |  | 43 | yellow | 43 |  | 43 | red | 43 |
| 44 | green | 44 |  | 44 | yellow | 44 |  | 44 | red | 44 |
| 45 | green | 45 |  | 45 | yellow | 45 |  | 45 | red | 45 |
| 46 | green | 46 |  | 46 | yellow | 46 |  | 46 | red | 46 |
| 47 | green | 47 |  | 47 | yellow | 47 |  | 47 | red | 47 |
| 48 | green | 48 |  | 48 | yellow | 48 |  | 48 | red | 48 |
| 49 | green | 49 |  | 49 | yellow | 49 |  | 49 | red | 49 |
| 50 | green | 50 |  | 50 | yellow | 50 |  | 50 | red | 50 |
| 51 | green | 51 |  | 51 | yellow | 51 |  | 51 | red | 51 |
| 52 | green | 52 |  | 52 | yellow | 52 |  | 52 | red | 52 |
| 53 | green | 53 |  | 53 | yellow | 53 |  | 53 | red | 53 |
| 54 | green | 54 |  | 54 | yellow | 54 |  | 54 | red | 54 |
| 55 | green | 55 |  | 55 | yellow | 55 |  | 55 | red | 55 |
| 56 | green | 56 |  | 56 | yellow | 56 |  | 56 | red | 56 |
| 57 | green | 57 |  | 57 | yellow | 57 |  | 57 | red | 57 |
| 58 | green | 58 |  | 58 | yellow | 58 |  | 58 | red | 58 |
| 59 | green | 59 |  | 59 | yellow | 59 |  | 59 | red | 59 |
| 60 | green | 60 |  | 60 | yellow | 60 |  | 60 | red | 60 |
| 61 | green | 61 |  | 61 | yellow | 61 |  | 61 | red | 61 |
| 62 | green | 62 |  | 62 | yellow | 62 |  | 62 | red | 62 |
| 63 | green | 63 |  | 63 | yellow | 63 |  | 63 | red | 63 |

**VTEP4**

```
VTEP4#show nvo vxlan tunnel
```

```
VxLAN Network tunnel Entries
```

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 4.4.4.4 | 2.2.2.2     | Installed | 01:14:47 | 01:14:47 |
| 4.4.4.4 | 1.1.1.1     | Installed | 01:18:35 | 01:18:35 |
| 4.4.4.4 | 5.5.5.5     | Installed | 01:18:20 | 01:18:20 |

```
Total number of entries are 3
```

```
VTEP4#show nvo vxlan
```

```
VxLAN Information
```

```
=====
```

```
Codes: NW - Network Port
```

```
AC - Access Port
```

```
(u) - Untagged
```

```
VNID      VNI-Name      VNI-Type Type Interface ESI      VLAN DF-Status
Src-Addr      Dst-Addr
```

|         |         |         |    |      |      |                   |      |
|---------|---------|---------|----|------|------|-------------------|------|
| 101     | VNI-101 | L2      | NW | ---- | ---- | ----              | ---- |
| 4.4.4.4 |         | 2.2.2.2 |    |      |      |                   |      |
| 101     | VNI-101 | L2      | NW | ---- | ---- | ----              | ---- |
| 4.4.4.4 |         | 1.1.1.1 |    |      |      |                   |      |
| 101     | VNI-101 | L2      | NW | ---- | ---- | ----              | ---- |
| 4.4.4.4 |         | 5.5.5.5 |    |      |      |                   |      |
| 201     | VNI-201 | L2      | NW | ---- | ---- | ----              | ---- |
| 4.4.4.4 |         | 2.2.2.2 |    |      |      |                   |      |
| 201     | VNI-201 | L2      | NW | ---- | ---- | ----              | ---- |
| 4.4.4.4 |         | 1.1.1.1 |    |      |      |                   |      |
| 201     | VNI-201 | L2      | NW | ---- | ---- | ----              | ---- |
| 4.4.4.4 |         | 5.5.5.5 |    |      |      |                   |      |
| 201     | VNI-201 | --      | AC | xe3  | ---  | Single Homed Port | ---  |
| ----    |         | ----    |    |      |      | 20                | ---- |

Total number of entries are 7

VTEP4#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

| VNID | Ip-Addr      | Mac-Addr       | Type           | Age-Out | Retries-Left |
|------|--------------|----------------|----------------|---------|--------------|
| 201  | 21.21.21.51  | 0000.2222.1020 | Static Remote  | ----    |              |
| 201  | 21.21.21.1   | 0000.0000.1111 | Static Local   | ----    |              |
| 201  | 21.21.21.101 | 0000.5555.1020 | Static Local   | ----    |              |
| 101  | 11.11.11.51  | 0000.2222.1010 | Static Remote  | ----    |              |
| 101  | 11.11.11.10  | 0010.9400.0002 | Dynamic Remote | ----    |              |
| 101  | 11.11.11.1   | 0000.0000.1111 | Static Local   | ----    |              |
| 101  | 11.11.11.201 | 0000.4444.1010 | Static Remote  | ----    |              |

Total number of entries are 7

VTEP4#show nvo vxlan nd-cache

VxLAN ND-CACHE Information

=====

| VNID | Ip-Addr  | Mac-Addr       | Type           | Age-Out | Retries-Left |
|------|----------|----------------|----------------|---------|--------------|
| 201  | 2121::1  | 0000.0000.1111 | Static Local   | ----    |              |
| 101  | 1111::10 | 0010.9400.0002 | Dynamic Remote | ----    |              |
| 101  | 1111::1  | 0000.0000.1111 | Static Local   | ----    |              |

Total number of entries are 3

VTEP4#show ipv4 route vrf L3VRF1

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP

O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,

ia - IS-IS inter area, E - EVPN,

v - vrf leaked

\* - candidate default

IP Route Table for VRF "L3VRF1"

```
C          11.11.11.0/24 is directly connected, irb1001, 00:07:24
C          21.21.21.0/24 is directly connected, irb2001, 00:07:14
C          127.0.0.0/8 is directly connected, lo.L3VRF1, 00:10:16
```

Gateway of last resort is not set

```
VTEP4#show ipv6 route vrf L3VRF1
```

IPv6 Routing Table

```
Codes: K - kernel route, C - connected, S - static, D- DHCP, R - RIP,
       O - OSPF, IA - OSPF inter area, E1 - OSPF external type 1,
       E2 - OSPF external type 2, E - EVPN  N1 - OSPF NSSA external type 1,
       N2 - OSPF NSSA external type 2, i - IS-IS, B - BGP,
       v - vrf leaked
```

Timers: Uptime

IP Route Table for VRF "L3VRF1"

```
C          ::1/128 via ::, lo.L3VRF1, 00:10:21
C          1111::/64 via ::, irb1001, 00:07:29
C          2121::/64 via ::, irb2001, 00:07:19
C          fe80::/64 via ::, irb2001, 00:07:19
```

```
VTEP4#show nvo vxlan l3vni-map
```

| L3VNI | L2VNI | IRB-interface |
|-------|-------|---------------|
| 1000  | 101   | irb1001       |
| 1000  | 201   | irb2001       |

## VTEP5

```
VTEP5#show running-config qos
```

```
qos enable
```

```
!
```

```
qos profile queue-color-to-cos QUEUE_COS
```

```
  queue 2 color all cos 6
```

```
!
```

```
qos profile dscp-to-queue DSCP_QUEUE
```

```
  dscp 34 queue 2
```

```
!
```

```
!
```

```
!
```

```
VTEP5#show running-config nvo vxlan
```

```
!
```

```
nvo vxlan enable
```

```
!
```

```
nvo vxlan irb
```

```
!
```

```
evpn vxlan multihoming enable
```

```
!
```

```
evpn irb-forwarding anycast-gateway-mac 0000.0000.1111
```

```
!
```

```
nvo vxlan vtep-ip-global 5.5.5.5
```

```
!
```

## VxLAN-EVPN with IRB QoS

```

nvo vxlan tunnel qos-map-mode cos-dscp ingress DSCP_QUEUE
!
nvo vxlan id 101 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp L2VRF1
  evpn irb1001
  vni-name VNI-101
!
nvo vxlan id 201 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp L2VRF2
  evpn irb2001
  vni-name VNI-201
!
nvo vxlan access-if port-vlan xe1 10
  map vnid 101
  mac 0000.4444.1010 ip 11.11.11.201
  map qos-profile queue-color-to-cos QUEUE_COS
!
!

```

VTEP5#show nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 5.5.5.5 | 2.2.2.2     | Installed | 01:11:17 | 01:11:17 |
| 5.5.5.5 | 4.4.4.4     | Installed | 01:14:50 | 01:14:50 |
| 5.5.5.5 | 1.1.1.1     | Installed | 01:14:50 | 01:14:50 |

Total number of entries are 3

VTEP5#sh nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port  
AC - Access Port  
(u) - Untagged

| VNID     | VNI-Name | VNI-Type | Type | Interface | ESI  | VLAN              | DF-Status |
|----------|----------|----------|------|-----------|------|-------------------|-----------|
| Src-Addr | Dst-Addr |          |      |           |      |                   |           |
| 101      | VNI-101  | L2       | NW   | ----      | ---- | ----              | ----      |
| 5.5.5.5  | 2.2.2.2  |          |      |           |      |                   |           |
| 101      | VNI-101  | L2       | NW   | ----      | ---- | ----              | ----      |
| 5.5.5.5  | 4.4.4.4  |          |      |           |      |                   |           |
| 101      | VNI-101  | L2       | NW   | ----      | ---- | ----              | ----      |
| 5.5.5.5  | 1.1.1.1  |          |      |           |      |                   |           |
| 101      | VNI-101  | --       | AC   | xe1       | ---  | Single Homed Port | ---       |
| ----     | ----     |          |      |           |      | 10                | ----      |
| 201      | VNI-201  | L2       | NW   | ----      | ---- | ----              | ----      |
| 5.5.5.5  | 2.2.2.2  |          |      |           |      |                   |           |
| 201      | VNI-201  | L2       | NW   | ----      | ---- | ----              | ----      |
| 5.5.5.5  | 4.4.4.4  |          |      |           |      |                   |           |
| 201      | VNI-201  | L2       | NW   | ----      | ---- | ----              | ----      |
| 5.5.5.5  | 1.1.1.1  |          |      |           |      |                   |           |

Total number of entries are 7  
VTEP5#show nvo vxlan arp-cache  
VxLAN ARP-CACHE Information

```
=====
```

| VNID | Ip-Addr      | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|--------------|----------------|---------------|---------|--------------|
| 201  | 21.21.21.51  | 0000.2222.1020 | Static Remote | ----    |              |
| 201  | 21.21.21.1   | 0000.0000.1111 | Static Local  | ----    |              |
| 201  | 21.21.21.101 | 0000.5555.1020 | Static Remote | ----    |              |
| 101  | 11.11.11.51  | 0000.2222.1010 | Static Remote | ----    |              |
| 101  | 11.11.11.10  | 0010.9400.0002 | Dynamic Local | ----    |              |
| 101  | 11.11.11.1   | 0000.0000.1111 | Static Local  | ----    |              |
| 101  | 11.11.11.201 | 0000.4444.1010 | Static Local  | ----    |              |

Total number of entries are 7  
VTEP5#show nvo vxlan nd-cache  
VxLAN ND-CACHE Information

```
=====
```

| VNID | Ip-Addr   | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|-----------|----------------|---------------|---------|--------------|
| 201  | 2121:::1  | 0000.0000.1111 | Static Local  | ----    |              |
| 101  | 1111:::10 | 0010.9400.0002 | Dynamic Local | ----    |              |
| 101  | 1111:::1  | 0000.0000.1111 | Static Local  | ----    |              |

Total number of entries are 3

VTEP5#show ipv4 route vrf L3VRF1

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP  
O - OSPF, IA - OSPF inter area  
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
E1 - OSPF external type 1, E2 - OSPF external type 2  
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,  
ia - IS-IS inter area, E - EVPN,  
v - vrf leaked  
\* - candidate default

IP Route Table for VRF "L3VRF1"

```
C          11.11.11.0/24 is directly connected, irb1001, 00:05:08
C          21.21.21.0/24 is directly connected, irb2001, 00:04:57
C          127.0.0.0/8 is directly connected, lo.L3VRF1, 00:07:30
```

Gateway of last resort is not set

VTEP5#show ipv6 route vrf L3VRF1

IPv6 Routing Table

Codes: K - kernel route, C - connected, S - static, D- DHCP, R - RIP,  
O - OSPF, IA - OSPF inter area, E1 - OSPF external type 1,  
E2 - OSPF external type 2, E - EVPN N1 - OSPF NSSA external type 1,  
N2 - OSPF NSSA external type 2, i - IS-IS, B - BGP,  
v - vrf leaked

Timers: Uptime

```
IP Route Table for VRF "L3VRF1"
C      ::1/128 via ::, lo.L3VRF1, 00:07:35
C      1111::/24 via ::, irb1001, 00:05:13
C      2121::/64 via ::, irb2001, 00:05:02
C      fe80::/64 via ::, irb2001, 00:05:02
```

```
VTEP5#show nvo vxlan l3vni-map
L3VNI      L2VNI      IRB-interface
=====
1000      101        irb1001
1000      201        irb2001
```

```
VTEP5#show interface xel counters queue-stats
E - Egress, I - Ingress, Q-Size is in bytes
```

| Queue/Class-map<br>Dropped bytes | Q-Size               | Tx pkts    | Tx bytes | Dropped pkts |
|----------------------------------|----------------------|------------|----------|--------------|
| q0                               | (E) 12517376 0       | 0          | 0        | 0            |
| q1                               | (E) 12517376 0       | 0          | 0        | 0            |
| q2                               | (E) 12517376 1170696 | 1224549062 | 0        | 0            |
| q3                               | (E) 12517376 0       | 0          | 0        | 0            |
| q4                               | (E) 12517376 0       | 0          | 0        | 0            |
| q5                               | (E) 12517376 0       | 0          | 0        | 0            |
| q6                               | (E) 12517376 0       | 0          | 0        | 0            |
| q7                               | (E) 12517376 0       | 0          | 0        | 0            |

```
VTEP5#show qos-profile QUEUE_COS
profile name: QUEUE_COS
profile type: queue-color-to-cos
profile attached to 1 instances
configured mapping:
```

```
queue 2 color all cos 6
```

```
Detailed mapping:
```

| INPUT |       |     | OUTPUT |        |     | INPUT |       |     | OUTPUT |       |     |
|-------|-------|-----|--------|--------|-----|-------|-------|-----|--------|-------|-----|
| Queue | Color | COS | Queue  | Color  | COS | Queue | Color | COS | Queue  | Color | COS |
| 0     | green | 0   | 0      | yellow | 0   | 0     | red   | 0   | 0      | red   | 0   |
| 1     | green | 1   | 1      | yellow | 1   | 1     | red   | 1   | 1      | red   | 1   |
| 2     | green | 6   | 2      | yellow | 6   | 2     | red   | 6   | 2      | red   | 6   |
| 3     | green | 3   | 3      | yellow | 3   | 3     | red   | 3   | 3      | red   | 3   |
| 4     | green | 4   | 4      | yellow | 4   | 4     | red   | 4   | 4      | red   | 4   |
| 5     | green | 5   | 5      | yellow | 5   | 5     | red   | 5   | 5      | red   | 5   |
| 6     | green | 6   | 6      | yellow | 6   | 6     | red   | 6   | 6      | red   | 6   |
| 7     | green | 7   | 7      | yellow | 7   | 7     | red   | 7   | 7      | red   | 7   |

```
VTEP5#show qos-profile DSCP_QUEUE
profile name: DSCP_QUEUE
```

```

profile type: dscp-to-queue
profile attached to 1 instances
configured mapping:
  dscp 34 queue 2
Detailed mapping:

```

| INPUT OUTPUT |       |        |          | INPUT OUTPUT |       |        |          | INPUT OUTPUT |       |       |          |
|--------------|-------|--------|----------|--------------|-------|--------|----------|--------------|-------|-------|----------|
| DSCP         | Queue | Color  | Out DSCP | DSCP         | Queue | Color  | Out DSCP | DSCP         | Queue | Color | Out DSCP |
| 0            | 0     | green  | 0        | 16           | 2     | green  | 16       | 32           | 4     |       |          |
| green        | 32    |        | 48       | 6            | green | 48     |          |              |       |       |          |
| 1            | 0     | green  | 1        | 17           | 2     | green  | 17       | 33           | 4     |       |          |
| green        | 33    |        | 49       | 6            | green | 49     |          |              |       |       |          |
| 2            | 0     | green  | 2        | 18           | 2     | green  | 18       | 34           | 2     |       |          |
| green        | 34    |        | 50       | 6            | green | 50     |          |              |       |       |          |
| 3            | 0     | green  | 3        | 19           | 2     | green  | 19       | 35           | 4     |       |          |
| green        | 35    |        | 51       | 6            | green | 51     |          |              |       |       |          |
| 4            | 0     | green  | 4        | 20           | 2     | yellow | 20       | 36           | 4     |       |          |
| yellow       | 36    |        | 52       | 6            | green | 52     |          |              |       |       |          |
| 5            | 0     | green  | 5        | 21           | 2     | green  | 21       | 37           | 4     |       |          |
| green        | 37    |        | 53       | 6            | green | 53     |          |              |       |       |          |
| 6            | 0     | green  | 6        | 22           | 2     | yellow | 22       | 38           | 4     |       |          |
| yellow       | 38    |        | 54       | 6            | green | 54     |          |              |       |       |          |
| 7            | 0     | green  | 7        | 23           | 2     | green  | 23       | 39           | 4     |       |          |
| green        | 39    |        | 55       | 6            | green | 55     |          |              |       |       |          |
| 8            | 1     | green  | 8        | 24           | 3     | green  | 24       | 40           | 5     |       |          |
| green        | 40    |        | 56       | 7            | green | 56     |          |              |       |       |          |
| 9            | 1     | green  | 9        | 25           | 3     | green  | 25       | 41           | 5     |       |          |
| green        | 41    |        | 57       | 7            | green | 57     |          |              |       |       |          |
| 10           | 1     | green  | 10       | 26           | 3     | green  | 26       | 42           | 5     |       |          |
| green        | 42    |        | 58       | 7            | green | 58     |          |              |       |       |          |
| 11           | 1     | green  | 11       | 27           | 3     | green  | 27       | 43           | 5     |       |          |
| green        | 43    |        | 59       | 7            | green | 59     |          |              |       |       |          |
| 12           | 1     | yellow | 12       | 28           | 3     | yellow | 28       | 44           | 5     |       |          |
| green        | 44    |        | 60       | 7            | green | 60     |          |              |       |       |          |
| 13           | 1     | green  | 13       | 29           | 3     | green  | 29       | 45           | 5     |       |          |
| green        | 45    |        | 61       | 7            | green | 61     |          |              |       |       |          |
| 14           | 1     | yellow | 14       | 30           | 3     | yellow | 30       | 46           | 5     |       |          |
| green        | 46    |        | 62       | 7            | green | 62     |          |              |       |       |          |
| 15           | 1     | green  | 15       | 31           | 3     | green  | 31       | 47           | 5     |       |          |
| green        | 47    |        | 63       | 7            | green | 63     |          |              |       |       |          |

## Distributed Gateway

In distributed gateway approach, VTEP will act as default gateways for one or more VNIDs, Each VTEP having its own default gateway IP and MAC configuration for a given VNID.

## IRB QoS Configuration for Distributed

Configure from Base Configuration-L2 VxLAN section, then configure below commands for centralized distributed approach.

Note: For L3 traffic, when l3vni is sent in the traffic, then dscp-to-queue qos profile mapped at tunnel ingress takes effect.

### VTEP4

Unconfigure vnid 101 from nvo vxlan.

|  |   |
|--|---|
| (config)#nvo vxlan irb   | Enable VxLAN irb  |
| (config)#ip vrf L3VRF1   | Create mac routing/forwarding instance with L3VRF1 name and enter into vrf mode   |
| (config-vrf)#rd 41000:11   | Assign RD value   |
| (config-vrf)# route-target both 100:100                          | Assign route-target value for same for import and export.   |
| (config-vrf)# l3vni 1000   | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit  | Exit from vrf mode  |
| (config)# interface irb2001                                      | Configure IRB interface 2001  |
| (config-if)ip vrf forwarding L3VRF1                              | Configure L3VRF1  |
| (config-if)ip address 21.21.21.1/24                              | Configure ip address  |
| (config-if)ipv6 address 2121::1/64                               | Configure ipv6 address  |
| (config-if)exit  | Exit from interface config mode   |
| (config)router bgp 5000  | Enter into bgp router mode  |
| (config-router)#address-family ipv4 vrf L3VRF1                   | Enter into address-family mode for L3VRF1   |
| (config-router-af)#redistribute connected                        | Redistribute connected  |
| (config-router-af)#exit-address-family                           | Exit form address-family  |
| (config-router)#address-family ipv6 vrf L3VRF1                   | Enter into address-family mode for L3VRF1   |
| (config-router-af)#redistribute connected                        | Redistribute connected  |
| (config-router-af)#exit-address-family                           | Exit form address-family  |
| (config)#nvo vxlan id 201 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode   |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF2    | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb2001                                       | Configure irb2001 under vxlan id 201  |
| (config-nvo)#exit  | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#qos remark dscp   | Enable qos dscp remark for dscp-to-dscp mapping if required   |
| (config)#qos profile dscp-to-queue DSCP_QUEUE                    | Configure qos profile to remark at vxlan ingress tunnel. Here dscp to <queue, dscp> is not applicable. I.e ingress remarking of dscp at the ingress tunnel is not applicable. |



|  |   |
|--|---|
| (config-ingress-dscp-map)#dscp 56 queue 6                          | Configure particular outer dscp value to queue value. Here classification at the ingress vtep is based on overlay dscp value    |
| (config-ingress-dscp-map)#exit                                     | Exit from qos profile config mode   |
| (config)#qos profile dscp-to-dscp DSCP_DSCP                        | Configure qos profile for dscp value remark if required. Here classification at the egress vtep is based on customer dscp value |
| (config-egress-dscp-map)#dscp 20 dscp 32                           | Configure particular dscp value to dscp value   |
| (config-egress-dscp-map)#exit                                      | Exit from qos profile config mode   |
| (config)#qos profile queue-color-to-cos QUEUE_COS                  | Configure qos profile for remark at vxlan access-if   |
| (config-egress-cos-map)#queue 6 cos 2                              | Configure particular queue value to COS value   |
| (config-egress-cos-map)#exit                                       | Exit from qos profile config mode   |
| (config)#nvo vxlan tunnel qos-map-mode cos-dscp ingress DSCP_QUEUE | Map the qos profile to vxlan tunnel ingress   |
| (config)#int irb2001   | Enter IRB interface mode  |
| (config-irb-if)#qos map-profile dscp-to-dscp DSCP_DSCP             | Map Qos profile for dscp remark if required   |
| (config-irb-if)#exit   | Exit from interface mode  |
| (config)#nvo vxlan access-if port-vlan xe3 20                      | Enter vxlan access-if mode  |
| (config-nvo-acc-if)#map qos-profile queue-color-to-cos QUEUE_COS   | Map qos profile   |
| (config-nvo-acc-if)#commit   | Commit the candidate configuration to the running configuration   |
| (config-nvo-acc-if)#end  | Exit from global configuration mode   |

## VTEP5

Unconfigure vnid 201 from nvo vxlan.

|  |   |
|--|---|
| (config)#nvo vxlan irb                         | Enable VxLAN IRB  |
| (config)#ip vrf L3VRF1                         | Create mac routing/forwarding instance with L3VRF1 name and enter into vrf mode |
| (config-vrf)#rd 51000:11                       | Assign RD value   |
| (config-vrf)# route-target both 100:100        | Assign route-target value for same for import and export.                       |
| (config-vrf)# l3vni 1000                       | Configure L3VNI as 1000 for L3VRF1  |
| (config-vrf)#exit                              | Exit from vrf mode  |
| (config)# interface irb1001                    | Configure IRB interface 1001  |
| (config-if)ip vrf forwarding L3VRF1            | Configure L3VRF1  |
| (config-if)ip address 11.11.11.1/24            | Configure ip address  |
| (config-if)ipv6 address 1111::1/64             | Configure ipv6 address  |
| (config-if)exit                                | Exit from interface config mode   |
| (config)router bgp 5000                        | Enter into bgp router mode  |
| (config-router)#address-family ipv4 vrf L3VRF1 | Enter into address-family mode for L3VRF1                                       |

|   |   |
|---|---|
| (config-router-af)#redistribute connected                         | Redistribute connected  |
| (config-router-af)#exit-address-family                            | Exit form address-family  |
| (config-router)#address-family ipv6 vrf L3VRF1                    | Enter into address-family mode for L3VRF1   |
| (config-router-af)#redistribute connected                         | Redistribute connected  |
| (config-router-af)#exit-address-family                            | Exit form address-family  |
| (config)# nvo vxlan id 101 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1     | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb1001  | Configure irb1001 under vxlan id 101  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#qos profile dscp-to-queue DSCP_QUEUE                     | Configure qos profile for dscp to queue for ingress traffic   |
| (config-ingress-dscp-map)# dscp 20 queue 4                        | Configure particular dscp value to queue value  |
| (config-ingress-dscp-map)#qos profile dscp-encap DSCP_ENCAP       | Configure qos profile for overlay dscp remark in vxlan tunnel egress  |
| (config-egress-dscp-encap-map)# 13 dscp 20 dscpEncap 56           | Egress remarking of the customer dscp packet to overlay dscp  |
| (config-egress-dscp-encap-map)#exit                               | Exit from qos profile config mode   |
| (config)#nvo vxlan tunnel qos-map-mode cos-dscp egress DSCP_ENCAP | Map the qos profile in vxlan tunnel egress  |
| (config)#interface irb1001  | Enter IRB L3 interface  |
| (config-irb-if)#qos map-profile dscp-to-queue DSCP_QUEUE          | Map qos profile   |
| (config-irb-if)#commit  | Commit the candidate configuration to the running configuration   |
| (config-irb-if)#end   | Exit from global conf mode  |

## Validations

Send traffic from TS1-11 to VTEP5 access-if with dscp value 20 COS value 1(vlan10) and verify traffic received at TS2-21 with dscp value 32 and COS value 2(vlan20) at the VTEP4 access-if.

### VTEP5

```
VTEP5#show running-config qos
qos enable
!
qos profile dscp-to-queue DSCP_QUEUE
  dscp 20 queue 4
!
qos profile dscp-encap DSCP_ENCAP
  13 dscp 20 dscpEncap 56
!
!
```

```

!
!
interface irb1001
  qos map-profile dscp-to-queue DSCP_QUEUE
!
VTEP5#show run nvo vxlan
!
nvo vxlan enable
!
nvo vxlan irb
!
evpn vxlan multihoming enable
!
nvo vxlan vtep-ip-global 5.5.5.5
!
nvo vxlan tunnel qos-map-mode cos-dscp egress DSCP_ENCAP
!
nvo vxlan id 101 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp L2VRF1
  evpn irb1001
  vni-name VNI-101
!
nvo vxlan id 201 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp L2VRF2
  vni-name VNI-201
!
nvo vxlan access-if port-vlan xe1 10
  map vnid 101
  mac 0000.4444.1010 ip 11.11.11.201
!
!

```

```
VTEP5#show nvo vxlan tunnel
```

```
VxLAN Network tunnel Entries
```

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 5.5.5.5 | 2.2.2.2     | Installed | 00:29:54 | 00:29:54 |
| 5.5.5.5 | 4.4.4.4     | Installed | 00:29:54 | 00:29:54 |
| 5.5.5.5 | 1.1.1.1     | Installed | 00:29:54 | 00:29:54 |

```
Total number of entries are 3
```

```
VTEP5#show nvo vxlan
```

```
VxLAN Information
```

```
=====
```

```

Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged

```

| VNID     | VNI-Name | VNI-Type | Type | Interface | ESI | VLAN | DF-Status |
|----------|----------|----------|------|-----------|-----|------|-----------|
| Src-Addr | Dst-Addr |          |      |           |     |      |           |

VxLAN-EVPN with IRB QoS

```

101      VNI-101      L2      NW      ----      ----      ----      ----
5.5.5.5      2.2.2.2
101      VNI-101      L2      NW      ----      ----      ----      ----
5.5.5.5      4.4.4.4
101      VNI-101      L2      NW      ----      ----      ----      ----
5.5.5.5      1.1.1.1
101      VNI-101      --      AC      xe1      --- Single Homed Port ---      10      ----
----
201      VNI-201      L2      NW      ----      ----      ----      ----
5.5.5.5      2.2.2.2
201      VNI-201      L2      NW      ----      ----      ----      ----
5.5.5.5      4.4.4.4
201      VNI-201      L2      NW      ----      ----      ----      ----
5.5.5.5      1.1.1.1
1000     ----      L3      NW      ----      ----      ----      ----
5.5.5.5      4.4.4.4

```

Total number of entries are 8

VTEP5#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

| VNID | Ip-Addr      | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|--------------|----------------|---------------|---------|--------------|
| 201  | 21.21.21.51  | 0000.2222.1020 | Static Remote | ----    |              |
| 201  | 21.21.21.1   | 3c2c.991a.da7a | Static Remote | ----    |              |
| 201  | 21.21.21.101 | 0000.5555.1020 | Static Remote | ----    |              |
| 101  | 11.11.11.51  | 0000.2222.1010 | Static Remote | ----    |              |
| 101  | 11.11.11.1   | 04f8.f82f.8eee | Static Local  | ----    |              |
| 101  | 11.11.11.201 | 0000.4444.1010 | Static Local  | ----    |              |

Total number of entries are 6

VTEP5#show nvo vxlan nd-cache

VxLAN ND-CACHE Information

=====

| VNID | Ip-Addr | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|---------|----------------|---------------|---------|--------------|
| 201  | 2121::1 | 3c2c.991a.da7a | Static Remote | ----    |              |
| 101  | 1111::1 | 04f8.f82f.8eee | Static Local  | ----    |              |

Total number of entries are 2

VTEP5#show nvo vxlan l3vni-map

L3VNI L2VNI IRB-interface

=====

```

1000      101      irb1001

```

VTEP5#show ipv4 route vrf L3VRF1

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP

O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,

ia - IS-IS inter area, E - EVPN,

v - vrf leaked



VxLAN-EVPN with IRB QoS

| INPUT   OUTPUT |       |        |          | INPUT   OUTPUT |       |        |          | INPUT   OUTPUT |       |       |          |
|----------------|-------|--------|----------|----------------|-------|--------|----------|----------------|-------|-------|----------|
| DSCP           | Queue | Color  | Out DSCP | DSCP           | Queue | Color  | Out DSCP | DSCP           | Queue | Color | Out DSCP |
| 0              | 0     | green  | 0        | 16             | 2     | green  | 16       | 32             | 4     |       |          |
| green          | 32    | 48     | 6        | green          | 2     | 48     |          |                |       |       |          |
| 1              | 0     | green  | 1        | 17             | 2     | green  | 17       | 33             | 4     |       |          |
| green          | 33    | 49     | 6        | green          | 2     | 49     |          |                |       |       |          |
| 2              | 0     | green  | 2        | 18             | 2     | green  | 18       | 34             | 4     |       |          |
| green          | 34    | 50     | 6        | green          | 2     | 50     |          |                |       |       |          |
| 3              | 0     | green  | 3        | 19             | 2     | green  | 19       | 35             | 4     |       |          |
| green          | 35    | 51     | 6        | green          | 2     | 51     |          |                |       |       |          |
| 4              | 0     | green  | 4        | 20             | 4     | yellow | 20       | 36             | 4     |       |          |
| yellow         | 36    | 52     | 6        | green          | 4     | 52     |          |                |       |       |          |
| 5              | 0     | green  | 5        | 21             | 2     | green  | 21       | 37             | 4     |       |          |
| green          | 37    | 53     | 6        | green          | 2     | 53     |          |                |       |       |          |
| 6              | 0     | green  | 6        | 22             | 2     | yellow | 22       | 38             | 4     |       |          |
| yellow         | 38    | 54     | 6        | green          | 2     | 54     |          |                |       |       |          |
| 7              | 0     | green  | 7        | 23             | 2     | green  | 23       | 39             | 4     |       |          |
| green          | 39    | 55     | 6        | green          | 2     | 55     |          |                |       |       |          |
| 8              | 1     | green  | 8        | 24             | 3     | green  | 24       | 40             | 5     |       |          |
| green          | 40    | 56     | 7        | green          | 3     | 56     |          |                |       |       |          |
| 9              | 1     | green  | 9        | 25             | 3     | green  | 25       | 41             | 5     |       |          |
| green          | 41    | 57     | 7        | green          | 3     | 57     |          |                |       |       |          |
| 10             | 1     | green  | 10       | 26             | 3     | green  | 26       | 42             | 5     |       |          |
| green          | 42    | 58     | 7        | green          | 3     | 58     |          |                |       |       |          |
| 11             | 1     | green  | 11       | 27             | 3     | green  | 27       | 43             | 5     |       |          |
| green          | 43    | 59     | 7        | green          | 3     | 59     |          |                |       |       |          |
| 12             | 1     | yellow | 12       | 28             | 3     | yellow | 28       | 44             | 5     |       |          |
| green          | 44    | 60     | 7        | green          | 3     | 60     |          |                |       |       |          |
| 13             | 1     | green  | 13       | 29             | 3     | green  | 29       | 45             | 5     |       |          |
| green          | 45    | 61     | 7        | green          | 3     | 61     |          |                |       |       |          |
| 14             | 1     | yellow | 14       | 30             | 3     | yellow | 30       | 46             | 5     |       |          |
| green          | 46    | 62     | 7        | green          | 3     | 62     |          |                |       |       |          |
| 15             | 1     | green  | 15       | 31             | 3     | green  | 31       | 47             | 5     |       |          |
| green          | 47    | 63     | 7        | green          | 3     | 63     |          |                |       |       |          |

VTEP5#show qos-profile DSCP\_ENCAP

```

profile name: DSCP_ENCAP
profile type: dscp-encap
profile attached to 1 instances
configured mapping:
 13 dscp 20 dscpEncap 56
Detailed mapping:
L3 DSCP to DSCP-ENCAP

```

| INPUT   OUTPUT |      | INPUT   OUTPUT |      | INPUT   OUTPUT |      | INPUT   OUTPUT |      |
|----------------|------|----------------|------|----------------|------|----------------|------|
| DSCP           | DSCP | DSCP           | DSCP | DSCP           | DSCP | DSCP           | DSCP |
| 0              | 0    | 16             | 16   | 32             | 32   | 48             | 48   |

|    |    |  |    |    |  |    |    |  |    |    |
|----|----|--|----|----|--|----|----|--|----|----|
| 1  | 1  |  | 17 | 17 |  | 33 | 33 |  | 49 | 49 |
| 2  | 2  |  | 18 | 18 |  | 34 | 34 |  | 50 | 50 |
| 3  | 3  |  | 19 | 19 |  | 35 | 35 |  | 51 | 51 |
| 4  | 4  |  | 20 | 56 |  | 36 | 36 |  | 52 | 52 |
| 5  | 5  |  | 21 | 21 |  | 37 | 37 |  | 53 | 53 |
| 6  | 6  |  | 22 | 22 |  | 38 | 38 |  | 54 | 54 |
| 7  | 7  |  | 23 | 23 |  | 39 | 39 |  | 55 | 55 |
| 8  | 8  |  | 24 | 24 |  | 40 | 40 |  | 56 | 56 |
| 9  | 9  |  | 25 | 25 |  | 41 | 41 |  | 57 | 57 |
| 10 | 10 |  | 26 | 26 |  | 42 | 42 |  | 58 | 58 |
| 11 | 11 |  | 27 | 27 |  | 43 | 43 |  | 59 | 59 |
| 12 | 12 |  | 28 | 28 |  | 44 | 44 |  | 60 | 60 |
| 13 | 13 |  | 29 | 29 |  | 45 | 45 |  | 61 | 61 |
| 14 | 14 |  | 30 | 30 |  | 46 | 46 |  | 62 | 62 |
| 15 | 15 |  | 31 | 31 |  | 47 | 47 |  | 63 | 63 |

L2 Queue + Color to DSCP-ENCAP

| INPUT |       |      | OUTPUT |        |      | INPUT |       |      | OUTPUT |       |      |
|-------|-------|------|--------|--------|------|-------|-------|------|--------|-------|------|
| Queue | Color | DSCP | Queue  | Color  | DSCP | Queue | Color | DSCP | Queue  | Color | DSCP |
| 0     | green | 0    | 0      | yellow | 0    | 0     | red   | 0    |        |       |      |
| 1     | green | 8    | 1      | yellow | 8    | 1     | red   | 8    |        |       |      |
| 2     | green | 16   | 2      | yellow | 16   | 2     | red   | 16   |        |       |      |
| 3     | green | 24   | 3      | yellow | 24   | 3     | red   | 24   |        |       |      |
| 4     | green | 32   | 4      | yellow | 32   | 4     | red   | 32   |        |       |      |
| 5     | green | 40   | 5      | yellow | 40   | 5     | red   | 40   |        |       |      |
| 6     | green | 48   | 6      | yellow | 48   | 6     | red   | 48   |        |       |      |
| 7     | green | 56   | 7      | yellow | 56   | 7     | red   | 56   |        |       |      |

VTEP5#show qos-profile interface irb1001

profile name: DSCP\_QUEUE

profile type: dscp-to-queue (Ingress)

mapping:

| INPUT |       | OUTPUT |       | INPUT |       | OUTPUT |       | INPUT |       |
|-------|-------|--------|-------|-------|-------|--------|-------|-------|-------|
| Queue | Color | Queue  | Color | Queue | Color | Queue  | Color | Queue | Color |
| 0     | green | 0      | green | 16    | 2     | green  | 16    | 32    | 4     |
| 1     | green | 32     | 48    | 6     | green | 48     | 6     | 17    | 2     |
| 2     | green | 33     | 49    | 6     | green | 49     | 6     | 18    | 2     |
| 3     | green | 34     | 50    | 6     | green | 50     | 6     |       |       |

VxLAN-EVPN with IRB QoS

|        |    |        |    |   |       |    |        |    |    |   |
|--------|----|--------|----|---|-------|----|--------|----|----|---|
| 3      | 0  | green  | 3  | 6 | 19    | 2  | green  | 19 | 35 | 4 |
| green  | 35 |        | 51 | 6 | green | 51 |        |    |    |   |
| 4      | 0  | green  | 4  | 6 | 20    | 4  | yellow | 20 | 36 | 4 |
| yellow | 36 |        | 52 | 6 | green | 52 |        |    |    |   |
| 5      | 0  | green  | 5  | 6 | 21    | 2  | green  | 21 | 37 | 4 |
| green  | 37 |        | 53 | 6 | green | 53 |        |    |    |   |
| 6      | 0  | green  | 6  | 6 | 22    | 2  | yellow | 22 | 38 | 4 |
| yellow | 38 |        | 54 | 6 | green | 54 |        |    |    |   |
| 7      | 0  | green  | 7  | 6 | 23    | 2  | green  | 23 | 39 | 4 |
| green  | 39 |        | 55 | 6 | green | 55 |        |    |    |   |
| 8      | 1  | green  | 8  | 7 | 24    | 3  | green  | 24 | 40 | 5 |
| green  | 40 |        | 56 | 7 | green | 56 |        |    |    |   |
| 9      | 1  | green  | 9  | 7 | 25    | 3  | green  | 25 | 41 | 5 |
| green  | 41 |        | 57 | 7 | green | 57 |        |    |    |   |
| 10     | 1  | green  | 10 | 7 | 26    | 3  | green  | 26 | 42 | 5 |
| green  | 42 |        | 58 | 7 | green | 58 |        |    |    |   |
| 11     | 1  | green  | 11 | 7 | 27    | 3  | green  | 27 | 43 | 5 |
| green  | 43 |        | 59 | 7 | green | 59 |        |    |    |   |
| 12     | 1  | yellow | 12 | 7 | 28    | 3  | yellow | 28 | 44 | 5 |
| green  | 44 |        | 60 | 7 | green | 60 |        |    |    |   |
| 13     | 1  | green  | 13 | 7 | 29    | 3  | green  | 29 | 45 | 5 |
| green  | 45 |        | 61 | 7 | green | 61 |        |    |    |   |
| 14     | 1  | yellow | 14 | 7 | 30    | 3  | yellow | 30 | 46 | 5 |
| green  | 46 |        | 62 | 7 | green | 62 |        |    |    |   |
| 15     | 1  | green  | 15 | 7 | 31    | 3  | green  | 31 | 47 | 5 |
| green  | 47 |        | 63 | 7 | green | 63 |        |    |    |   |

profile name: default  
 profile type: dscp-to-dscp (Egress)  
 Status: Inactive  
 mapping:

| INPUT |       |          | OUTPUT |        |          | INPUT |       |          | OUTPUT |       |          |
|-------|-------|----------|--------|--------|----------|-------|-------|----------|--------|-------|----------|
| DSCP  | Color | Out DSCP | DSCP   | Color  | Out DSCP | DSCP  | Color | Out DSCP | DSCP   | Color | Out DSCP |
| 0     | green | 0        | 0      | yellow | 0        | 0     | red   | 0        |        |       |          |
| 1     | green | 1        | 1      | yellow | 1        | 1     | red   | 1        |        |       |          |
| 2     | green | 2        | 2      | yellow | 2        | 2     | red   | 2        |        |       |          |
| 3     | green | 3        | 3      | yellow | 3        | 3     | red   | 3        |        |       |          |
| 4     | green | 4        | 4      | yellow | 4        | 4     | red   | 4        |        |       |          |
| 5     | green | 5        | 5      | yellow | 5        | 5     | red   | 5        |        |       |          |
| 6     | green | 6        | 6      | yellow | 6        | 6     | red   | 6        |        |       |          |
| 7     | green | 7        | 7      | yellow | 7        | 7     | red   | 7        |        |       |          |
| 8     | green | 8        | 8      | yellow | 8        | 8     | red   | 8        |        |       |          |
| 9     | green | 9        | 9      | yellow | 9        | 9     | red   | 9        |        |       |          |
| 10    | green | 10       | 10     | yellow | 12       | 10    | red   | 14       |        |       |          |
| 11    | green | 11       | 11     | yellow | 11       | 11    | red   | 11       |        |       |          |
| 12    | green | 12       | 12     | yellow | 12       | 12    | red   | 14       |        |       |          |
| 13    | green | 13       | 13     | yellow | 13       | 13    | red   | 13       |        |       |          |
| 14    | green | 14       | 14     | yellow | 14       | 14    | red   | 14       |        |       |          |



---

|    |       |    |  |    |        |    |  |    |     |    |
|----|-------|----|--|----|--------|----|--|----|-----|----|
| 15 | green | 15 |  | 15 | yellow | 15 |  | 15 | red | 15 |
| 16 | green | 16 |  | 16 | yellow | 16 |  | 16 | red | 16 |
| 17 | green | 17 |  | 17 | yellow | 17 |  | 17 | red | 17 |
| 18 | green | 18 |  | 18 | yellow | 20 |  | 18 | red | 22 |
| 19 | green | 19 |  | 19 | yellow | 19 |  | 19 | red | 19 |
| 20 | green | 20 |  | 20 | yellow | 20 |  | 20 | red | 22 |
| 21 | green | 21 |  | 21 | yellow | 21 |  | 21 | red | 21 |
| 22 | green | 22 |  | 22 | yellow | 22 |  | 22 | red | 22 |
| 23 | green | 23 |  | 23 | yellow | 23 |  | 23 | red | 23 |
| 24 | green | 24 |  | 24 | yellow | 24 |  | 24 | red | 24 |
| 25 | green | 25 |  | 25 | yellow | 25 |  | 25 | red | 25 |
| 26 | green | 26 |  | 26 | yellow | 28 |  | 26 | red | 30 |
| 27 | green | 27 |  | 27 | yellow | 27 |  | 27 | red | 27 |
| 28 | green | 28 |  | 28 | yellow | 28 |  | 28 | red | 30 |
| 29 | green | 29 |  | 29 | yellow | 29 |  | 29 | red | 29 |
| 30 | green | 30 |  | 30 | yellow | 30 |  | 30 | red | 30 |
| 31 | green | 31 |  | 31 | yellow | 31 |  | 31 | red | 31 |
| 32 | green | 32 |  | 32 | yellow | 32 |  | 32 | red | 32 |
| 33 | green | 33 |  | 33 | yellow | 33 |  | 33 | red | 33 |
| 34 | green | 34 |  | 34 | yellow | 36 |  | 34 | red | 38 |
| 35 | green | 35 |  | 35 | yellow | 35 |  | 35 | red | 35 |
| 36 | green | 36 |  | 36 | yellow | 36 |  | 36 | red | 38 |
| 37 | green | 37 |  | 37 | yellow | 37 |  | 37 | red | 37 |
| 38 | green | 38 |  | 38 | yellow | 38 |  | 38 | red | 38 |
| 39 | green | 39 |  | 39 | yellow | 39 |  | 39 | red | 39 |
| 40 | green | 40 |  | 40 | yellow | 40 |  | 40 | red | 40 |
| 41 | green | 41 |  | 41 | yellow | 41 |  | 41 | red | 41 |
| 42 | green | 42 |  | 42 | yellow | 42 |  | 42 | red | 42 |
| 43 | green | 43 |  | 43 | yellow | 43 |  | 43 | red | 43 |
| 44 | green | 44 |  | 44 | yellow | 44 |  | 44 | red | 44 |
| 45 | green | 45 |  | 45 | yellow | 45 |  | 45 | red | 45 |
| 46 | green | 46 |  | 46 | yellow | 46 |  | 46 | red | 46 |
| 47 | green | 47 |  | 47 | yellow | 47 |  | 47 | red | 47 |
| 48 | green | 48 |  | 48 | yellow | 48 |  | 48 | red | 48 |
| 49 | green | 49 |  | 49 | yellow | 49 |  | 49 | red | 49 |
| 50 | green | 50 |  | 50 | yellow | 50 |  | 50 | red | 50 |
| 51 | green | 51 |  | 51 | yellow | 51 |  | 51 | red | 51 |
| 52 | green | 52 |  | 52 | yellow | 52 |  | 52 | red | 52 |
| 53 | green | 53 |  | 53 | yellow | 53 |  | 53 | red | 53 |
| 54 | green | 54 |  | 54 | yellow | 54 |  | 54 | red | 54 |
| 55 | green | 55 |  | 55 | yellow | 55 |  | 55 | red | 55 |
| 56 | green | 56 |  | 56 | yellow | 56 |  | 56 | red | 56 |
| 57 | green | 57 |  | 57 | yellow | 57 |  | 57 | red | 57 |
| 58 | green | 58 |  | 58 | yellow | 58 |  | 58 | red | 58 |
| 59 | green | 59 |  | 59 | yellow | 59 |  | 59 | red | 59 |
| 60 | green | 60 |  | 60 | yellow | 60 |  | 60 | red | 60 |
| 61 | green | 61 |  | 61 | yellow | 61 |  | 61 | red | 61 |
| 62 | green | 62 |  | 62 | yellow | 62 |  | 62 | red | 62 |
| 63 | green | 63 |  | 63 | yellow | 63 |  | 63 | red | 63 |

---

#### VTEP4

```
VTEP4#show run qos
qos enable
qos remark dscp
!
!
qos profile queue-color-to-cos QUEUE_COS
  queue 6 color all cos 2
!
qos profile dscp-to-queue DSCP_QUEUE
  dscp 56 queue 6
!
qos profile dscp-to-dscp DSCP_DSCP
  dscp 20 color all dscp 32
!
!
!
!
interface irb2001
  qos map-profile dscp-to-dscp DSCP_DSCP
!
VTEP4#show run nvo vxlan
!
nvo vxlan enable
!
nvo vxlan irb
!
evpn vxlan multihoming enable
!
nvo vxlan vtep-ip-global 4.4.4.4
!
nvo vxlan tunnel qos-map-mode cos-dscp ingress DSCP_QUEUE
!
nvo vxlan id 101 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp L2VRF1
  vni-name VNI-101
!
nvo vxlan id 201 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp L2VRF2
  evpn irb2001
  vni-name VNI-201
!
nvo vxlan access-if port-vlan xe3 20
  map vnid 201
  mac 0000.5555.1020 ip 21.21.21.101
  map qos-profile queue-color-to-cos QUEUE_COS
!
!
VTEP4#show nvo vxlan tunnel
VxLAN Network tunnel Entries
```

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 4.4.4.4 | 2.2.2.2     | Installed | 00:28:32 | 00:28:32 |
| 4.4.4.4 | 1.1.1.1     | Installed | 00:28:38 | 00:28:38 |
| 4.4.4.4 | 5.5.5.5     | Installed | 00:28:31 | 00:28:31 |

Total number of entries are 3

VTEP4#show nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port

AC - Access Port

(u) - Untagged

| VNID     | VNI-Name | VNI-Type | Type | Interface | ESI  | VLAN              | DF-Status |
|----------|----------|----------|------|-----------|------|-------------------|-----------|
| Src-Addr | Dst-Addr |          |      |           |      |                   |           |
| 101      | VNI-101  | L2       | NW   | ----      | ---- | ----              | ----      |
| 4.4.4.4  | 2.2.2.2  |          |      |           |      |                   |           |
| 101      | VNI-101  | L2       | NW   | ----      | ---- | ----              | ----      |
| 4.4.4.4  | 1.1.1.1  |          |      |           |      |                   |           |
| 101      | VNI-101  | L2       | NW   | ----      | ---- | ----              | ----      |
| 4.4.4.4  | 5.5.5.5  |          |      |           |      |                   |           |
| 201      | VNI-201  | L2       | NW   | ----      | ---- | ----              | ----      |
| 4.4.4.4  | 2.2.2.2  |          |      |           |      |                   |           |
| 201      | VNI-201  | L2       | NW   | ----      | ---- | ----              | ----      |
| 4.4.4.4  | 1.1.1.1  |          |      |           |      |                   |           |
| 201      | VNI-201  | L2       | NW   | ----      | ---- | ----              | ----      |
| 4.4.4.4  | 5.5.5.5  |          |      |           |      |                   |           |
| 201      | VNI-201  | --       | AC   | xe3       | ---  | Single Homed Port | ---       |
| ----     | ----     | ----     |      |           |      | 20                | ----      |
| 1000     | ----     | L3       | NW   | ----      | ---- | ----              | ----      |
| 4.4.4.4  | 5.5.5.5  |          |      |           |      |                   |           |

Total number of entries are 8

VTEP4#show nvo vxlan arp-cache

VxLAN ARP-CACHE Information

=====

| VNID | Ip-Addr      | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|--------------|----------------|---------------|---------|--------------|
| 201  | 21.21.21.51  | 0000.2222.1020 | Static Remote | ----    |              |
| 201  | 21.21.21.1   | 3c2c.991a.da7a | Static Local  | ----    |              |
| 201  | 21.21.21.101 | 0000.5555.1020 | Static Local  | ----    |              |
| 101  | 11.11.11.51  | 0000.2222.1010 | Static Remote | ----    |              |
| 101  | 11.11.11.1   | 04f8.f82f.8eee | Static Remote | ----    |              |
| 101  | 11.11.11.201 | 0000.4444.1010 | Static Remote | ----    |              |

Total number of entries are 6

VTEP4#show nvo vxlan nd-cache

VxLAN ND-CACHE Information

=====

| VNID         | Ip-Addr | Mac-Addr | Type | Age-Out |
|--------------|---------|----------|------|---------|
| Retries-Left |         |          |      |         |

```

201      2121::1          3c2c.991a.da7a Static Local      ----
101      1111::1          04f8.f82f.8eee Static Remote     ----

```

Total number of entries are 2

VTEP4#show ipv4 route vrf L3VRF1

```

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP
       O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,
       ia - IS-IS inter area, E - EVPN,
       v - vrf leaked
       * - candidate default

```

IP Route Table for VRF "L3VRF1"

```

B      5.5.5.5/32 [0/0] is directly connected, tunvxlan1000, 00:01:03
B      11.11.11.0/24 [200/0] via 5.5.5.5 (recursive is directly connected,
tunvxlan1000), 00:01:03
C      21.21.21.0/24 is directly connected, irb2001, 00:03:31
C      127.0.0.0/8 is directly connected, lo.L3VRF1, 00:15:13

```

Gateway of last resort is not set

VTEP4#show ipv6 route vrf L3VRF1

IPv6 Routing Table

```

Codes: K - kernel route, C - connected, S - static, D- DHCP, R - RIP,
       O - OSPF, IA - OSPF inter area, E1 - OSPF external type 1,
       E2 - OSPF external type 2, E - EVPN N1 - OSPF NSSA external type 1,
       N2 - OSPF NSSA external type 2, i - IS-IS, B - BGP,
       v - vrf leaked

```

Timers: Uptime

IP Route Table for VRF "L3VRF1"

```

C      ::1/128 via ::, lo.L3VRF1, 00:15:18
B      ::ffff:505:505/128 [0/0] via ::, tunvxlan1000, 00:01:08
B      1111::/64 [200/0] via ::ffff:505:505 (recursive via ::, unknown), 00:01:08
C      2121::/64 via ::, irb2001, 00:03:36
C      fe80::/64 via ::, irb2001, 00:03:36

```

VTEP4#show nvo vxlan l3vni-map

```

L3VNI      L2VNI      IRB-interface
=====
1000      201      irb2001

```

VTEP4#show interface xe3 counter queue-stats

E - Egress, I - Ingress, Q-Size is in bytes

```

+-----+-----+-----+-----+-----+
+-----+
| Queue/Class-map | Q-Size | Tx pkts | Tx bytes | Dropped pkts |
| Dropped bytes  |        |         |          |                |
+-----+-----+-----+-----+-----+
+-----+

```

|    |                      |            |   |   |
|----|----------------------|------------|---|---|
| q0 | (E) 12517376 0       | 0          | 0 | 0 |
| q1 | (E) 12517376 0       | 0          | 0 | 0 |
| q2 | (E) 12517376 0       | 0          | 0 | 0 |
| q3 | (E) 12517376 0       | 0          | 0 | 0 |
| q4 | (E) 12517376 0       | 0          | 0 | 0 |
| q5 | (E) 12517376 0       | 0          | 0 | 0 |
| q6 | (E) 12517376 2219303 | 3209162748 | 0 | 0 |
| q7 | (E) 12517376 0       | 0          | 0 | 0 |

```
VTEP4#show qos-profile QUEUE_COS
profile name: QUEUE_COS
profile type: queue-color-to-cos
profile attached to 1 instances
configured mapping:
  queue 6 color all cos 2
Detailed mapping:
```

| INPUT |       |     | OUTPUT |        |     | INPUT |       |     | OUTPUT |       |     | INPUT |       |     | OUTPUT |       |     |
|-------|-------|-----|--------|--------|-----|-------|-------|-----|--------|-------|-----|-------|-------|-----|--------|-------|-----|
| Queue | Color | COS | Queue  | Color  | COS | Queue | Color | COS | Queue  | Color | COS | Queue | Color | COS | Queue  | Color | COS |
| 0     | green | 0   | 0      | yellow | 0   | 0     | red   | 0   | 0      | red   | 0   | 0     | red   | 0   | 0      | red   | 0   |
| 1     | green | 1   | 1      | yellow | 1   | 1     | red   | 1   | 1      | red   | 1   | 1     | red   | 1   | 1      | red   | 1   |
| 2     | green | 2   | 2      | yellow | 2   | 2     | red   | 2   | 2      | red   | 2   | 2     | red   | 2   | 2      | red   | 2   |
| 3     | green | 3   | 3      | yellow | 3   | 3     | red   | 3   | 3      | red   | 3   | 3     | red   | 3   | 3      | red   | 3   |
| 4     | green | 4   | 4      | yellow | 4   | 4     | red   | 4   | 4      | red   | 4   | 4     | red   | 4   | 4      | red   | 4   |
| 5     | green | 5   | 5      | yellow | 5   | 5     | red   | 5   | 5      | red   | 5   | 5     | red   | 5   | 5      | red   | 5   |
| 6     | green | 2   | 6      | yellow | 2   | 6     | red   | 2   | 6      | red   | 2   | 6     | red   | 2   | 6      | red   | 2   |
| 7     | green | 7   | 7      | yellow | 7   | 7     | red   | 7   | 7      | red   | 7   | 7     | red   | 7   | 7      | red   | 7   |

```
VTEP4#show qos-profile DSCP_QUEUE
profile name: DSCP_QUEUE
profile type: dscp-to-queue
profile attached to 1 instances
configured mapping:
  dscp 56 queue 6
Detailed mapping:
```

| INPUT |       |       |          | OUTPUT |       |       |          | INPUT |       |       |          | OUTPUT |       |       |          | INPUT |       |       |          | OUTPUT |       |       |          |       |       |       |          |      |       |       |          |   |
|-------|-------|-------|----------|--------|-------|-------|----------|-------|-------|-------|----------|--------|-------|-------|----------|-------|-------|-------|----------|--------|-------|-------|----------|-------|-------|-------|----------|------|-------|-------|----------|---|
| DSCP  | Queue | Color | Out DSCP | DSCP   | Queue | Color | Out DSCP | DSCP  | Queue | Color | Out DSCP | DSCP   | Queue | Color | Out DSCP | DSCP  | Queue | Color | Out DSCP | DSCP   | Queue | Color | Out DSCP | DSCP  | Queue | Color | Out DSCP | DSCP | Queue | Color | Out DSCP |   |
| 0     | 0     | green | 0        | 16     | 2     | green | 16       | 32    | 4     | 16    | 2        | green  | 16    | 32    | 4        | 16    | 2     | green | 16       | 32     | 4     | 16    | 2        | green | 16    | 32    | 4        | 16   | 2     | green | 16       |   |
| green | 32    |       | 48       | 6      | green | 48    |          | 6     | green | 48    |          | 6      | green | 48    |          | 6     | green | 48    |          | 6      | green | 48    |          | 6     | green | 48    |          | 6    | green | 48    |          | 6 |
| 1     | 0     | green | 1        | 17     | 2     | green | 17       | 33    | 4     | 17    | 2        | green  | 17    | 33    | 4        | 17    | 2     | green | 17       | 33     | 4     | 17    | 2        | green | 17    | 33    | 4        | 17   | 2     | green | 17       |   |
| green | 33    |       | 49       | 6      | green | 49    |          | 6     | green | 49    |          | 6      | green | 49    |          | 6     | green | 49    |          | 6      | green | 49    |          | 6     | green | 49    |          | 6    | green | 49    |          | 6 |

VxLAN-EVPN with IRB QoS

|        |    |        |    |    |       |        |    |    |    |   |
|--------|----|--------|----|----|-------|--------|----|----|----|---|
| 2      | 0  | green  | 2  | 18 | 2     | green  | 18 | 34 | 4  |   |
| green  | 34 |        | 50 | 6  | green | 50     |    | 35 | 4  |   |
| 3      | 0  | green  | 3  | 19 | 2     | green  | 19 |    | 35 | 4 |
| green  | 35 |        | 51 | 6  | green | 51     |    | 36 | 4  |   |
| 4      | 0  | green  | 4  | 20 | 2     | yellow | 20 |    | 36 | 4 |
| yellow | 36 |        | 52 | 6  | green | 52     |    | 37 | 4  |   |
| 5      | 0  | green  | 5  | 21 | 2     | green  | 21 |    | 37 | 4 |
| green  | 37 |        | 53 | 6  | green | 53     |    | 38 | 4  |   |
| 6      | 0  | green  | 6  | 22 | 2     | yellow | 22 |    | 38 | 4 |
| yellow | 38 |        | 54 | 6  | green | 54     |    | 39 | 4  |   |
| 7      | 0  | green  | 7  | 23 | 2     | green  | 23 |    | 39 | 4 |
| green  | 39 |        | 55 | 6  | green | 55     |    | 40 | 5  |   |
| 8      | 1  | green  | 8  | 24 | 3     | green  | 24 |    | 40 | 5 |
| green  | 40 |        | 56 | 6  | green | 56     |    | 41 | 5  |   |
| 9      | 1  | green  | 9  | 25 | 3     | green  | 25 |    | 41 | 5 |
| green  | 41 |        | 57 | 7  | green | 57     |    | 42 | 5  |   |
| 10     | 1  | green  | 10 | 26 | 3     | green  | 26 |    | 42 | 5 |
| green  | 42 |        | 58 | 7  | green | 58     |    | 43 | 5  |   |
| 11     | 1  | green  | 11 | 27 | 3     | green  | 27 |    | 43 | 5 |
| green  | 43 |        | 59 | 7  | green | 59     |    | 44 | 5  |   |
| 12     | 1  | yellow | 12 | 28 | 3     | yellow | 28 |    | 44 | 5 |
| green  | 44 |        | 60 | 7  | green | 60     |    | 45 | 5  |   |
| 13     | 1  | green  | 13 | 29 | 3     | green  | 29 |    | 45 | 5 |
| green  | 45 |        | 61 | 7  | green | 61     |    | 46 | 5  |   |
| 14     | 1  | yellow | 14 | 30 | 3     | yellow | 30 |    | 46 | 5 |
| green  | 46 |        | 62 | 7  | green | 62     |    | 47 | 5  |   |
| 15     | 1  | green  | 15 | 31 | 3     | green  | 31 |    | 47 | 5 |
| green  | 47 |        | 63 | 7  | green | 63     |    |    |    |   |

VTEP4#show qos-profile DSCP\_DSCP

profile name: DSCP\_DSCP

profile type: dscp-to-dscp

profile attached to 1 instances

configured mapping:

dscp 20 color all dscp 32

Detailed mapping:

| -----+----- |       |          | -----+----- |       |          | -----+----- |       |          |             |       |          |
|-------------|-------|----------|-------------|-------|----------|-------------|-------|----------|-------------|-------|----------|
| INPUT       |       |          | OUTPUT      |       |          | INPUT       |       |          | OUTPUT      |       |          |
| -----+----- |       |          | -----+----- |       |          | -----+----- |       |          | -----+----- |       |          |
| DSCP        | Color | Out DSCP | DSCP        | Color | Out DSCP | DSCP        | Color | Out DSCP | DSCP        | Color | Out DSCP |
| -----+----- |       |          | -----+----- |       |          | -----+----- |       |          | -----+----- |       |          |
| 0           | green | 0        |             | 0     | yellow   | 0           |       | 0        | red         | 0     |          |
| 1           | green | 1        |             | 1     | yellow   | 1           |       | 1        | red         | 1     |          |
| 2           | green | 2        |             | 2     | yellow   | 2           |       | 2        | red         | 2     |          |
| 3           | green | 3        |             | 3     | yellow   | 3           |       | 3        | red         | 3     |          |
| 4           | green | 4        |             | 4     | yellow   | 4           |       | 4        | red         | 4     |          |
| 5           | green | 5        |             | 5     | yellow   | 5           |       | 5        | red         | 5     |          |
| 6           | green | 6        |             | 6     | yellow   | 6           |       | 6        | red         | 6     |          |
| 7           | green | 7        |             | 7     | yellow   | 7           |       | 7        | red         | 7     |          |
| 8           | green | 8        |             | 8     | yellow   | 8           |       | 8        | red         | 8     |          |
| 9           | green | 9        |             | 9     | yellow   | 9           |       | 9        | red         | 9     |          |

---

|    |       |    |  |    |        |    |  |    |     |    |
|----|-------|----|--|----|--------|----|--|----|-----|----|
| 10 | green | 10 |  | 10 | yellow | 12 |  | 10 | red | 14 |
| 11 | green | 11 |  | 11 | yellow | 11 |  | 11 | red | 11 |
| 12 | green | 12 |  | 12 | yellow | 12 |  | 12 | red | 14 |
| 13 | green | 13 |  | 13 | yellow | 13 |  | 13 | red | 13 |
| 14 | green | 14 |  | 14 | yellow | 14 |  | 14 | red | 14 |
| 15 | green | 15 |  | 15 | yellow | 15 |  | 15 | red | 15 |
| 16 | green | 16 |  | 16 | yellow | 16 |  | 16 | red | 16 |
| 17 | green | 17 |  | 17 | yellow | 17 |  | 17 | red | 17 |
| 18 | green | 18 |  | 18 | yellow | 20 |  | 18 | red | 22 |
| 19 | green | 19 |  | 19 | yellow | 19 |  | 19 | red | 19 |
| 20 | green | 32 |  | 20 | yellow | 32 |  | 20 | red | 32 |
| 21 | green | 21 |  | 21 | yellow | 21 |  | 21 | red | 21 |
| 22 | green | 22 |  | 22 | yellow | 22 |  | 22 | red | 22 |
| 23 | green | 23 |  | 23 | yellow | 23 |  | 23 | red | 23 |
| 24 | green | 24 |  | 24 | yellow | 24 |  | 24 | red | 24 |
| 25 | green | 25 |  | 25 | yellow | 25 |  | 25 | red | 25 |
| 26 | green | 26 |  | 26 | yellow | 28 |  | 26 | red | 30 |
| 27 | green | 27 |  | 27 | yellow | 27 |  | 27 | red | 27 |
| 28 | green | 28 |  | 28 | yellow | 28 |  | 28 | red | 30 |
| 29 | green | 29 |  | 29 | yellow | 29 |  | 29 | red | 29 |
| 30 | green | 30 |  | 30 | yellow | 30 |  | 30 | red | 30 |
| 31 | green | 31 |  | 31 | yellow | 31 |  | 31 | red | 31 |
| 32 | green | 32 |  | 32 | yellow | 32 |  | 32 | red | 32 |
| 33 | green | 33 |  | 33 | yellow | 33 |  | 33 | red | 33 |
| 34 | green | 34 |  | 34 | yellow | 36 |  | 34 | red | 38 |
| 35 | green | 35 |  | 35 | yellow | 35 |  | 35 | red | 35 |
| 36 | green | 36 |  | 36 | yellow | 36 |  | 36 | red | 38 |
| 37 | green | 37 |  | 37 | yellow | 37 |  | 37 | red | 37 |
| 38 | green | 38 |  | 38 | yellow | 38 |  | 38 | red | 38 |
| 39 | green | 39 |  | 39 | yellow | 39 |  | 39 | red | 39 |
| 40 | green | 40 |  | 40 | yellow | 40 |  | 40 | red | 40 |
| 41 | green | 41 |  | 41 | yellow | 41 |  | 41 | red | 41 |
| 42 | green | 42 |  | 42 | yellow | 42 |  | 42 | red | 42 |
| 43 | green | 43 |  | 43 | yellow | 43 |  | 43 | red | 43 |
| 44 | green | 44 |  | 44 | yellow | 44 |  | 44 | red | 44 |
| 45 | green | 45 |  | 45 | yellow | 45 |  | 45 | red | 45 |
| 46 | green | 46 |  | 46 | yellow | 46 |  | 46 | red | 46 |
| 47 | green | 47 |  | 47 | yellow | 47 |  | 47 | red | 47 |
| 48 | green | 48 |  | 48 | yellow | 48 |  | 48 | red | 48 |
| 49 | green | 49 |  | 49 | yellow | 49 |  | 49 | red | 49 |
| 50 | green | 50 |  | 50 | yellow | 50 |  | 50 | red | 50 |
| 51 | green | 51 |  | 51 | yellow | 51 |  | 51 | red | 51 |
| 52 | green | 52 |  | 52 | yellow | 52 |  | 52 | red | 52 |
| 53 | green | 53 |  | 53 | yellow | 53 |  | 53 | red | 53 |
| 54 | green | 54 |  | 54 | yellow | 54 |  | 54 | red | 54 |
| 55 | green | 55 |  | 55 | yellow | 55 |  | 55 | red | 55 |
| 56 | green | 56 |  | 56 | yellow | 56 |  | 56 | red | 56 |
| 57 | green | 57 |  | 57 | yellow | 57 |  | 57 | red | 57 |
| 58 | green | 58 |  | 58 | yellow | 58 |  | 58 | red | 58 |
| 59 | green | 59 |  | 59 | yellow | 59 |  | 59 | red | 59 |

---

VxLAN-EVPN with IRB QoS

|    |       |    |  |    |        |    |  |    |     |    |
|----|-------|----|--|----|--------|----|--|----|-----|----|
| 60 | green | 60 |  | 60 | yellow | 60 |  | 60 | red | 60 |
| 61 | green | 61 |  | 61 | yellow | 61 |  | 61 | red | 61 |
| 62 | green | 62 |  | 62 | yellow | 62 |  | 62 | red | 62 |
| 63 | green | 63 |  | 63 | yellow | 63 |  | 63 | red | 63 |

VTEP4#show qos-profile interface irb2001

profile name: default

profile type: dscp-to-queue (Ingress)

mapping:

| INPUT  |       | OUTPUT   |          | INPUT  |       | OUTPUT   |          | INPUT |   |
|--------|-------|----------|----------|--------|-------|----------|----------|-------|---|
| OUTPUT |       | INPUT    |          | OUTPUT |       | OUTPUT   |          | INPUT |   |
| DSCP   | Queue | Color    | Out DSCP | DSCP   | Queue | Color    | Out DSCP | DSCP  |   |
| Queue  | Color | Out DSCP | DSCP     | Queue  | Color | Out DSCP | DSCP     |       |   |
| 0      | 0     | green    | 0        | 16     | 2     | green    | 16       | 32    | 4 |
| green  | 32    |          | 48       | 6      | green | 2        | 48       |       |   |
| 1      | 0     | green    | 1        | 17     | 2     | green    | 17       | 33    | 4 |
| green  | 33    |          | 49       | 6      | green | 2        | 49       |       |   |
| 2      | 0     | green    | 2        | 18     | 2     | green    | 18       | 34    | 4 |
| green  | 34    |          | 50       | 6      | green | 2        | 50       |       |   |
| 3      | 0     | green    | 3        | 19     | 2     | green    | 19       | 35    | 4 |
| green  | 35    |          | 51       | 6      | green | 2        | 51       |       |   |
| 4      | 0     | green    | 4        | 20     | 2     | yellow   | 20       | 36    | 4 |
| yellow | 36    |          | 52       | 6      | green | 2        | 52       |       |   |
| 5      | 0     | green    | 5        | 21     | 2     | green    | 21       | 37    | 4 |
| green  | 37    |          | 53       | 6      | green | 2        | 53       |       |   |
| 6      | 0     | green    | 6        | 22     | 2     | yellow   | 22       | 38    | 4 |
| yellow | 38    |          | 54       | 6      | green | 2        | 54       |       |   |
| 7      | 0     | green    | 7        | 23     | 2     | green    | 23       | 39    | 4 |
| green  | 39    |          | 55       | 6      | green | 2        | 55       |       |   |
| 8      | 1     | green    | 8        | 24     | 3     | green    | 24       | 40    | 5 |
| green  | 40    |          | 56       | 7      | green | 3        | 56       |       |   |
| 9      | 1     | green    | 9        | 25     | 3     | green    | 25       | 41    | 5 |
| green  | 41    |          | 57       | 7      | green | 3        | 57       |       |   |
| 10     | 1     | green    | 10       | 26     | 3     | green    | 26       | 42    | 5 |
| green  | 42    |          | 58       | 7      | green | 3        | 58       |       |   |
| 11     | 1     | green    | 11       | 27     | 3     | green    | 27       | 43    | 5 |
| green  | 43    |          | 59       | 7      | green | 3        | 59       |       |   |
| 12     | 1     | yellow   | 12       | 28     | 3     | yellow   | 28       | 44    | 5 |
| green  | 44    |          | 60       | 7      | green | 3        | 60       |       |   |
| 13     | 1     | green    | 13       | 29     | 3     | green    | 29       | 45    | 5 |
| green  | 45    |          | 61       | 7      | green | 3        | 61       |       |   |
| 14     | 1     | yellow   | 14       | 30     | 3     | yellow   | 30       | 46    | 5 |
| green  | 46    |          | 62       | 7      | green | 3        | 62       |       |   |
| 15     | 1     | green    | 15       | 31     | 3     | green    | 31       | 47    | 5 |
| green  | 47    |          | 63       | 7      | green | 3        | 63       |       |   |

profile name: DSCP\_DSCP

profile type: dscp-to-dscp (Egress)

Status: Active



mapping:

| INPUT |       |          | OUTPUT |        |          | INPUT |       |          | OUTPUT |       |          | INPUT |       |          | OUTPUT |       |          |
|-------|-------|----------|--------|--------|----------|-------|-------|----------|--------|-------|----------|-------|-------|----------|--------|-------|----------|
| DSCP  | Color | Out DSCP | DSCP   | Color  | Out DSCP | DSCP  | Color | Out DSCP | DSCP   | Color | Out DSCP | DSCP  | Color | Out DSCP | DSCP   | Color | Out DSCP |
| 0     | green | 0        | 0      | yellow | 0        | 0     | red   | 0        | 0      | red   | 0        | 0     | red   | 0        | 0      | red   | 0        |
| 1     | green | 1        | 1      | yellow | 1        | 1     | red   | 1        | 1      | red   | 1        | 1     | red   | 1        | 1      | red   | 1        |
| 2     | green | 2        | 2      | yellow | 2        | 2     | red   | 2        | 2      | red   | 2        | 2     | red   | 2        | 2      | red   | 2        |
| 3     | green | 3        | 3      | yellow | 3        | 3     | red   | 3        | 3      | red   | 3        | 3     | red   | 3        | 3      | red   | 3        |
| 4     | green | 4        | 4      | yellow | 4        | 4     | red   | 4        | 4      | red   | 4        | 4     | red   | 4        | 4      | red   | 4        |
| 5     | green | 5        | 5      | yellow | 5        | 5     | red   | 5        | 5      | red   | 5        | 5     | red   | 5        | 5      | red   | 5        |
| 6     | green | 6        | 6      | yellow | 6        | 6     | red   | 6        | 6      | red   | 6        | 6     | red   | 6        | 6      | red   | 6        |
| 7     | green | 7        | 7      | yellow | 7        | 7     | red   | 7        | 7      | red   | 7        | 7     | red   | 7        | 7      | red   | 7        |
| 8     | green | 8        | 8      | yellow | 8        | 8     | red   | 8        | 8      | red   | 8        | 8     | red   | 8        | 8      | red   | 8        |
| 9     | green | 9        | 9      | yellow | 9        | 9     | red   | 9        | 9      | red   | 9        | 9     | red   | 9        | 9      | red   | 9        |
| 10    | green | 10       | 10     | yellow | 12       | 10    | red   | 14       | 10     | red   | 14       | 10    | red   | 14       | 10     | red   | 14       |
| 11    | green | 11       | 11     | yellow | 11       | 11    | red   | 11       | 11     | red   | 11       | 11    | red   | 11       | 11     | red   | 11       |
| 12    | green | 12       | 12     | yellow | 12       | 12    | red   | 14       | 12     | red   | 14       | 12    | red   | 14       | 12     | red   | 14       |
| 13    | green | 13       | 13     | yellow | 13       | 13    | red   | 13       | 13     | red   | 13       | 13    | red   | 13       | 13     | red   | 13       |
| 14    | green | 14       | 14     | yellow | 14       | 14    | red   | 14       | 14     | red   | 14       | 14    | red   | 14       | 14     | red   | 14       |
| 15    | green | 15       | 15     | yellow | 15       | 15    | red   | 15       | 15     | red   | 15       | 15    | red   | 15       | 15     | red   | 15       |
| 16    | green | 16       | 16     | yellow | 16       | 16    | red   | 16       | 16     | red   | 16       | 16    | red   | 16       | 16     | red   | 16       |
| 17    | green | 17       | 17     | yellow | 17       | 17    | red   | 17       | 17     | red   | 17       | 17    | red   | 17       | 17     | red   | 17       |
| 18    | green | 18       | 18     | yellow | 20       | 18    | red   | 22       | 18     | red   | 22       | 18    | red   | 22       | 18     | red   | 22       |
| 19    | green | 19       | 19     | yellow | 19       | 19    | red   | 19       | 19     | red   | 19       | 19    | red   | 19       | 19     | red   | 19       |
| 20    | green | 32       | 20     | yellow | 32       | 20    | red   | 32       | 20     | red   | 32       | 20    | red   | 32       | 20     | red   | 32       |
| 21    | green | 21       | 21     | yellow | 21       | 21    | red   | 21       | 21     | red   | 21       | 21    | red   | 21       | 21     | red   | 21       |
| 22    | green | 22       | 22     | yellow | 22       | 22    | red   | 22       | 22     | red   | 22       | 22    | red   | 22       | 22     | red   | 22       |
| 23    | green | 23       | 23     | yellow | 23       | 23    | red   | 23       | 23     | red   | 23       | 23    | red   | 23       | 23     | red   | 23       |
| 24    | green | 24       | 24     | yellow | 24       | 24    | red   | 24       | 24     | red   | 24       | 24    | red   | 24       | 24     | red   | 24       |
| 25    | green | 25       | 25     | yellow | 25       | 25    | red   | 25       | 25     | red   | 25       | 25    | red   | 25       | 25     | red   | 25       |
| 26    | green | 26       | 26     | yellow | 28       | 26    | red   | 30       | 26     | red   | 30       | 26    | red   | 30       | 26     | red   | 30       |
| 27    | green | 27       | 27     | yellow | 27       | 27    | red   | 27       | 27     | red   | 27       | 27    | red   | 27       | 27     | red   | 27       |
| 28    | green | 28       | 28     | yellow | 28       | 28    | red   | 30       | 28     | red   | 30       | 28    | red   | 30       | 28     | red   | 30       |
| 29    | green | 29       | 29     | yellow | 29       | 29    | red   | 29       | 29     | red   | 29       | 29    | red   | 29       | 29     | red   | 29       |
| 30    | green | 30       | 30     | yellow | 30       | 30    | red   | 30       | 30     | red   | 30       | 30    | red   | 30       | 30     | red   | 30       |
| 31    | green | 31       | 31     | yellow | 31       | 31    | red   | 31       | 31     | red   | 31       | 31    | red   | 31       | 31     | red   | 31       |
| 32    | green | 32       | 32     | yellow | 32       | 32    | red   | 32       | 32     | red   | 32       | 32    | red   | 32       | 32     | red   | 32       |
| 33    | green | 33       | 33     | yellow | 33       | 33    | red   | 33       | 33     | red   | 33       | 33    | red   | 33       | 33     | red   | 33       |
| 34    | green | 34       | 34     | yellow | 36       | 34    | red   | 38       | 34     | red   | 38       | 34    | red   | 38       | 34     | red   | 38       |
| 35    | green | 35       | 35     | yellow | 35       | 35    | red   | 35       | 35     | red   | 35       | 35    | red   | 35       | 35     | red   | 35       |
| 36    | green | 36       | 36     | yellow | 36       | 36    | red   | 38       | 36     | red   | 38       | 36    | red   | 38       | 36     | red   | 38       |
| 37    | green | 37       | 37     | yellow | 37       | 37    | red   | 37       | 37     | red   | 37       | 37    | red   | 37       | 37     | red   | 37       |
| 38    | green | 38       | 38     | yellow | 38       | 38    | red   | 38       | 38     | red   | 38       | 38    | red   | 38       | 38     | red   | 38       |
| 39    | green | 39       | 39     | yellow | 39       | 39    | red   | 39       | 39     | red   | 39       | 39    | red   | 39       | 39     | red   | 39       |
| 40    | green | 40       | 40     | yellow | 40       | 40    | red   | 40       | 40     | red   | 40       | 40    | red   | 40       | 40     | red   | 40       |
| 41    | green | 41       | 41     | yellow | 41       | 41    | red   | 41       | 41     | red   | 41       | 41    | red   | 41       | 41     | red   | 41       |

|    |       |    |  |    |        |    |  |    |     |    |
|----|-------|----|--|----|--------|----|--|----|-----|----|
| 42 | green | 42 |  | 42 | yellow | 42 |  | 42 | red | 42 |
| 43 | green | 43 |  | 43 | yellow | 43 |  | 43 | red | 43 |
| 44 | green | 44 |  | 44 | yellow | 44 |  | 44 | red | 44 |
| 45 | green | 45 |  | 45 | yellow | 45 |  | 45 | red | 45 |
| 46 | green | 46 |  | 46 | yellow | 46 |  | 46 | red | 46 |
| 47 | green | 47 |  | 47 | yellow | 47 |  | 47 | red | 47 |
| 48 | green | 48 |  | 48 | yellow | 48 |  | 48 | red | 48 |
| 49 | green | 49 |  | 49 | yellow | 49 |  | 49 | red | 49 |
| 50 | green | 50 |  | 50 | yellow | 50 |  | 50 | red | 50 |
| 51 | green | 51 |  | 51 | yellow | 51 |  | 51 | red | 51 |
| 52 | green | 52 |  | 52 | yellow | 52 |  | 52 | red | 52 |
| 53 | green | 53 |  | 53 | yellow | 53 |  | 53 | red | 53 |
| 54 | green | 54 |  | 54 | yellow | 54 |  | 54 | red | 54 |
| 55 | green | 55 |  | 55 | yellow | 55 |  | 55 | red | 55 |
| 56 | green | 56 |  | 56 | yellow | 56 |  | 56 | red | 56 |
| 57 | green | 57 |  | 57 | yellow | 57 |  | 57 | red | 57 |
| 58 | green | 58 |  | 58 | yellow | 58 |  | 58 | red | 58 |
| 59 | green | 59 |  | 59 | yellow | 59 |  | 59 | red | 59 |
| 60 | green | 60 |  | 60 | yellow | 60 |  | 60 | red | 60 |
| 61 | green | 61 |  | 61 | yellow | 61 |  | 61 | red | 61 |
| 62 | green | 62 |  | 62 | yellow | 62 |  | 62 | red | 62 |
| 63 | green | 63 |  | 63 | yellow | 63 |  | 63 | red | 63 |





## CHAPTER 11 VxLAN-IRB-Inter-VRF Route Leaking

A VRF is a mechanism used to provide logical separation between routing tables on the same router. It is locally significant to the router. Each interface on a router can only be assigned to one VRF, but a VRF can have multiple interfaces. VRF route leaking can be done using route-target import/export.

The routes of VRF catering shared services shall be leaked to tenant VRFs. The leaking of routes shall be possible over one overlay VRF to another overlay VRF. By doing so shared services like Internet access through gateway routes can be made possible. Introduction of this feature shall cater various use cases of shared services like storage / Internet access etc.

### Topology

The procedures in this section use the topology in [Figure 11-12](#).

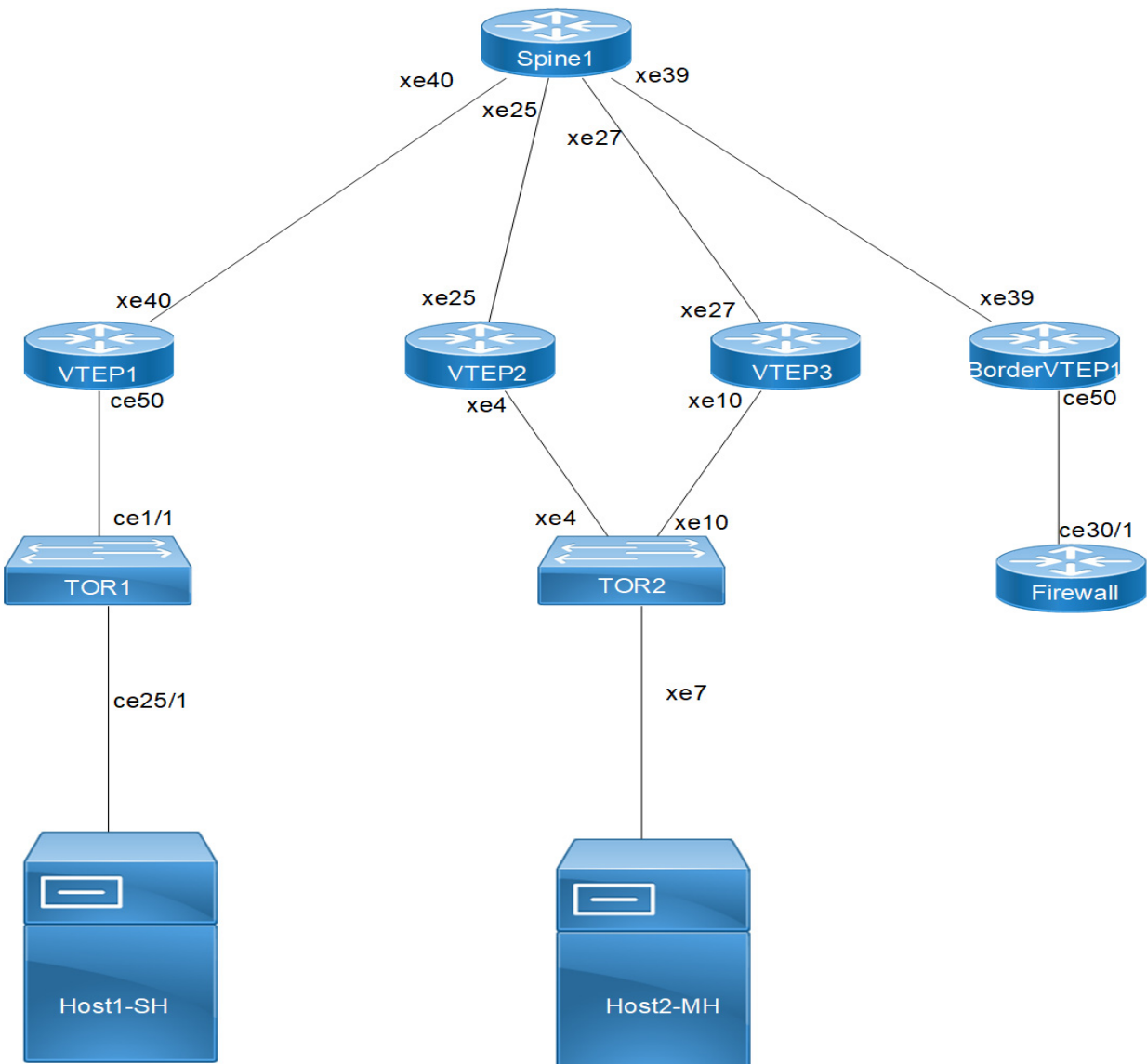


Figure 11-12: VxLAN\_EVPN\_IVRF

Note: SH means Single homing host and MH means Multihoming host.

## VTEP1

Single Home -SH

Hardware profile and generic configuration:

|   |   |
|---|---|
| #configure terminal                                 | Enter Configure mode.                                       |
| (config)#hardware-profile filter vxlan enable       | Enable hardware-profile filter for VxLAN.                   |
| (config)#hardware-profile filter vxlan-mh enable    | Enable hardware-profile filter for VxLAN multi-homing.      |
| (config)#nvo vxlan enable                           | Enable VxLAN  |
| (config)#nvo vxlan irb                              | Enable VxLAN irb  |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4.             |
| (config)#hardware-profile statistics ac-lif enable  | Enable ac-lif for vxlan access-if port counters             |
| (config)#qos enable                                 | Enabling qos  |
| (Config)# bfd interval 3 minrx 3 multiplier 3       | Configure bfd   |
| (config)#commit                                     | Commit the candidate configuration to running configuration |

Interface and loopback configuration:

|  |   |
|--|---|
| (config)#interface ce50                            | Enter Interface mode for ce50 (SH1)                         |
| (config-if)# description ***Connected to TOR1***   | Interface description                                       |
| (config-if)#switchport                             | Make it L2 interface  |
| (config-if)#exit                                   | Exit Interface mode and return to Configure mode.           |
| (config)#interface lo                              | Enter Interface mode for lo                                 |
| (config-if)#ip address 51.51.51.51/32 secondary    | Configure loopback ip address                               |
| (config-if)#exit                                   | Exit Interface mode and return to Configure mode.           |
| (config) interface xe40                            | Enter interface mode  |
| (config-if)# description ***Connected to Spine2*** | Interface description                                       |
| (config-if)# ip address 10.10.10.1/31              | Configure ip address on network side of Spine1              |
| (config-if)#exit                                   | Exit Interface mode and return to Configure mode.           |
| (config)#commit                                    | Commit the candidate configuration to running configuration |

OSPF configuration:

|  |                                      |
|--|--------------------------------------|
| (config)#router ospf 100                   | Enter into router OSPF mode          |
| (config-router)#ospf router-id 51.51.51.51 | Configure router-id as lo ip address |

|   |   |
|---|---|
| (config-router)#network 51.51.51.51/32 area 0.0.0.0 | Add lo ip address network into area 0                       |
| (config-router)#network 10.10.10.0/24 area 0.0.0.0  | Add Spine-connected network into area 0                     |
| (config-router)#bfd all-interfaces                  | Enabling bfd on all ospf interface for fast convergence     |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.           |
| (config)#commit                                     | Commit the candidate configuration to running configuration |

**BGP configuration:**

|   |  |
|---|--|
| (config)#router bgp 500                                       | Enter into Router BGP mode   |
| (config-router)#bgp router-id 51.51.51.51                     | Configure router-id as lo ip address                                       |
| (config-router)#neighbor 66.66.66.66 remote-as 500            | Specify a BorderVTEP1 loopback ip address and remote-as defined            |
| (config-router)#neighbor 66.66.66.66 update-source lo         | Configure update as loopback for BorderVTEP1                               |
| (config-router)#neighbor 66.66.66.66 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for BorderVTEP1 |
| (config-router)# no bgp default ipv4-unicast                  | It will avoid default ipv4 unicast routing                                 |
| (config-router)# address-family ipv4 unicast                  | Enter into IPV4 unicast address family mode                                |
| (config-router-af)# neighbor 66.66.66.66 activate             | Activate BorderVTEP1 into ipv4 unicast family                              |
| (config-router-af)# exit-address-family                       | Exit from IPV4 unicast address family                                      |
| (config-router)#address-family l2vpn evpn                     | Enter into l2vpn EVPN address family mode                                  |
| (config-router-af)#neighbor 66.66.66.66 activate              | Activate BorderVTEP1 into l2vpn evpn address family mode                   |
| (config-router-af)#exit-address-family                        | Exit from l2vpn address family mode  |
| (config-router)#exit  | Exit from Router BGP mode and enter into config mode                       |
| (config)#commit   | Commit the candidate configuration to running configuration                |

**L2 VRF Configuration:**

|   |  |
|---|--|
| (config)# mac vrf RED                     | Create mac routing/forwarding instance with RED name and enter into vrf mode                 |
| (config-vrf)# rd 2.3.4.5:1                | Assign RD value  |
| (config-vrf)# route-target both 6000:6000 | Assign route-target value for same for import and export. Should be same on all node for RED |
| (config-vrf)#exit                         | Exit from vrf mode   |
| (config)#commit                           | Commit the candidate configuration to running configuration                                  |

**L3 VRF and BGP Configuration:**

|   |  |
|---|--|
| (config)# ip vrf FAX                      | Create mac routing/forwarding instance with FAX name and enter into vrf mode |
| (config-vrf)# rd 51.51.51.51:1050         | Assign RD value  |
| (config-vrf)# route-target both 1050:1050 | Assign route-target value for same for import and export.                    |

## VxLAN-IRB-Inter-VRF Route Leaking

|   |   |
|---|---|
| (config-vrf)# l3vni 10502                   | Configure L3VNI as 10502 for FAX vrf                        |
| (config-vrf)#exit                           | Exit from vrf mode  |
| (config)# interface irb 1050                | Configure irb interface 1050                                |
| (config-if)ip vrf forwarding FAX            | Configure FAX   |
| (config-if) ip address 10.12.32.1/24        | Configure ip address  |
| (config-if)exit                             | Exit from interface config mode                             |
| (config)#commit                             | Commit the candidate configuration to running configuration |
| (config)router bgp 500                      | Enter into bgp router mode                                  |
| (config-router)#address-family ipv4 vrf FAX | Enter into address-family mode for FAX                      |
| (config-router-af)#redistribute connected   | Redistribute connected                                      |
| (config-router-af)#exit-address-family      | Exit form address-family                                    |
| (config-router)#exit                        | Exit from router bgp configuration mode                     |
| (config)#commit                             | Commit the candidate configuration to running configuration |

### VxLAN configuration:

|   |   |
|---|---|
| (config)#nvo vxlan vtep-ip-global 51.51.51.51                     | Configure Source vtep-ip-global configuration. Use loopback ip address  |
| (config)#nvo vxlan id 1050 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp RED        | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb1050  | Configure irb1050 under vxlan id 1050   |
| (config)# nvo vxlan access-if port-vlan ce50 1050                 | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN)   |
| (config-nvo-acc-if)# map vnid 1050                                | Map VxLAN Identified to access-port for VxLAN   |
| (config-nvo-acc-if)# mac 0000.3333.1050 ip 10.12.32.10            | Configure static mac-ip   |
| (config-nvo-acc-if)#exit  | Exit from VxLAN access-interface mode and enter into configuration mode                                       |
| (config)#commit   | Commit the candidate configuration to running configuration   |

### VTEP2

(Multi-homed group) - Part of both Multi-homed with po1000(MH).

### Hardware profile and generic configuration:

|  |  |
|--|--|
| #configure terminal                              | Enter Configure mode.                                  |
| (config)#hardware-profile filter vxlan enable    | Enable hardware-profile filter for VxLAN.              |
| (config)#hardware-profile filter vxlan-mh enable | Enable hardware-profile filter for VxLAN multi-homing. |
| (config)#nvo vxlan enable                        | Enable VxLAN   |
| (config)#nvo vxlan irb                           | Enable VxLAN irb                                       |



|  |   |
|--|---|
| (config)# evpn irb-forwarding anycast-gateway-mac 0000.2222.3333 | Configure Anycast gateway mac                               |
| (config)#hardware-profile filter egress-ipv4 enable              | Enable hardware-profile filter for egress IPv4.             |
| (Config)#hardware-profile statistics ac-lif enable               | Enable ac-lif for vxlan access-if port counters             |
| (Config)#qos enable  | Enabling qos  |
| (Config)# bfd interval 3 minrx 3 multiplier 3                    | Configure bfd   |
| (config)#commit  | Commit the candidate configuration to running configuration |

### Interface and loopback configuration:

|   |   |
|---|---|
| (config)#interface xe4                                  | Enter Interface mode for xe4(MH)                            |
| (config-if)# description ***Connected to TOR2***        | Interface description                                       |
| (config-if)# channel-group 1000 mode active             | Make it member of po1000                                    |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.           |
| (config)# interface po1000                              | Enter into po1000 mode                                      |
| (config-if)# switchport                                 | Configure L2 mode   |
| (config-if)# evpn multi-homed system-mac 0000.4444.5555 | Configure System mac  |
| (config)#interface lo                                   | Enter Interface mode for lo                                 |
| (config-if)#ip address 60.60.60.60/32                   | Configure loopback ip address                               |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.           |
| (config) interface xe25                                 | Enter interface mode  |
| (config-if)# description ***Connected to Spine1***      | Interface description                                       |
| (config-if)# ip address ip address 10.10.12.1/31        | Configure ip address on network side of Spine1              |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.           |
| (config)#commit   | Commit the candidate configuration to running configuration |

### OSPF configuration:

|   |   |
|---|---|
| (config)#router ospf 100                            | Enter into router OSPF mode                                 |
| (config-router)#ospf router-id 60.60.60.60          | Configure router-id as lo ip address                        |
| (config-router)#network 60.60.60.60/32 area 0.0.0.0 | Add lo ip address network into area 0                       |
| (config-router)#network 10.10.12.0/24 area 0.0.0.0  | Add Spine-connected network into area 0                     |
| (config-router)#bfd all-interfaces                  | Enabling bfd on all ospf interface for fast convergence     |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.           |
| (config)#commit                                     | Commit the candidate configuration to running configuration |

**BGP configuration:**

|   |  |
|---|--|
| (config)#router bgp 500                                       | Enter into Router BGP mode   |
| (config-router)#bgp router-id 60.60.60.60                     | Configure router-id as lo ip address                                       |
| (config-router)#neighbor 66.66.66.66 remote-as 500            | Specify a BorderVTEP1 loopback ip address and remote-as defined            |
| (config-router)#neighbor 66.66.66.66 update-source lo         | Configure update as loopback for BorderVTEP1                               |
| (config-router)#neighbor 66.66.66.66 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for BorderVTEP1 |
| (config-router)#neighbor 76.76.76.76 remote-as 500            | Specify a VTEP3 loopback ip address and remote-as defined                  |
| (config-router)#neighbor 76.76.76.76 update-source lo         | Configure update as loopback for VTEP3                                     |
| (config-router)#neighbor 76.76.76.76 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP3       |
| (config-router)# no bgp default ipv4-unicast                  | It will avoid default ipv4 unicast routing                                 |
| (config-router)# address-family ipv4 unicast                  | Enter into IPV4 unicast address family mode                                |
| (config-router-af)# neighbor 66.66.66.66 activate             | Activate BorderVTEP1 into ipv4 unicast family                              |
| (config-router-af)# neighbor 76.76.76.76 activate             | Activate VTEP3 into ipv4 unicast family                                    |
| (config-router-af)# exit-address-family                       | Exit from IPV4 unicast address family                                      |
| (config-router)#address-family l2vpn evpn                     | Enter into l2vpn EVPN address family mode                                  |
| (config-router-af)#neighbor 66.66.66.66 activate              | Activate BorderVTEP1 into l2vpn evpn address family mode                   |
| (config-router-af)#neighbor 76.76.76.76 activate              | Activate VTEP3 into l2vpn evpn address family mode                         |
| (config-router-af)#exit-address-family                        | Exit from l2vpn address family mode  |
| (config-router)#exit  | Exit from Router BGP mode and enter into config mode                       |
| (config)#commit   | Commit the candidate configuration to running configuration                |

**L2 VRF Configuration:**

|   |  |
|---|--|
| (config)# mac vrf RED                     | Create mac routing/forwarding instance with RED name and enter into vrf mode                 |
| (config-vrf)# rd 2.3.4.5:2                | Assign RD value  |
| (config-vrf)# route-target both 6000:6000 | Assign route-target value for same for import and export. Should be same on all node for RED |
| (config-vrf)#exit                         | Exit from vrf mode   |
| (config)#commit                           | Commit the candidate configuration to running configuration                                  |

**L3 VRF and BGP Configuration:**

|                                   |  |
|-----------------------------------|--|
| (config)# ip vrf SMS              | Create mac routing/forwarding instance with SMS name and enter into vrf mode |
| (config-vrf)# rd 60.60.60.60:1040 | Assign RD value  |

|  |   |
|--|---|
| (config-vrf)# route-target both 1040:1040              | Assign route-target value for same for import and export.   |
| (config-vrf)# l3vni 10402                              | Configure L3VNI as 10402 for SMS vrf                        |
| (config-vrf)#exit                                      | Exit from vrf mode  |
| (config)# interface irb 1060                           | Configure irb interface 1060                                |
| (config-if) ip vrf forwarding SMS                      | Configure ip vrf forwarding                                 |
| (config-if) ip address 10.240.38.1/24                  | Configure ip address  |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac | Anycast mac configured                                      |
| (config-if)exit  | Exit from interface config mode                             |
| (config)#commit  | Commit the candidate configuration to running configuration |
| (config)router bgp 500                                 | Enter into bgp router mode                                  |
| (config-router)#address-family ipv4 vrf SMS            | Enter into address-family mode for SMS                      |
| (config-router-af)#redistribute connected              | Redistribute connected                                      |
| (config-router-af)#exit-address-family                 | Exit form address-family                                    |
| (config)#commit  | Commit the candidate configuration to running configuration |

### VxLAN configuration:

|   |   |
|---|---|
| (config)#nvo vxlan vtep-ip-global 60.60.60.60                     | Configure Source vtep-ip-global configuration. Use loopback ip address  |
| (config)#nvo vxlan id 1060 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp RED        | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb1060  | Configure irb1060 under vxlan id 1060   |
| (config)# nvo vxlan access-if port-vlan po1000 1060               | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN) - Multihomed access port                      |
| (config-nvo-acc-if)# map vnid 1060                                | Map VxLAN Identified to access-port for VxLAN   |
| (config-nvo-acc-if)# mac 0000.2222.1060 ip 10.240.38.10           | Configure static mac-ip   |
| (config-nvo-acc-if)#exit  | Exit from VxLAN access-interface mode and enter into configuration mode                                       |
| (config)#commit   | Commit the candidate configuration to running configuration   |

### VTEP3

(Multi-homed group) - Part of both Multi-homed with po1000(MH).

### Hardware profile and generic configuration:

|  |  |
|--|--|
| #configure terminal                              | Enter Configure mode.                                  |
| (config)#hardware-profile filter vxlan enable    | Enable hardware-profile filter for VxLAN.              |
| (config)#hardware-profile filter vxlan-mh enable | Enable hardware-profile filter for VxLAN multi-homing. |
| (config)#nvo vxlan enable                        | Enable VxLAN   |

## VxLAN-IRB-Inter-VRF Route Leaking

|  |   |
|--|---|
| (config)#nvo vxlan irb   | Enable VxLAN irb  |
| (config)#commit  | Commit the candidate configuration to running configuration |
| (config)# evpn irb-forwarding anycast-gateway-mac 0000.2222.3333 | Configure Anycast gateway mac                               |
| (config)#hardware-profile filter egress-ipv4 enable              | Enable hardware-profile filter for egress IPv4.             |
| (config)#hardware-profile statistics ac-lif enable               | Enable ac-lif for vxlan access-if port counters             |
| (config)#qos enable  | Enabling qos  |
| (config)# bfd interval 3 minrx 3 multiplier 3                    | Configure bfd   |
| (config)#commit  | Commit the candidate configuration to running configuration |

### Interface and loopback configuration:

|   |   |
|---|---|
| (config)#interface xe10                                 | Enter Interface mode for xe10(MH)                           |
| (config-if)# description ***Connected to TOR2***        | Interface description                                       |
| (config-if)# channel-group 1000 mode active             | Make it member of po1000                                    |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.           |
| (config)# interface po1000                              | Enter into po1000 mode                                      |
| (config-if)# switchport                                 | Configure L2 mode   |
| (config-if)# evpn multi-homed system-mac 0000.4444.5555 | Configure System mac  |
| (config)#interface lo                                   | Enter Interface mode for lo                                 |
| (config-if)#ip address 76.76.76.76/32                   | Configure loopback ip address                               |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.           |
| (config)#commit   | Commit the candidate configuration to running configuration |
| (config) interface xe27                                 | Enter interface mode  |
| (config-if)# description ***Connected to Spine1***      | Interface description                                       |
| (config-if)# ip address ip address 10.10.24.1/31        | Configure ip address on network side of Spine1              |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.           |
| (config)#commit   | Commit the candidate configuration to running configuration |

### OSPF configuration:

|   |   |
|---|---|
| (config)#router ospf 100                            | Enter into router OSPF mode                             |
| (config-router)#ospf router-id 76.76.76.76          | Configure router-id as lo ip address                    |
| (config-router)#network 76.76.76.76/32 area 0.0.0.0 | Add lo ip address network into area 0                   |
| (config-router)#network 10.10.24.0/24 area 0.0.0.0  | Add Spine-connected network into area 0                 |
| (config-router)#bfd all-interfaces                  | Enabling bfd on all ospf interface for fast convergence |

|                  |   |
|------------------|---|
| (config-if)#exit | Exit Interface mode and return to Configure mode.           |
| (config)#commit  | Commit the candidate configuration to running configuration |

**BGP configuration:**

|   |  |
|---|--|
| (config)#router bgp 500                                       | Enter into Router BGP mode   |
| (config-router)#bgp router-id 76.76.76.76                     | Configure router-id as lo ip address                                       |
| (config-router)#neighbor 66.66.66.66 remote-as 500            | Specify a BorderVTEP1 loopback ip address and remote-as defined            |
| (config-router)#neighbor 66.66.66.66 update-source lo         | Configure update as loopback for BorderVTEP1                               |
| (config-router)#neighbor 66.66.66.66 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for BorderVTEP1 |
| (config-router)#neighbor 60.60.60.60 remote-as 500            | Specify a VTEP2 loopback ip address and remote-as defined                  |
| (config-router)#neighbor 60.60.60.60 update-source lo         | Configure update as loopback for VTEP2                                     |
| (config-router)#neighbor 60.60.60.60 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP2       |
| (config-router)# no bgp default ipv4-unicast                  | It will avoid default ipv4 unicast routing                                 |
| (config-router)# address-family ipv4 unicast                  | Enter into IPV4 unicast address family mode                                |
| (config-router-af)# neighbor 66.66.66.66 activate             | Activate BorderVTEP1 into ipv4 unicast family                              |
| (config-router-af)# neighbor 60.60.60.60 activate             | Activate VTEP2 into ipv4 unicast family                                    |
| (config-router-af)# exit-address-family                       | Exit from IPV4 unicast address family                                      |
| (config-router)#address-family l2vpn evpn                     | Enter into l2vpn EVPN address family mode                                  |
| (config-router-af)#neighbor 66.66.66.66 activate              | Activate BorderVTEP1 into l2vpn evpn address family mode                   |
| (config-router-af)#neighbor 60.60.60.60 activate              | Activate VTEP2 into l2vpn evpn address family mode                         |
| (config-router-af)#exit-address-family                        | Exit from l2vpn address family mode  |
| (config-router)#exit  | Exit from Router BGP mode and enter into config mode                       |
| (config)#commit   | Commit the candidate configuration to running configuration                |

**L2 VRF Configuration:**

|   |  |
|---|--|
| (config)# mac vrf RED                     | Create mac routing/forwarding instance with RED name and enter into vrf mode                 |
| (config-vrf)# rd 2.3.4.6:2                | Assign RD value  |
| (config-vrf)# route-target both 6000:6000 | Assign route-target value for same for import and export. Should be same on all node for RED |
| (config-vrf)#exit                         | Exit from vrf mode   |
| (config)#commit                           | Commit the candidate configuration to running configuration                                  |

**L3 VRF and BGP Configuration:**

|  |  |
|--|--|
| (config)# ip vrf SMS                                   | Create mac routing/forwarding instance with SMS name and enter into vrf mode |
| (config-vrf)# rd 76.76.76.76:1040                      | Assign RD value  |
| (config-vrf)# route-target both 1040:1040              | Assign route-target value for same for import and export.                    |
| (config-vrf)# l3vni 10402                              | Configure L3VNI as 10402 for SMS vrf   |
| (config-vrf)#exit                                      | Exit from vrf mode   |
| (config)# interface irb 1060                           | Configure irb interface 1060   |
| (config-if)ip vrf forwarding SMS                       | Configure ip vrf forwarding  |
| (config-if) ip address 10.240.38.1/24                  | Configure ip address   |
| (config-if) evpn irb-if-forwarding anycast-gateway-mac | Anycast mac configured   |
| (config-if)exit  | Exit from interface config mode  |
| (config)#commit  | Commit the candidate configuration to running configuration                  |
| (config)router bgp 500                                 | Enter into bgp router mode   |
| (config-router)#address-family ipv4 vrf SMS            | Enter into address-family mode for SMS                                       |
| (config-router-af)#redistribute connected              | Redistribute connected   |
| (config-router-af)#exit-address-family                 | Exit form address-family   |
| (config)#commit  | Commit the candidate configuration to running configuration                  |

**VxLAN configuration:**

|   |   |
|---|---|
| (config)#nvo vxlan vtep-ip-global 76.76.76.76                     | Configure Source vtep-ip-global configuration. Use loopback ip address  |
| (config)#nvo vxlan id 1060 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp RED        | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb1060  | Configure irb1060 under vxlan id 1060   |
| (config)# nvo vxlan access-if port-vlan po1000 1060               | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN) - Multihomed access port                      |
| (config-nvo-acc-if)# map vnid 1060                                | Map VxLAN Identified to access-port for VxLAN   |
| (config-nvo-acc-if)# mac 0000.2222.1060 ip 10.240.38.10           | Configure static mac-ip   |
| (config-nvo-acc-if)#exit  | Exit from VxLAN access-interface mode and enter into configuration mode                                       |
| (config)#commit   | Commit the candidate configuration to running configuration   |

**BorderVTEP1**

**Hardware profile and generic configuration:**

|   |   |
|---|---|
| #configure terminal                           | Enter Configure mode.                     |
| (config)#hardware-profile filter vxlan enable | Enable hardware-profile filter for VxLAN. |

|   |   |
|---|---|
| (config)#hardware-profile filter vxlan-mh enable    | Enable hardware-profile filter for VxLAN multi-homing.      |
| (config)#nvo vxlan enable                           | Enable VxLAN  |
| (config)#nvo vxlan irb                              | Enable VxLAN irb  |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4.             |
| (Config)#hardware-profile statistics ac-lif enable  | Enable ac-lif for vxlan access-if port counters             |
| (Config)#qos enable                                 | Enabling qos  |
| (Config)# bfd interval 3 minrx 3 multiplier 3       | Configure bfd   |
| (config)#commit                                     | Commit the candidate configuration to running configuration |

### Interface and loopback configuration:

|  |   |
|--|---|
| (config)#interface ce50                            | Enter Interface mode  |
| (config-if)# description ***Connected to FW***     | Interface description                                       |
| (config-if)# switchport                            | Configure L2 mode   |
| (config)#interface lo                              | Enter Interface mode for lo                                 |
| (config-if)#ip address 66.66.66.66/32              | Configure loopback ip address                               |
| (config-if)#exit                                   | Exit Interface mode and return to Configure mode.           |
| (config) interface xe39                            | Enter interface mode  |
| (config-if)# description ***Connected to Spine1*** | Interface description                                       |
| (config-if)# ip address ip address 10.10.14.1/31   | Configure ip address on network side of Spine1              |
| (config-if)#exit                                   | Exit Interface mode and return to Configure mode.           |
| (config)#commit                                    | Commit the candidate configuration to running configuration |

### OSPF configuration:

|   |   |
|---|---|
| (config)#router ospf 100                            | Enter into router OSPF mode                                 |
| (config-router)#ospf router-id 66.66.66.66          | Configure router-id as lo ip address                        |
| (config-router)#network 66.66.66.66/32 area 0.0.0.0 | Add lo ip address network into area 0                       |
| (config-router)#network 10.10.24.0/24 area 0.0.0.0  | Add Spine-connected network into area 0                     |
| (config-router)#bfd all-interfaces                  | Enabling bfd on all ospf interface for fast convergence     |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.           |
| (config)#commit                                     | Commit the candidate configuration to running configuration |

### BGP configuration:

|   |                                      |
|---|--------------------------------------|
| (config)#router bgp 500                   | Enter into Router BGP mode           |
| (config-router)#bgp router-id 66.66.66.66 | Configure router-id as lo ip address |

## VxLAN-IRB-Inter-VRF Route Leaking

|   |  |
|---|--|
| (config-router)#neighbor 51.51.51.51 remote-as 500            | Specify a VTEP1 loopback ip address and remote-as defined            |
| (config-router)#neighbor 51.51.51.51 update-source lo         | Configure update as loopback for VTEP1                               |
| (config-router)#neighbor 51.51.51.51 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP1 |
| (config-router)#neighbor 60.60.60.60 remote-as 500            | Specify a VTEP2 loopback ip address and remote-as defined            |
| (config-router)#neighbor 60.60.60.60 update-source lo         | Configure update as loopback for VTEP2                               |
| (config-router)#neighbor 60.60.60.60 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP2 |
| (config-router)#neighbor 76.76.76.76 remote-as 500            | Specify a VTEP3 loopback ip address and remote-as defined            |
| (config-router)#neighbor 76.76.76.76 update-source lo         | Configure update as loopback for VTEP3                               |
| (config-router)#neighbor 76.76.76.76 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP3 |
| (config-router)# no bgp default ipv4-unicast                  | It will avoid default ipv4 unicast routing                           |
| (config-router)# address-family ipv4 unicast                  | Enter into IPV4 unicast address family mode                          |
| (config-router-af)# neighbor 51.51.51.51 activate             | Activate VTEP1 into ipv4 unicast family                              |
| (config-router-af)# neighbor 60.60.60.60 activate             | Activate VTEP2 into ipv4 unicast family                              |
| (config-router-af)# neighbor 76.76.76.76 activate             | Activate VTEP3 into ipv4 unicast family                              |
| (config-router-af)# exit-address-family                       | Exit from IPV4 unicast address family                                |
| (config-router)#address-family l2vpn evpn                     | Enter into l2vpn EVPN address family mode                            |
| (config-router-af)#neighbor 51.51.51.51 activate              | Activate VTEP1 into l2vpn evpn address family mode                   |
| (config-router-af)#neighbor 60.60.60.60 activate              | Activate VTEP2 into l2vpn evpn address family mode                   |
| (config-router-af)#neighbor 76.76.76.76 activate              | Activate VTEP3 into l2vpn evpn address family mode                   |
| (config-router-af)#exit-address-family                        | Exit from l2vpn address family mode                                  |
| (config-router)#exit  | Exit from Router BGP mode and enter into config mode                 |
| (config)#commit   | Commit the candidate configuration to running configuration          |

## L2 VRF Configuration:

|   |  |
|---|--|
| (config)# mac vrf RED                     | Create mac routing/forwarding instance with RED name and enter into vrf mode                 |
| (config-vrf)# rd 2.2.4.4:4                | Assign RD value  |
| (config-vrf)# route-target both 6000:6000 | Assign route-target value for same for import and export. Should be same on all node for RED |
| (config-vrf)#exit                         | Exit from vrf mode   |
| (config)#commit                           | Commit the candidate configuration to running configuration                                  |



## L3 VRF and BGP Configuration:

|  |  |
|--|--|
| (config)# ip vrf gvrif   | Create mac routing/forwarding instance with gvrif name and enter into vrf mode |
| (config-vrf)# rd 4.5.6.8:6                                       | Assign RD value  |
| (config-vrf)# route-target import 100:100                        | Assign route-target value for import from FAX vrf                              |
| (config-vrf)# route-target import 300:300                        | Assign route-target value for import from SMS vrf                              |
| (config-vrf)# route-target export 1000:1000                      | Assign route-target value for export from gvrif                                |
| (config-vrf)# l3vni 500  | Configure L3VNI as 500 for gvrif vrf   |
| (config-vrf)#exit  | Exit from vrf mode   |
| (config)# interface irb 1067                                     | Configure irb interface 1060   |
| (config-if) ip vrf forwarding gvrif                              | Configure ip vrf forwarding  |
| (config-if) ip address 10.10.18.1/24                             | Configure ip address   |
| (config-if)exit  | Exit from interface config mode  |
| (config)# ip vrf FAX   | Create mac routing/forwarding instance with FAX name and enter into vrf mode   |
| (config-vrf)# rd 66.66.66.66:1050                                | Assign RD value  |
| (config-vrf)# route-target both 1050:1050                        | Assign route-target value for same for import and export.                      |
| (config-vrf)# route-target export 100:100                        | Assign route-target value export from FAX                                      |
| (config-vrf)# route-target import 1000:1000                      | Assign route-target value for import from gvrif                                |
| (config-vrf)# l3vni 10502  | Configure L3VNI as 10502 for FAX vrf   |
| (config-vrf)#exit  | Exit from vrf mode   |
| (config)# ip vrf SMS   | Create mac routing/forwarding instance with SMS name and enter into vrf mode   |
| (config-vrf)# rd 66.66.66.66:1060                                | Assign RD value  |
| (config-vrf)# route-target both 1040:1040                        | Assign route-target value for same for import and export.                      |
| (config-vrf)# route-target export 300:300                        | Assign route-target value export from SMS                                      |
| (config-vrf)# route-target import 1000:1000                      | Assign route-target value for import from gvrif                                |
| (config-vrf)# l3vni 10402  | Configure L3VNI as 10402 for SMS vrf   |
| (config-vrf)#exit  | Exit from vrf mode   |
| (config)router bgp 500   | Enter into bgp router mode   |
| (config-router)#address-family ipv4 vrf gvrif                    | Enter into address-family mode for gvrif                                       |
| (config-router-af)#redistribute connected                        | Redistribute connected   |
| (config-router-af)# neighbor 10.10.18.2 remote-as 64603          | Add Firewall as neighbor   |
| (config-router-af)# neighbor 10.10.18.2 fall-over bfd            | Configure bfd for better convergence   |
| (config-router-af)# neighbor 10.10.18.2 activate                 | Activate the neighbor  |
| (config-router-af)# neighbor 10.10.18.2 advertisement-interval 0 | Configure interval 0 for better convergence                                    |
| (config-router-af)#exit-address-family                           | Exit form address-family   |

## VxLAN-IRB-Inter-VRF Route Leaking

|                      |   |
|----------------------|---|
| (config-router)#exit | Exit router mode.   |
| (config)#commit      | Commit the candidate configuration to running configuration |

### VxLAN configuration:

|  |   |
|--|---|
| (config)#nvo vxlan vtep-ip-global 66.66.66.66                      | Configure Source vtep-ip-global configuration. Use loopback ip address  |
| (config)# nvo vxlan id 1067 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp RED         | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)# evpn irb1067   | Configure irb1067 under vxlan id 1067   |
| (config)# nvo vxlan access-if port-vlan ce50 1067                  | Enable port-vlan mapping i.e. access port to outer-vlan (SVLAN) - Multihomed access port                      |
| (config-nvo-acc-if)# map vnid 1067                                 | Map VxLAN Identified to access-port for VxLAN   |
| (config-nvo-acc-if)#exit   | Exit from VxLAN access-interface mode and enter into configuration mode                                       |
| (config)#commit  | Commit the candidate configuration to running configuration   |

## Firewall

### Hardware profile and generic configuration:

|  |   |
|--|---|
| #configure terminal                          | Enter Configure mode.                                       |
| (Config)#qos enable                          | Enabling qos  |
| (Config)#bfd interval 3 minrx 3 multiplier 3 | Configure bfd   |
| (config)#commit                              | Commit the candidate configuration to running configuration |

### Interface and loopback configuration:

|   |   |
|---|---|
| #configure terminal                                     | Enter Configure mode.                                 |
| (config)# bridge 1 protocol rstp vlan-bridge            | Configure rstp vlan bridge                            |
| (config)# vlan database                                 |   |
| (config)#vlan 1067 bridge 1 state enable                | Configure vlans from 1067 and associate with bridge 1 |
| (config)#interface ce30/1                               | Enter Interface mode for ce30/1                       |
| (config-if)# description ***Connected to BorderVTEP1*** | Interface description                                 |
| (config-if)#bridge-group 1                              | Associate to bridge 1                                 |
| (config-if)# bridge-group 1 spanning-tree disable       | Configure stp disable                                 |
| (config-if)# switchport mode trunk                      | Mode as trunk   |
| (config-if)# switchport trunk allowed vlan add 1067     | Trunk allowed vlan as 1067                            |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.     |
| (config)#interface vlan1.1067                           | Enter Interface mode                                  |
| (config-if)# ip address 10.10.18.2/24                   | Configure ip address                                  |

|                                      |   |
|--------------------------------------|---|
| (config-if)#exit                     | Exit Interface mode and return to Configure mode.           |
| (config)#interface ce1/1             | Enter Interface mode  |
| (config-if)#ip address 10.10.20.1/24 | Configure ip address to advertise                           |
| (config-if)#exit                     | Exit Interface mode and return to Configure mode.           |
| (config)#commit                      | Commit the candidate configuration to running configuration |

**BGP configuration:**

|  |   |
|--|---|
| (Config)#router bgp 64603                                    | Enter into Router BGP mode                                  |
| (config-router)# neighbor 10.10.18.1 remote-as 500           | Specify a BorderVTEP1 gvrf ip address and remote-as defined |
| (config-router)# neighbor 10.10.18.1 fall-over bfd           | Configure fall-over bfd for fast convergence                |
| (config-router)#neighbor 10.10.18.1 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence  |
| (config-router)# address-family ipv4 unicast                 | Enter into IPV4 unicast address family mode                 |
| (config-router-af)# network 10.10.20.0/24                    | Add lo adders as network for advertise                      |
| (config-router-af)# max-paths ebgp 8                         | Add max path  |
| (config-router-af)# neighbor 10.10.18.1 default-originate    | Do default originate  |
| (config-router-af)# exit-address-family                      | Exit from IPV4 unicast address family                       |
| (config-router)#exit   |   |
| (config)#commit  | Commit the candidate configuration to running configuration |

**TOR1 (SH)**

|   |   |
|---|---|
| #configure terminal                                 | Enter Configure mode.                                 |
| (config)# bridge 1 protocol rstp vlan-bridge        | Configure rstp vlan bridge                            |
| (config)# vlan database                             |   |
| (config)#vlan 1050 bridge 1 state enable            | Configure vlans from 1050 and associate with bridge 1 |
| (config)#interface ce1/1                            | Enter Interface mode for ce1/1                        |
| (config-if)#switchport                              | Make as L2 port by configuring switchport             |
| (config-if)#bridge-group 1                          | Associate to bridge 1                                 |
| (config-if)# bridge-group 1 spanning-tree disable   | Configure stp disable                                 |
| (config-if)# switchport mode trunk                  | Mode as trunk   |
| (config-if)# switchport trunk allowed vlan add 1050 | Trunk allowed vlan as 1050                            |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.     |
| (config)#interface ce25/1                           | Enter Interface mode for ce25/1                       |
| (config-if)#switchport                              | Make as L2 port by configuring switchport             |
| (config-if)#bridge-group 1                          | Associate to bridge 1                                 |
| (config-if)# bridge-group 1 spanning-tree disable   | Configure stp disable                                 |

## VxLAN-IRB-Inter-VRF Route Leaking

|   |   |
|---|---|
| (config-if)# switchport mode trunk                  | Mode as trunk   |
| (config-if)# switchport trunk allowed vlan add 1050 | Trunk allowed vlan as 1050                                  |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.           |
| (config)#commit                                     | Commit the candidate configuration to running configuration |

## TOR2 (MH)

Multihomed to 2-VTEPs (VTEP2 and VTEP3).

|   |   |
|---|---|
| #configure terminal                                 | Enter Configure mode.                                       |
| (config)# bridge 1 protocol rstp vlan-bridge        | Configure rstp vlan bridge                                  |
| (config)# vlan database                             |   |
| (config)#vlan 1060 bridge 1 state enable            | Configure vlans from 1060 and associate with bridge 1       |
| (config)#interface po1000                           | Enter Interface mode for po1000                             |
| (config-if)#switchport                              | Make as L2 port by configuring switchport                   |
| (config-if)#bridge-group 1                          | Associate to bridge 1                                       |
| (config-if)# bridge-group 1 spanning-tree disable   | Configure stp disable                                       |
| (config-if)# switchport mode trunk                  | Mode as trunk   |
| (config-if)# switchport trunk allowed vlan add 1060 | Trunk allowed vlan as 1060                                  |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.           |
| (config)#interface xe4                              | Enter Interface mode for xe4                                |
| (config-if)# channel-group 1000 mode active         | Make it member of po1000                                    |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.           |
| (config)#interface xe7                              | Enter Interface mode for xe7                                |
| (config-if)# channel-group 1000 mode active         | Make it member of po1000                                    |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.           |
| (config)#interface xe7                              | Enter Interface mode for ce25/1                             |
| (config-if)#switchport                              | Make as L2 port by configuring switchport                   |
| (config-if)#bridge-group 1                          | Associate to bridge 1                                       |
| (config-if)# bridge-group 1 spanning-tree disable   | Configure stp disable                                       |
| (config-if)# switchport mode trunk                  | Mode as trunk   |
| (config-if)# switchport trunk allowed vlan add 1060 | Trunk allowed vlan as 1060                                  |
| (config-if)#exit                                    | Exit Interface mode and return to Configure mode.           |
| (config)#commit                                     | Commit the candidate configuration to running configuration |

## Spine1

Spine node where all VTEPs are connected.

**Generic configuration:**

|   |   |
|---|---|
| #configure terminal                           | Enter Configure mode.                                       |
| (Config)#qos enable                           | Enabling qos  |
| (Config)# bfd interval 3 minrx 3 multiplier 3 | Configure bfd   |
| (config)#commit                               | Commit the candidate configuration to running configuration |

**Interface and loopback configuration:**

|   |   |
|---|---|
| (config)#interface lo                                   | Enter Interface mode for lo                                 |
| (config-if)#ip address 62.62.62.62/32 secondary         | Configure loopback ip address                               |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.           |
| (config)#interface xe40                                 | Enter Interface mode  |
| (config-if)# description ***Connected to VTEP1***       | Description of interface                                    |
| (config-if)#ip address ip address 10.10.10.2/31         | Configure ip address on network side of VTEP1               |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.           |
| (config)#interface xe25                                 | Enter Interface mode  |
| (config-if)# description ***Connected to VTEP2***       | Description of interface                                    |
| (config-if)#ip address ip address 10.10.12.2/31         | Configure ip address on network side of VTEP2               |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.           |
| (config)#interface xe27                                 | Enter Interface mode  |
| (config-if)# description ***Connected to VTEP3***       | Description of interface                                    |
| (config-if)#ip address ip address 10.10.24.2/31         | Configure ip address on network side of VTEP3               |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.           |
| (config)#interface xe39                                 | Enter Interface mode  |
| (config-if)# description ***Connected to BorderVTEP1*** | Description of interface                                    |
| (config-if)#ip address ip address 10.10.14.2/31         | Configure ip address on network side of BorderVTEP1         |
| (config-if)#exit  | Exit Interface mode and return to Configure mode.           |
| (config)#commit   | Commit the candidate configuration to running configuration |

**OSPF configuration:**

|   |                                       |
|---|---------------------------------------|
| (config)#router ospf 100                            | Enter into router OSPF mode           |
| (config-router)#ospf router-id 62.62.62.62          | Configure router-id as lo ip address  |
| (config-router)#network 62.62.62.62/32 area 0.0.0.0 | Add lo ip address network into area 0 |

## VxLAN-IRB-Inter-VRF Route Leaking

---

|  |   |
|--|---|
| (config-router)#network 10.10.10.0/24 area 0.0.0.0 | Add VTEP1 network into area 0                               |
| (config-router)#network 10.10.12.0/24 area 0.0.0.0 | Add VTEP2 network into area 0                               |
| (config-router)#network 10.10.14.0/24 area 0.0.0.0 | Add VTEP4 network into area 0                               |
| (config-router)#bfd all-interfaces                 | Enabling bfd on all ospf interface for fast convergence     |
| (config-if)#exit                                   | Exit Interface mode and return to Configure mode.           |
| (config)#commit                                    | Commit the candidate configuration to running configuration |

---

## Validations

### Firewall

=====

```
Firewall#show ip bgp summary
BGP router identifier 10.10.19.2, local AS number 64603
BGP table version is 3
2 BGP AS-PATH entries
0 BGP community entries
8 Configured ebgp ECMP multipath: Currently set at 8
```

| Neighbor       | V | AS  | MsgRcv | MsgSen | TblVer | InQ | OutQ | Up/Dow   |
|----------------|---|-----|--------|--------|--------|-----|------|----------|
| n State/PfxRcd |   |     |        |        |        |     |      |          |
| 10.10.18.1     | 4 | 500 | 46     | 58     | 3      | 0   | 0    | 00:17:36 |
|                | 3 |     |        |        |        |     |      |          |

Total number of neighbors 1

Total number of Established sessions 1

```
Firewall#show ip roy
```

```
Firewall#show ip route vrf all
```

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP

O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,

ia - IS-IS inter area, E - EVPN,

v - vrf leaked

\* - candidate default

IP Route Table for VRF "default"

```
C      10.10.18.0/24 is directly connected, vlan1.1067, 00:19:40
C      10.10.20.0/24 is directly connected, ce1/1, 00:00:13
B      10.12.32.0/24 [20/0] via 10.10.18.1, vlan1.1067, 00:17:43
B      10.240.38.0/24 [20/0] via 10.10.18.1, vlan1.1067, 00:17:43
C      127.0.0.0/8 is directly connected, lo, 00:52:18
```

IP Route Table for VRF "management"

```
C      10.12.85.0/24 is directly connected, eth0, 00:52:07
C      127.0.0.0/8 is directly connected, lo.management, 00:52:18
```

Gateway of last resort is not set  
FW#

BorderVTEP1  
=====

BorderVTEP1#show nvo vxlan  
VxLAN Information  
=====

Codes: NW - Network Port  
AC - Access Port  
(u) - Untagged

| VNID        | VNI-Name    | VNI-Type | Type | Interface | ESI  | VLAN              | DF-Status |
|-------------|-------------|----------|------|-----------|------|-------------------|-----------|
| Src-Addr    | Dst-Addr    |          |      |           |      |                   |           |
| 1067        | ----        | --       | AC   | ce50      | ---  | Single Homed Port | ---       |
| ----        | ----        |          |      |           |      | 1067              | ----      |
| 10402       | ----        | L3       | NW   | ----      | ---- |                   | ----      |
| 66.66.66.66 | 60.60.60.60 |          |      |           |      |                   |           |
| 10402       | ----        | L3       | NW   | ----      | ---- |                   | ----      |
| 66.66.66.66 | 76.76.76.76 |          |      |           |      |                   |           |
| 10502       | ----        | L3       | NW   | ----      | ---- |                   | ----      |
| 66.66.66.66 | 51.51.51.51 |          |      |           |      |                   |           |

Total number of entries are 4  
BorderVTEP1#show nvo vxlan tunnel  
VxLAN Network tunnel Entries

| Source      | Destination | Status    | Up/Down  | Update   |
|-------------|-------------|-----------|----------|----------|
| 66.66.66.66 | 51.51.51.51 | Installed | 00:22:36 | 00:22:36 |
| 66.66.66.66 | 60.60.60.60 | Installed | 00:22:36 | 00:22:36 |
| 66.66.66.66 | 76.76.76.76 | Installed | 00:22:36 | 00:22:36 |

Total number of entries are 3  
BorderVTEP1#show ip route vrf all  
Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP  
O - OSPF, IA - OSPF inter area  
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
E1 - OSPF external type 1, E2 - OSPF external type 2  
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,  
ia - IS-IS inter area, E - EVPN,  
v - vrf leaked  
\* - candidate default

IP Route Table for VRF "default"  
O 10.10.10.0/31 [110/2] via 10.10.14.0, xe39, 00:22:44  
O 10.10.12.0/31 [110/2] via 10.10.14.0, xe39, 00:22:44  
C 10.10.14.0/31 is directly connected, xe39, 00:23:29  
O 10.10.24.0/31 [110/2] via 10.10.14.0, xe39, 00:22:44

## VxLAN-IRB-Inter-VRF Route Leaking

---

```
O          51.51.51.51/32 [110/3] via 10.10.14.0, xe39, 00:22:44
O          60.60.60.60/32 [110/3] via 10.10.14.0, xe39, 00:22:44
C          66.66.66.66/32 is directly connected, lo, 00:23:32
O          76.76.76.76/32 [110/3] via 10.10.14.0, xe39, 00:22:44
C          127.0.0.0/8 is directly connected, lo, 00:24:12
IP Route Table for VRF "management"
C          10.12.86.0/24 is directly connected, eth0, 00:23:38
C          127.0.0.0/8 is directly connected, lo.management, 00:24:12
IP Route Table for VRF "gvrf"
Gateway of last resort is 10.10.18.2 to network 0.0.0.0

B*         0.0.0.0/0 [20/0] via 10.10.18.2, irb1067, 00:21:31
C          10.10.18.0/24 is directly connected, irb1067, 00:23:30
B          10.10.20.0/24 [20/0] via 10.10.18.2, irb1067, 00:04:01
B v        10.12.32.0/24 [200/0] via 51.51.51.51 (recursive is directly connected,
tunvxlan3), 00:22:39
B v        10.240.38.0/24 [200/0] via 60.60.60.60 (recursive is directly connected,
tunvxlan4), 00:22:40
C          127.0.0.0/8 is directly connected, lo.gvrf, 00:23:36
IP Route Table for VRF "SMS"
Gateway of last resort is 10.10.18.2 to network 0.0.0.0

B* v       0.0.0.0/0 [20/0] via 10.10.18.2, irb1067, 00:21:31
B v        10.10.18.0/24 [20/0] is directly connected, irb1067, 00:23:30
B v        10.10.20.0/24 [20/0] via 10.10.18.2, irb1067, 00:04:01
B          10.240.38.0/24 [200/0] via 60.60.60.60 (recursive is directly connected,
tunvxlan4), 00:22:40
B          60.60.60.60/32 [0/0] is directly connected, tunvxlan4, 00:22:39
B          76.76.76.76/32 [0/0] is directly connected, tunvxlan4, 00:22:39
C          127.0.0.0/8 is directly connected, lo.SMS, 00:23:35
IP Route Table for VRF "FAX"
Gateway of last resort is 10.10.18.2 to network 0.0.0.0

B* v       0.0.0.0/0 [20/0] via 10.10.18.2, irb1067, 00:21:31
B v        10.10.18.0/24 [20/0] is directly connected, irb1067, 00:23:30
B v        10.10.20.0/24 [20/0] via 10.10.18.2, irb1067, 00:04:01
B          10.12.32.0/24 [200/0] via 51.51.51.51 (recursive is directly connected,
tunvxlan3), 00:22:39
B          51.51.51.51/32 [0/0] is directly connected, tunvxlan3, 00:22:39
C          127.0.0.0/8 is directly connected, lo.FAX, 00:23:35
IP Route Table for VRF "SMM"
C          127.0.0.0/8 is directly connected, lo.SMM, 00:23:35

Gateway of last resort is not set
BorderVTEP1# show bgp l2vpn evpn summary
BGP router identifier 66.66.66.66, local AS number 500
BGP table version is 6
2 BGP AS-PATH entries
0 BGP community entries
```



| Neighbor PfxRcd | AD | MACIP | V MCAST | AS  | MsgRcv ESI | MsgSen PREFIX-ROUTE | TblVer | InQ | OutQ | Up/Down  | State/ |
|-----------------|----|-------|---------|-----|------------|---------------------|--------|-----|------|----------|--------|
| 51.51.51.51     |    |       | 4       | 500 | 62         | 71                  | 6      | 0   | 0    | 00:22:50 |        |
| 7 0             | 5  |       | 1       | 0   | 1          |                     |        |     |      |          |        |
| 60.60.60.60     |    |       | 4       | 500 | 65         | 71                  | 6      | 0   | 0    | 00:22:50 |        |
| 8 2             | 3  |       | 1       | 1   | 1          |                     |        |     |      |          |        |
| 76.76.76.76     |    |       | 4       | 500 | 65         | 70                  | 6      | 0   | 0    | 00:22:50 |        |
| 9 2             | 4  |       | 1       | 1   | 1          |                     |        |     |      |          |        |

Total number of neighbors 3

Total number of Established sessions 3

BorderVTEP1# show bgp l2vpn evpn

BGP table version is 6, local router ID is 66.66.66.66

Status codes: s suppressed, d damped, h history, \* valid, > best, i - internal, l - labeled, S Stale

Origin codes: i - IGP, e - EGP, ? - incomplete

[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]

- 1 - Ethernet Auto-discovery Route
- 2 - MAC/IP Route
- 3 - Inclusive Multicast Route
- 4 - Ethernet Segment Route
- 5 - Prefix Route

| Network Encap | Next Hop | Metric | LocPrf | Weight | Path | Peer |
|---------------|----------|--------|--------|--------|------|------|
|---------------|----------|--------|--------|--------|------|------|

RD[2.2.4.4:4] VRF[RED]:

|   |             |   |     |   |               |       |
|---|-------------|---|-----|---|---------------|-------|
| * i [1]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[1060]                                       | 76.76.76.76 | 0 | 100 | 0 | i 76.76.76.76 | VxLAN |
| * i [1]:[00:00:00:44:44:55:55:00:00:00]:[4294967295]:[0]                                    | 60.60.60.60 | 0 | 100 | 0 | i 60.60.60.60 | VxLAN |
| * i [2]:[0]:[1050]:[48,0000:0e8d:561a]:[0]:[1050]   | 76.76.76.76 | 0 | 100 | 0 | i 76.76.76.76 | VxLAN |
| * i [2]:[0]:[1050]:[48,0000:3333:1050]:[32,10.12.32.11]:[1050]                              | 60.60.60.60 | 0 | 100 | 0 | i 60.60.60.60 | VxLAN |
| * i [2]:[0]:[1050]:[48,0000:3333:1050]:[32,10.12.32.10]:[1050]                              | 51.51.51.51 | 0 | 100 | 0 | i 51.51.51.51 | VxLAN |
| * i [2]:[0]:[1050]:[48,0000:3333:1050]:[32,10.12.32.11]:[1050]                              | 51.51.51.51 | 0 | 100 | 0 | i 51.51.51.51 | VxLAN |
| * i [2]:[0]:[1050]:[48,3c2c:99d6:167a]:[128,2401::1]:[1050]                                 | 51.51.51.51 | 0 | 100 | 0 | i 51.51.51.51 | VxLAN |
| * i [2]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[48,0000:0e8d:5619]:[0]:[1060]               | 51.51.51.51 | 0 | 100 | 0 | i 51.51.51.51 | VxLAN |
| * i [2]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[48,0000:2222:1060]:[32,10.240.38.10]:[1060] | 76.76.76.76 | 0 | 100 | 0 | i 76.76.76.76 | VxLAN |
| * i [2]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[48,0000:2222:3333]:[32,10.240.38.1]:[1060]  | 76.76.76.76 | 0 | 100 | 0 | i 76.76.76.76 | VxLAN |
| * i [2]:[0]:[1060]:[48,0000:2222:3333]:[32,10.240.38.1]:[1060]                              | 60.60.60.60 | 0 | 100 | 0 | i 60.60.60.60 | VxLAN |

## VxLAN-IRB-Inter-VRF Route Leaking

```

76.76.76.76          0          100          0    i  76.76.76.76      VxLAN
* i          60.60.60.60          0          100          0    i  60.60.60.60      VxLAN
* i  [2]:[0]:[1060]:[48,0000:2222:3333]:[128,1601::1]:[1060]
76.76.76.76          0          100          0    i  76.76.76.76      VxLAN
* i          60.60.60.60          0          100          0    i  60.60.60.60      VxLAN
*>  [2]:[0]:[1067]:[48,3c2c:991c:dc7a]:[32,10.10.18.1]:[1067]
66.66.66.66          0          100          32768  i  -----
VxLAN
*>  [2]:[0]:[1067]:[48,a82b:b5cf:f806]:[32,10.10.18.2]:[1067]
66.66.66.66          0          100          32768  i  -----
VxLAN
* i  [3]:[1050]:[32,51.51.51.51]
51.51.51.51          0          100          0    i  51.51.51.51      VxLAN
* i  [3]:[1060]:[32,60.60.60.60]
60.60.60.60          0          100          0    i  60.60.60.60      VxLAN
* i  [3]:[1060]:[32,76.76.76.76]
76.76.76.76          0          100          0    i  76.76.76.76      VxLAN
*>  [3]:[1067]:[32,66.66.66.66]
66.66.66.66          0          100          32768  i  -----
VxLAN

RD[2.3.4.5:1]
*>i  [2]:[0]:[1050]:[48,0000:0e8d:561a]:[0]:[1050]
51.51.51.51          0          100          0    i  51.51.51.51      VxLAN
*>i  [2]:[0]:[1050]:[48,0000:0e8d:561a]:[32,10.12.32.11]:[1050]
51.51.51.51          0          100          0    i  51.51.51.51      VxLAN
*>i  [2]:[0]:[1050]:[48,0000:3333:1050]:[32,10.12.32.10]:[1050]
51.51.51.51          0          100          0    i  51.51.51.51      VxLAN
*>i  [2]:[0]:[1050]:[48,3c2c:99d6:167a]:[32,10.12.32.1]:[1050]
51.51.51.51          0          100          0    i  51.51.51.51      VxLAN
*>i  [2]:[0]:[1050]:[48,3c2c:99d6:167a]:[128,2401::1]:[1050]
51.51.51.51          0          100          0    i  51.51.51.51      VxLAN
*>i  [3]:[1050]:[32,51.51.51.51]
51.51.51.51          0          100          0    i  51.51.51.51      VxLAN

RD[2.3.4.5:2]
*>i  [1]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[1060]
60.60.60.60          0          100          0    i  60.60.60.60      VxLAN
*>i
[2]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[48,0000:2222:1060]:[32,10.240.38.10]:[1060]
60.60.60.60          0          100          0    i  60.60.60.60      VxLAN
*>i  [2]:[0]:[1060]:[48,0000:2222:3333]:[32,10.240.38.1]:[1060]
60.60.60.60          0          100          0    i  60.60.60.60      VxLAN
*>i  [2]:[0]:[1060]:[48,0000:2222:3333]:[128,1601::1]:[1060]
60.60.60.60          0          100          0    i  60.60.60.60      VxLAN
*>i  [3]:[1060]:[32,60.60.60.60]
60.60.60.60          0          100          0    i  60.60.60.60      VxLAN

RD[2.3.4.6:2]
*>i  [1]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[1060]
76.76.76.76          0          100          0    i  76.76.76.76      VxLAN

```

```
*>i [2]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[48,0000:0e8d:5619]:[0]:[1060]
      76.76.76.76      0      100      0      i 76.76.76.76      VxLAN
*>i
[2]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[48,0000:2222:1060]:[32,10.240.38.10]:[1060]
      76.76.76.76      0      100      0      i 76.76.76.76      VxLAN
*>i [2]:[0]:[1060]:[48,0000:2222:3333]:[32,10.240.38.1]:[1060]
      76.76.76.76      0      100      0      i 76.76.76.76      VxLAN
*>i [2]:[0]:[1060]:[48,0000:2222:3333]:[128,1601::1]:[1060]
      76.76.76.76      0      100      0      i 76.76.76.76      VxLAN
*>i [3]:[1060]:[32,76.76.76.76]
      76.76.76.76      0      100      0      i 76.76.76.76      VxLAN
```

RD[51.51.51.51:1050]

```
*>i [5]:[0]:[10502]:[24]:[10.12.32.0]:[0.0.0.0]:[10502]
      51.51.51.51      0      100      0      ? 51.51.51.51      VxLAN
```

RD[60.60.60.60:1]

```
*>i [1]:[00:00:00:44:44:55:55:00:00:00]:[4294967295]:[0]
      60.60.60.60      0      100      0      i 60.60.60.60      VxLAN
*>i [4]:[00:00:00:44:44:55:55:00:00:00]:[32,60.60.60.60]
      60.60.60.60      0      100      0      i 60.60.60.60      VxLAN
```

RD[60.60.60.60:1040]

```
*>i [5]:[0]:[10402]:[24]:[10.240.38.0]:[0.0.0.0]:[10402]
      60.60.60.60      0      100      0      ? 60.60.60.60      VxLAN
```

RD[76.76.76.76:1]

```
*>i [1]:[00:00:00:44:44:55:55:00:00:00]:[4294967295]:[0]
      76.76.76.76      0      100      0      i 76.76.76.76      VxLAN
*>i [4]:[00:00:00:44:44:55:55:00:00:00]:[32,76.76.76.76]
      76.76.76.76      0      100      0      i 76.76.76.76      VxLAN
```

RD[76.76.76.76:1040]

```
*>i [5]:[0]:[10402]:[24]:[10.240.38.0]:[0.0.0.0]:[10402]
      76.76.76.76      0      100      0      ? 76.76.76.76      VxLAN
```

Total number of prefixes 41

BorderVTEP1#

BorderVTEP1#show bgp l2vpn evpn prefix-route

RD[51.51.51.51:1050]

| ESI<br>IPAddress | Eth-Tag     | Prefix-Length<br>L3VNID | IP-Address<br>NextHop | Encap   | Router-Mac | GW- |
|------------------|-------------|-------------------------|-----------------------|---------|------------|-----|
| 0                | 10502       | 24                      | 10.12.32.0            | 0.0.0.0 |            |     |
| 10502            | 51.51.51.51 | VxLAN                   | 3c2c:99d6:167a        |         |            |     |

RD[60.60.60.60:1040]

| ESI<br>IPAddress | Eth-Tag | Prefix-Length<br>L3VNID | IP-Address<br>NextHop | Encap | Router-Mac | GW- |
|------------------|---------|-------------------------|-----------------------|-------|------------|-----|
|                  |         |                         |                       |       |            |     |

## VxLAN-IRB-Inter-VRF Route Leaking

```
0          10402 24          10.240.38.0          0.0.0.0
10402     60.60.60.60      VxLAN      3c2c:99d1:117a
```

```
RD[76.76.76.76:1040]
```

```
ESI          Eth-Tag Prefix-Length  IP-Address  Encap  Router-Mac  GW-
IPAddress    L3VNID  Nexthop
0          10402 24          10.240.38.0          0.0.0.0
10402     76.76.76.76      VxLAN      3c2c:99de:1e7a
```

## VTEP3

```
=====
```

```
VTEP3#show nvo vxlan
```

```
VxLAN Information
```

```
=====
```

```
Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged
```

| VNI-ID      | VNI-Name    | VNI-Type | Type | Interface | ESI                           | VLAN | DF-Status |
|-------------|-------------|----------|------|-----------|-------------------------------|------|-----------|
| Src-Addr    | Dst-Addr    |          |      |           |                               |      |           |
| 1060        | ----        | L2       | NW   | ----      | ----                          | ---- | ----      |
| 76.76.76.76 | 60.60.60.60 |          |      |           |                               |      |           |
| 1060        | ----        | --       | AC   | po1000    | 00:00:00:44:44:55:55:00:00:00 | 1060 | NON-DF    |
| ----        | ----        | ----     |      |           |                               |      |           |
| 10402       | ----        | L3       | NW   | ----      | ----                          | ---- | ----      |
| 76.76.76.76 | 66.66.66.66 |          |      |           |                               |      |           |

```
Total number of entries are 3
```

```
VTEP3#show nvo vxlan tunnel
```

```
VxLAN Network tunnel Entries
```

| Source      | Destination | Status    | Up/Down  | Update   |
|-------------|-------------|-----------|----------|----------|
| 76.76.76.76 | 66.66.66.66 | Installed | 00:24:35 | 00:24:35 |
| 76.76.76.76 | 60.60.60.60 | Installed | 00:54:40 | 00:54:40 |

```
Total number of entries are 2
```

```
VTEP3#show ip route vrf all
```

```
Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP
```

```
O - OSPF, IA - OSPF inter area
```

```
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
```

```
E1 - OSPF external type 1, E2 - OSPF external type 2
```

```
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,
```

```
ia - IS-IS inter area, E - EVPN,
```

```
v - vrf leaked
```

```
* - candidate default
```

```
IP Route Table for VRF "default"
```

```

O      10.10.10.0/31 [110/2] via 10.10.24.1, xe27, 00:54:56
O      10.10.12.0/31 [110/2] via 10.10.24.1, xe27, 00:54:56
O      10.10.14.0/31 [110/2] via 10.10.24.1, xe27, 00:25:31
C      10.10.24.0/31 is directly connected, xe27, 00:55:37
O      51.51.51.51/32 [110/3] via 10.10.24.1, xe27, 00:54:47
O      60.60.60.60/32 [110/3] via 10.10.24.1, xe27, 00:54:45
O      66.66.66.66/32 [110/3] via 10.10.24.1, xe27, 00:24:46
C      76.76.76.76/32 is directly connected, lo, 00:55:38
C      127.0.0.0/8 is directly connected, lo, 00:55:39
IP Route Table for VRF "management"
C      10.12.20.0/24 is directly connected, eth0, 00:55:10
C      127.0.0.0/8 is directly connected, lo.management, 00:55:39
IP Route Table for VRF "SMS"
Gateway of last resort is 66.66.66.66 to network 0.0.0.0

B*     0.0.0.0/0 [200/0] via 66.66.66.66 (recursive is directly connected,
tunvxlan2), 00:23:33
B      10.10.18.0/24 [200/0] via 66.66.66.66 (recursive is directly connected,
tunvxlan2), 00:24:41
B      10.10.20.0/24 [200/0] via 66.66.66.66 (recursive is directly connected,
tunvxlan2), 00:06:03
C      10.240.38.0/24 is directly connected, irb1060, 00:55:38
B      66.66.66.66/32 [0/0] is directly connected, tunvxlan2, 00:24:41
C      127.0.0.0/8 is directly connected, lo.SMS, 00:55:39
VTEP3# show bgp l2vpn evpn summary
BGP router identifier 76.76.76.76, local AS number 500
BGP table version is 8
2 BGP AS-PATH entries
0 BGP community entries

Neighbor      AD  MACIP  V  AS  MsgRcv  MsgSen  TblVer  InQ  OutQ  Up/Down  State/
PfxRcd
60.60.60.60  2  3      4  500  144    140     7      0    0  00:54:55
8
66.66.66.66  0  2      4  500  127    125     7      0    0  00:24:51
12
Total number of neighbors 2

Total number of Established sessions 2
VTEP3# show bgp l2vpn evpn
BGP table version is 8, local router ID is 76.76.76.76
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
l - labeled, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]
1 - Ethernet Auto-discovery Route
2 - MAC/IP Route
3 - Inclusive Multicast Route
4 - Ethernet Segment Route
5 - Prefix Route

```

## VxLAN-IRB-Inter-VRF Route Leaking

| Network Encap   | Next Hop    | Metric | LocPrf | Weight | Path          | Peer  |
|---|-------------|--------|--------|--------|---------------|-------|
| RD[2.2.4.4:4]   |             |        |        |        |               |       |
| *>i [2]:[0]:[1067]:[48,3c2c:991c:dc7a]:[32,10.10.18.1]:[1067]                               | 66.66.66.66 | 0      | 100    | 0      | i 66.66.66.66 | VxLAN |
| *>i [2]:[0]:[1067]:[48,a82b:b5cf:f806]:[32,10.10.18.2]:[1067]                               | 66.66.66.66 | 0      | 100    | 0      | i 66.66.66.66 | VxLAN |
| *>i [3]:[1067]:[32,66.66.66.66]   | 66.66.66.66 | 0      | 100    | 0      | i 66.66.66.66 | VxLAN |
| RD[2.3.4.5:2]   |             |        |        |        |               |       |
| *>i [1]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[1060]                                       | 60.60.60.60 | 0      | 100    | 0      | i 60.60.60.60 | VxLAN |
| *>i [2]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[48,0000:2222:1060]:[32,10.240.38.10]:[1060] | 60.60.60.60 | 0      | 100    | 0      | i 60.60.60.60 | VxLAN |
| *>i [2]:[0]:[1060]:[48,0000:2222:3333]:[32,10.240.38.1]:[1060]                              | 60.60.60.60 | 0      | 100    | 0      | i 60.60.60.60 | VxLAN |
| *>i [2]:[0]:[1060]:[48,0000:2222:3333]:[128,1601::1]:[1060]                                 | 60.60.60.60 | 0      | 100    | 0      | i 60.60.60.60 | VxLAN |
| *>i [3]:[1060]:[32,60.60.60.60]   | 60.60.60.60 | 0      | 100    | 0      | i 60.60.60.60 | VxLAN |
| RD[2.3.4.6:2] VRF[RED]:   |             |        |        |        |               |       |
| *> [1]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[1060]  | 76.76.76.76 | 0      | 100    | 32768  | i -----       |       |
| VxLAN   |             |        |        |        |               |       |
| * i 60.60.60.60   | 60.60.60.60 | 0      | 100    | 0      | i 60.60.60.60 | VxLAN |
| * i [1]:[00:00:00:44:44:55:55:00:00:00]:[4294967295]:[0]                                    | 60.60.60.60 | 0      | 100    | 0      | i 60.60.60.60 | VxLAN |
| *> [2]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[48,0000:0e8d:5619]:[0]:[1060]                | 76.76.76.76 | 0      | 100    | 32768  | i -----       |       |
| VxLAN   |             |        |        |        |               |       |
| *> [2]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[48,0000:2222:1060]:[32,10.240.38.10]:[1060]  | 76.76.76.76 | 0      | 100    | 32768  | i -----       |       |
| VxLAN   |             |        |        |        |               |       |
| * i 60.60.60.60   | 60.60.60.60 | 0      | 100    | 0      | i 60.60.60.60 | VxLAN |
| * i [2]:[0]:[1060]:[48,0000:2222:3333]:[32,10.240.38.1]:[1060]                              | 60.60.60.60 | 0      | 100    | 0      | i 60.60.60.60 | VxLAN |
| *> 76.76.76.76  | 76.76.76.76 | 0      | 100    | 32768  | i -----       |       |
| VxLAN   |             |        |        |        |               |       |
| * i [2]:[0]:[1060]:[48,0000:2222:3333]:[128,1601::1]:[1060]                                 | 60.60.60.60 | 0      | 100    | 0      | i 60.60.60.60 | VxLAN |
| *> 76.76.76.76  | 76.76.76.76 | 0      | 100    | 32768  | i -----       |       |
| VxLAN   |             |        |        |        |               |       |
| * i [2]:[0]:[1067]:[48,3c2c:991c:dc7a]:[32,10.10.18.1]:[1067]                               | 66.66.66.66 | 0      | 100    | 0      | i 66.66.66.66 | VxLAN |
| * i [2]:[0]:[1067]:[48,a82b:b5cf:f806]:[32,10.10.18.2]:[1067]                               | 66.66.66.66 | 0      | 100    | 0      | i 66.66.66.66 | VxLAN |

```

* i [3]:[1060]:[32,60.60.60.60]
      60.60.60.60      0      100      0      i 60.60.60.60      VxLAN
*> [3]:[1060]:[32,76.76.76.76]
      76.76.76.76      0      100      32768 i -----
VxLAN
* i [3]:[1067]:[32,66.66.66.66]
      66.66.66.66      0      100      0      i 66.66.66.66      VxLAN

RD[4.5.6.8:6]
*>i [5]:[0]:[500]:[0]:[0.0.0.0]:[0.0.0.0]:[500]
      66.66.66.66      0      100      0      64603 i 66.66.66.66
VxLAN
*>i [5]:[0]:[500]:[24]:[10.10.18.0]:[0.0.0.0]:[500]
      66.66.66.66      0      100      0      ? 66.66.66.66      VxLAN
*>i [5]:[0]:[500]:[24]:[10.10.20.0]:[0.0.0.0]:[500]
      66.66.66.66      0      100      0      64603 i 66.66.66.66
VxLAN

RD[60.60.60.60:1]
*>i [1]:[00:00:00:44:44:55:55:00:00:00]:[4294967295]:[0]
      60.60.60.60      0      100      0      i 60.60.60.60      VxLAN
*>i [4]:[00:00:00:44:44:55:55:00:00:00]:[32,60.60.60.60]
      60.60.60.60      0      100      0      i 60.60.60.60      VxLAN

RD[60.60.60.60:1040]
*>i [5]:[0]:[10402]:[24]:[10.240.38.0]:[0.0.0.0]:[10402]
      60.60.60.60      0      100      0      ? 60.60.60.60      VxLAN

RD[66.66.66.66:1050]
*>i [5]:[0]:[500]:[0]:[0.0.0.0]:[0.0.0.0]:[500]
      66.66.66.66      0      100      0      64603 i 66.66.66.66
VxLAN
*>i [5]:[0]:[500]:[24]:[10.10.18.0]:[0.0.0.0]:[500]
      66.66.66.66      0      100      0      ? 66.66.66.66      VxLAN
*>i [5]:[0]:[500]:[24]:[10.10.20.0]:[0.0.0.0]:[500]
      66.66.66.66      0      100      0      64603 i 66.66.66.66
VxLAN

RD[66.66.66.66:1060]
*>i [5]:[0]:[500]:[0]:[0.0.0.0]:[0.0.0.0]:[500]
      66.66.66.66      0      100      0      64603 i 66.66.66.66
VxLAN
*>i [5]:[0]:[500]:[24]:[10.10.18.0]:[0.0.0.0]:[500]
      66.66.66.66      0      100      0      ? 66.66.66.66      VxLAN
*>i [5]:[0]:[500]:[24]:[10.10.20.0]:[0.0.0.0]:[500]
      66.66.66.66      0      100      0      64603 i 66.66.66.66
VxLAN

RD[76.76.76.76:1] VRF[evpn-gvrf-1]:
*> [1]:[00:00:00:44:44:55:55:00:00:00]:[4294967295]:[0]
      76.76.76.76      0      100      32768 i -----
VxLAN

```

## VxLAN-IRB-Inter-VRF Route Leaking

```
* i [4]:[00:00:00:44:44:55:55:00:00:00]:[32,60.60.60.60]
      60.60.60.60      0      100      0      i 60.60.60.60      VxLAN
*> [4]:[00:00:00:44:44:55:55:00:00:00]:[32,76.76.76.76]
      76.76.76.76      0      100      32768      i -----
VxLAN
```

Total number of prefixes 34

VTEP3#

VTEP3#show bgp l2vpn evpn prefix-route

RD[4.5.6.8:6]

| ESI<br>IPAddress | Eth-Tag           | Prefix-Length<br>L3VNID | IP-Address<br>Nexthop | Encap   | Router-Mac | GW- |
|------------------|-------------------|-------------------------|-----------------------|---------|------------|-----|
| 0                | 500 0             | 0.0.0.0                 |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |
| 0                | 500 24            | 10.10.18.0              |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |
| 0                | 500 24            | 10.10.20.0              |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |

RD[60.60.60.60:1040]

| ESI<br>IPAddress | Eth-Tag           | Prefix-Length<br>L3VNID | IP-Address<br>Nexthop | Encap   | Router-Mac | GW- |
|------------------|-------------------|-------------------------|-----------------------|---------|------------|-----|
| 0                | 10402 24          | 10.240.38.0             |                       | 0.0.0.0 |            |     |
| 10402            | 60.60.60.60 VxLAN | 3c2c:99d1:117a          |                       |         |            |     |

RD[66.66.66.66:1050]

| ESI<br>IPAddress | Eth-Tag           | Prefix-Length<br>L3VNID | IP-Address<br>Nexthop | Encap   | Router-Mac | GW- |
|------------------|-------------------|-------------------------|-----------------------|---------|------------|-----|
| 0                | 500 0             | 0.0.0.0                 |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |
| 0                | 500 24            | 10.10.18.0              |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |
| 0                | 500 24            | 10.10.20.0              |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |

RD[66.66.66.66:1060]

| ESI<br>IPAddress | Eth-Tag           | Prefix-Length<br>L3VNID | IP-Address<br>Nexthop | Encap   | Router-Mac | GW- |
|------------------|-------------------|-------------------------|-----------------------|---------|------------|-----|
| 0                | 500 0             | 0.0.0.0                 |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |
| 0                | 500 24            | 10.10.18.0              |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |
| 0                | 500 24            | 10.10.20.0              |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |

## VTEP2

=====

VTEP2#show nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port



AC - Access Port  
(u) - Untagged

| VNID        | VNI-Name    | VNI-Type | Type | Interface | ESI                           | VLAN | DF-Status |
|-------------|-------------|----------|------|-----------|-------------------------------|------|-----------|
| Src-Addr    | Dst-Addr    |          |      |           |                               |      |           |
| 1060        | ----        | L2       | NW   | ----      | ----                          | ---- | ----      |
| 60.60.60.60 | 76.76.76.76 |          |      |           |                               |      |           |
| 1060        | ----        | --       | AC   | po1000    | 00:00:00:44:44:55:55:00:00:00 | 1060 | DF        |
| ----        | ----        |          |      |           |                               |      |           |
| 10402       | ----        | L3       | NW   | ----      | ----                          | ---- | ----      |
| 60.60.60.60 | 66.66.66.66 |          |      |           |                               |      |           |

Total number of entries are 3

VTEP2#show nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source      | Destination | Status    | Up/Down  | Update   |
|-------------|-------------|-----------|----------|----------|
| 60.60.60.60 | 66.66.66.66 | Installed | 00:26:50 | 00:26:50 |
| 60.60.60.60 | 76.76.76.76 | Installed | 00:56:51 | 00:56:51 |

Total number of entries are 2

VTEP2#show ip route vrf all

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP  
 O - OSPF, IA - OSPF inter area  
 N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
 E1 - OSPF external type 1, E2 - OSPF external type 2  
 i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,  
 ia - IS-IS inter area, E - EVPN,  
 v - vrf leaked  
 \* - candidate default

IP Route Table for VRF "default"

```
O      10.10.10.0/31 [110/2] via 10.10.12.0, xe25, 00:57:13
C      10.10.12.0/31 is directly connected, xe25, 00:57:57
O      10.10.14.0/31 [110/2] via 10.10.12.0, xe25, 00:27:47
O      10.10.16.0/31 [110/2] via 10.10.12.0, xe25, 00:57:13
O      10.10.24.0/31 [110/2] via 10.10.12.0, xe25, 00:57:13
O      51.51.51.51/32 [110/3] via 10.10.12.0, xe25, 00:57:03
C      60.60.60.60/32 is directly connected, lo, 00:57:59
O      66.66.66.66/32 [110/3] via 10.10.12.0, xe25, 00:27:02
O      76.76.76.76/32 [110/3] via 10.10.12.0, xe25, 00:57:13
C      127.0.0.0/8 is directly connected, lo, 00:58:00
```

IP Route Table for VRF "management"

```
C      10.12.20.0/24 is directly connected, eth0, 00:57:29
C      127.0.0.0/8 is directly connected, lo.management, 00:58:00
```

IP Route Table for VRF "SMS"

Gateway of last resort is 66.66.66.66 to network 0.0.0.0

```
B*      0.0.0.0/0 [200/0] via 66.66.66.66 (recursive is directly connected,
tunvxlan2), 00:25:49
```

## VxLAN-IRB-Inter-VRF Route Leaking

```
B      10.10.18.0/24 [200/0] via 66.66.66.66 (recursive is directly connected,
tunvxlan2), 00:26:58
B      10.10.20.0/24 [200/0] via 66.66.66.66 (recursive is directly connected,
tunvxlan2), 00:08:19
C      10.240.38.0/24 is directly connected, irb1060, 00:57:58
B      66.66.66.66/32 [0/0] is directly connected, tunvxlan2, 00:26:58
C      127.0.0.0/8 is directly connected, lo.SMS, 00:58:00
```

```
VTEP2#show bgp l2vpn evpn sum
```

```
BGP router identifier 60.60.60.60, local AS number 500
```

```
BGP table version is 12
```

```
2 BGP AS-PATH entries
```

```
0 BGP community entries
```

| Neighbor    | V  | AS    | MsgRcv | MsgSen | TblVer       | InQ | OutQ | Up/Down | State/ |   |          |  |
|-------------|----|-------|--------|--------|--------------|-----|------|---------|--------|---|----------|--|
| PfxRcd      | AD | MACIP | MCAST  | ESI    | PREFIX-ROUTE |     |      |         |        |   |          |  |
| 66.66.66.66 |    |       | 4      | 500    | 135          |     | 133  | 11      | 0      | 0 | 00:27:29 |  |
| 12          | 0  | 2     | 1      | 0      |              | 9   |      |         |        |   |          |  |
| 76.76.76.76 |    |       | 4      | 500    | 146          |     | 150  | 11      | 0      | 0 | 00:57:30 |  |
| 9           | 2  | 4     | 1      | 1      | 1            |     |      |         |        |   |          |  |

```
Total number of neighbors 2
```

```
Total number of Established sessions 2
```

```
VTEP2#show bgp l2vpn evpn
```

```
BGP table version is 12, local router ID is 60.60.60.60
```

```
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
l - labeled, S Stale
```

```
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]
```

```
1 - Ethernet Auto-discovery Route
```

```
2 - MAC/IP Route
```

```
3 - Inclusive Multicast Route
```

```
4 - Ethernet Segment Route
```

```
5 - Prefix Route
```

| Network | Next Hop | Metric | LocPrf | Weight | Path | Peer |
|---------|----------|--------|--------|--------|------|------|
|---------|----------|--------|--------|--------|------|------|

```
RD[2.2.4.4:4]
```

```
*>i [2]:[0]:[1067]:[48,3c2c:991c:dc7a]:[32,10.10.18.1]:[1067]
```

|  |             |   |     |   |   |             |       |
|--|-------------|---|-----|---|---|-------------|-------|
|  | 66.66.66.66 | 0 | 100 | 0 | i | 66.66.66.66 | VxLAN |
|--|-------------|---|-----|---|---|-------------|-------|

```
*>i [2]:[0]:[1067]:[48,a82b:b5cf:f806]:[32,10.10.18.2]:[1067]
```

|  |             |   |     |   |   |             |       |
|--|-------------|---|-----|---|---|-------------|-------|
|  | 66.66.66.66 | 0 | 100 | 0 | i | 66.66.66.66 | VxLAN |
|--|-------------|---|-----|---|---|-------------|-------|

```
*>i [3]:[1067]:[32,66.66.66.66]
```

|  |             |   |     |   |   |             |       |
|--|-------------|---|-----|---|---|-------------|-------|
|  | 66.66.66.66 | 0 | 100 | 0 | i | 66.66.66.66 | VxLAN |
|--|-------------|---|-----|---|---|-------------|-------|

```
RD[2.3.4.5:2] VRF[RED]:
```

```
* i [1]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[1060]
```

|  |             |   |     |   |   |             |       |
|--|-------------|---|-----|---|---|-------------|-------|
|  | 76.76.76.76 | 0 | 100 | 0 | i | 76.76.76.76 | VxLAN |
|--|-------------|---|-----|---|---|-------------|-------|

```

*>          60.60.60.60          0          100          32768 i -----
VxLAN
* i  [1]:[00:00:00:44:44:55:55:00:00:00]:[4294967295]:[0]
          76.76.76.76          0          100          0 i 76.76.76.76 VxLAN
* i  [2]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[48,0000:0e8d:5619]:[0]:[1060]
          76.76.76.76          0          100          0 i 76.76.76.76 VxLAN
* i
[2]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[48,0000:2222:1060]:[32,10.240.38.10]:[1060]
          76.76.76.76          0          100          0 i 76.76.76.76 VxLAN
*>          60.60.60.60          0          100          32768 i -----
VxLAN
* i  [2]:[0]:[1060]:[48,0000:2222:3333]:[32,10.240.38.1]:[1060]
          76.76.76.76          0          100          0 i 76.76.76.76 VxLAN
*>          60.60.60.60          0          100          32768 i -----
VxLAN
* i  [2]:[0]:[1060]:[48,0000:2222:3333]:[128,1601::1]:[1060]
          76.76.76.76          0          100          0 i 76.76.76.76 VxLAN
*>          60.60.60.60          0          100          32768 i -----
VxLAN
* i  [2]:[0]:[1067]:[48,3c2c:991c:dc7a]:[32,10.10.18.1]:[1067]
          66.66.66.66          0          100          0 i 66.66.66.66 VxLAN
* i  [2]:[0]:[1067]:[48,a82b:b5cf:f806]:[32,10.10.18.2]:[1067]
          66.66.66.66          0          100          0 i 66.66.66.66 VxLAN
*>  [3]:[1060]:[32,60.60.60.60]
          60.60.60.60          0          100          32768 i -----
VxLAN
* i  [3]:[1060]:[32,76.76.76.76]
          76.76.76.76          0          100          0 i 76.76.76.76 VxLAN
* i  [3]:[1067]:[32,66.66.66.66]
          66.66.66.66          0          100          0 i 66.66.66.66 VxLAN

RD[2.3.4.6:2]
*>i  [1]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[1060]
          76.76.76.76          0          100          0 i 76.76.76.76 VxLAN
*>i  [2]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[48,0000:0e8d:5619]:[0]:[1060]
          76.76.76.76          0          100          0 i 76.76.76.76 VxLAN
*>i
[2]:[00:00:00:44:44:55:55:00:00:00]:[1060]:[48,0000:2222:1060]:[32,10.240.38.10]:[1060]
          76.76.76.76          0          100          0 i 76.76.76.76 VxLAN
*>i  [2]:[0]:[1060]:[48,0000:2222:3333]:[32,10.240.38.1]:[1060]
          76.76.76.76          0          100          0 i 76.76.76.76 VxLAN
*>i  [2]:[0]:[1060]:[48,0000:2222:3333]:[128,1601::1]:[1060]
          76.76.76.76          0          100          0 i 76.76.76.76 VxLAN
*>i  [3]:[1060]:[32,76.76.76.76]
          76.76.76.76          0          100          0 i 76.76.76.76 VxLAN

RD[4.5.6.8:6]
*>i  [5]:[0]:[500]:[0]:[0.0.0.0]:[0.0.0.0]:[500]
          66.66.66.66          0          100          0 64603 i 66.66.66.66
VxLAN
*>i  [5]:[0]:[500]:[24]:[10.10.18.0]:[0.0.0.0]:[500]
          66.66.66.66          0          100          0 ? 66.66.66.66 VxLAN

```

## VxLAN-IRB-Inter-VRF Route Leaking

```

*>i  [5]:[0]:[500]:[24]:[10.10.20.0]:[0.0.0.0]:[500]
          66.66.66.66          0          100          0  64603 i  66.66.66.66
VxLAN

RD[60.60.60.60:1] VRF[evpn-gvrf-1]:
*>  [1]:[00:00:00:44:44:55:55:00:00:00]:[4294967295]:[0]
          60.60.60.60          0          100          32768 i  -----
VxLAN
*>  [4]:[00:00:00:44:44:55:55:00:00:00]:[32,60.60.60.60]
          60.60.60.60          0          100          32768 i  -----
VxLAN
* i  [4]:[00:00:00:44:44:55:55:00:00:00]:[32,76.76.76.76]
          76.76.76.76          0          100          0  i  76.76.76.76      VxLAN

RD[66.66.66.66:1050]
*>i  [5]:[0]:[500]:[0]:[0.0.0.0]:[0.0.0.0]:[500]
          66.66.66.66          0          100          0  64603 i  66.66.66.66
VxLAN
*>i  [5]:[0]:[500]:[24]:[10.10.18.0]:[0.0.0.0]:[500]
          66.66.66.66          0          100          0  ?  66.66.66.66      VxLAN
*>i  [5]:[0]:[500]:[24]:[10.10.20.0]:[0.0.0.0]:[500]
          66.66.66.66          0          100          0  64603 i  66.66.66.66
VxLAN

RD[66.66.66.66:1060]
*>i  [5]:[0]:[500]:[0]:[0.0.0.0]:[0.0.0.0]:[500]
          66.66.66.66          0          100          0  64603 i  66.66.66.66
VxLAN
*>i  [5]:[0]:[500]:[24]:[10.10.18.0]:[0.0.0.0]:[500]
          66.66.66.66          0          100          0  ?  66.66.66.66      VxLAN
*>i  [5]:[0]:[500]:[24]:[10.10.20.0]:[0.0.0.0]:[500]
          66.66.66.66          0          100          0  64603 i  66.66.66.66
VxLAN

RD[76.76.76.76:1]
*>i  [1]:[00:00:00:44:44:55:55:00:00:00]:[4294967295]:[0]
          76.76.76.76          0          100          0  i  76.76.76.76      VxLAN
*>i  [4]:[00:00:00:44:44:55:55:00:00:00]:[32,76.76.76.76]
          76.76.76.76          0          100          0  i  76.76.76.76      VxLAN

RD[76.76.76.76:1040]
*>i  [5]:[0]:[10402]:[24]:[10.240.38.0]:[0.0.0.0]:[10402]
          76.76.76.76          0          100          0  ?  76.76.76.76      VxLAN

```

Total number of prefixes 35

VTEP2#

VTEP22#show bgp l2vpn evpn prefix-route

RD[4.5.6.8:6]

| ESI<br>IPAddress | Eth-Tag | Prefix-Length<br>L3VNID | IP-Address<br>NextHop | Encap | Router-Mac | GW- |
|------------------|---------|-------------------------|-----------------------|-------|------------|-----|
|------------------|---------|-------------------------|-----------------------|-------|------------|-----|

```

0          500  0          0.0.0.0          0.0.0.0
500        66.66.66.66    VxLAN    3c2c:991c:dc7a
0          500  24         10.10.18.0       0.0.0.0
500        66.66.66.66    VxLAN    3c2c:991c:dc7a
0          500  24         10.10.20.0       0.0.0.0
500        66.66.66.66    VxLAN    3c2c:991c:dc7a
    
```

RD[66.66.66.66:1050]

| ESI<br>IPAddress | Eth-Tag     | Prefix-Length | IP-Address<br>L3VNID | IP-Address<br>Nexthop | Encap   | Router-Mac | GW- |
|------------------|-------------|---------------|----------------------|-----------------------|---------|------------|-----|
| 0                | 500         | 0             | 0.0.0.0              |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 | VxLAN         | 3c2c:991c:dc7a       |                       |         |            |     |
| 0                | 500         | 24            | 10.10.18.0           |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 | VxLAN         | 3c2c:991c:dc7a       |                       |         |            |     |
| 0                | 500         | 24            | 10.10.20.0           |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 | VxLAN         | 3c2c:991c:dc7a       |                       |         |            |     |

RD[66.66.66.66:1060]

| ESI<br>IPAddress | Eth-Tag     | Prefix-Length | IP-Address<br>L3VNID | IP-Address<br>Nexthop | Encap   | Router-Mac | GW- |
|------------------|-------------|---------------|----------------------|-----------------------|---------|------------|-----|
| 0                | 500         | 0             | 0.0.0.0              |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 | VxLAN         | 3c2c:991c:dc7a       |                       |         |            |     |
| 0                | 500         | 24            | 10.10.18.0           |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 | VxLAN         | 3c2c:991c:dc7a       |                       |         |            |     |
| 0                | 500         | 24            | 10.10.20.0           |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 | VxLAN         | 3c2c:991c:dc7a       |                       |         |            |     |

RD[76.76.76.76:1040]

| ESI<br>IPAddress | Eth-Tag     | Prefix-Length | IP-Address<br>L3VNID | IP-Address<br>Nexthop | Encap   | Router-Mac | GW- |
|------------------|-------------|---------------|----------------------|-----------------------|---------|------------|-----|
| 0                | 10402       | 24            | 10.240.38.0          |                       | 0.0.0.0 |            |     |
| 10402            | 76.76.76.76 | VxLAN         | 3c2c:99de:1e7a       |                       |         |            |     |

VTEP2#

### VTEP1

=====

VTEP1#show nvo vxlan

VxLAN Information

=====

Codes: NW - Network Port  
 AC - Access Port  
 (u) - Untagged

| VNID<br>Src-Addr | VNI-Name<br>Dst-Addr | VNI-Type | Type | Interface | ESI  | VLAN              | DF-Status |
|------------------|----------------------|----------|------|-----------|------|-------------------|-----------|
| 1050             | ----                 | --       | AC   | ce50      | ---  | Single Homed Port | ---       |
| 10502            | ----                 | L3       | NW   | ----      | ---- |                   | ----      |
| 51.51.51.51      | 66.66.66.66          |          |      |           |      |                   |           |

Total number of entries are 2

## VxLAN-IRB-Inter-VRF Route Leaking

---

```
VTEP1#show nvo vxlan tunnel
VxLAN Network tunnel Entries
```

| Source      | Destination | Status    | Up/Down  | Update   |
|-------------|-------------|-----------|----------|----------|
| 51.51.51.51 | 66.66.66.66 | Installed | 00:28:13 | 00:28:13 |

```
Total number of entries are 1
```

```
VTEP1#show ip route vrf all
```

```
Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP
```

```
       O - OSPF, IA - OSPF inter area
```

```
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
```

```
       E1 - OSPF external type 1, E2 - OSPF external type 2
```

```
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,
```

```
       ia - IS-IS inter area, E - EVPN,
```

```
       v - vrf leaked
```

```
       * - candidate default
```

```
IP Route Table for VRF "default"
```

```
C       10.10.10.0/31 is directly connected, xe40, 00:59:46
O       10.10.12.0/31 [110/2] via 10.10.10.0, xe40, 00:59:01
O       10.10.14.0/31 [110/2] via 10.10.10.0, xe40, 00:29:45
O       10.10.24.0/31 [110/2] via 10.10.10.0, xe40, 00:59:01
C       51.51.51.51/32 is directly connected, lo, 00:59:47
O       60.60.60.60/32 [110/3] via 10.10.10.0, xe40, 00:59:01
O       66.66.66.66/32 [110/3] via 10.10.10.0, xe40, 00:29:00
O       76.76.76.76/32 [110/3] via 10.10.10.0, xe40, 00:59:01
C       127.0.0.0/8 is directly connected, lo, 00:59:49
```

```
IP Route Table for VRF "management"
```

```
C       10.12.20.0/24 is directly connected, eth0, 00:59:22
C       127.0.0.0/8 is directly connected, lo.management, 00:59:49
```

```
IP Route Table for VRF "FAX"
```

```
Gateway of last resort is 66.66.66.66 to network 0.0.0.0
```

```
B*      0.0.0.0/0 [200/0] via 66.66.66.66 (recursive is directly connected,
tunvxlan2), 00:27:47
B       10.10.18.0/24 [200/0] via 66.66.66.66 (recursive is directly connected,
tunvxlan2), 00:28:55
B       10.10.20.0/24 [200/0] via 66.66.66.66 (recursive is directly connected,
tunvxlan2), 00:10:17
C       10.12.32.0/24 is directly connected, irb1050, 00:59:47
B       66.66.66.66/32 [0/0] is directly connected, tunvxlan2, 00:28:55
C       127.0.0.0/8 is directly connected, lo.FAX, 00:59:48
```

```
VTEP1# show bgp l2vpn evpn summary
```

```
BGP router identifier 51.51.51.51, local AS number 500
```

```
BGP table version is 9
```

```
2 BGP AS-PATH entries
```

```
0 BGP community entries
```

| Neighbor | V  | AS    | MsgRcv | MsgSen | TblVer       | InQ | OutQ | Up/Down | State/ |
|----------|----|-------|--------|--------|--------------|-----|------|---------|--------|
| PfxRcd   | AD | MACIP | MCAST  | ESI    | PREFIX-ROUTE |     |      |         |        |

---

```
66.66.66.66      4  500 138      132      8      0      0 00:29:07
12      0      2      1      0      9
```

Total number of neighbors 1

Total number of Established sessions 1

VTEP1# show bgp l2vpn evpn

BGP table version is 9, local router ID is 51.51.51.51

Status codes: s suppressed, d damped, h history, \* valid, > best, i - internal,  
l - labeled, S Stale

Origin codes: i - IGP, e - EGP, ? - incomplete

[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]

1 - Ethernet Auto-discovery Route

2 - MAC/IP Route

3 - Inclusive Multicast Route

4 - Ethernet Segment Route

5 - Prefix Route

| Network   | Next Hop    | Metric | LocPrf | Weight | Path          | Peer  |
|---|-------------|--------|--------|--------|---------------|-------|
| RD[2.2.4.4:4]   |             |        |        |        |               |       |
| *>i [2]:[0]:[1067]:[48,3c2c:991c:dc7a]:[32,10.10.18.1]:[1067] | 66.66.66.66 | 0      | 100    | 0      | i 66.66.66.66 | VxLAN |
| *>i [2]:[0]:[1067]:[48,a82b:b5cf:f806]:[32,10.10.18.2]:[1067] | 66.66.66.66 | 0      | 100    | 0      | i 66.66.66.66 | VxLAN |
| *>i [3]:[1067]:[32,66.66.66.66]                               | 66.66.66.66 | 0      | 100    | 0      | i 66.66.66.66 | VxLAN |
| RD[2.3.4.5:1] VRF[RED]:                                       |             |        |        |        |               |       |
| *> [2]:[0]:[1050]:[48,0000:0e8d:561a]:[0]:[1050]              | 51.51.51.51 | 0      | 100    | 32768  | i -----       |       |
| VxLAN   |             |        |        |        |               |       |
| *> [2]:[0]:[1050]:[48,0000:0e8d:561a]:[32,10.12.32.11]:[1050] | 51.51.51.51 | 0      | 100    | 32768  | i -----       |       |
| VxLAN   |             |        |        |        |               |       |
| *> [2]:[0]:[1050]:[48,0000:3333:1050]:[32,10.12.32.10]:[1050] | 51.51.51.51 | 0      | 100    | 32768  | i -----       |       |
| VxLAN   |             |        |        |        |               |       |
| *> [2]:[0]:[1050]:[48,3c2c:99d6:167a]:[32,10.12.32.1]:[1050]  | 51.51.51.51 | 0      | 100    | 32768  | i -----       |       |
| VxLAN   |             |        |        |        |               |       |
| *> [2]:[0]:[1050]:[48,3c2c:99d6:167a]:[128,2401::1]:[1050]    | 51.51.51.51 | 0      | 100    | 32768  | i -----       |       |
| VxLAN   |             |        |        |        |               |       |
| * i [2]:[0]:[1067]:[48,3c2c:991c:dc7a]:[32,10.10.18.1]:[1067] | 66.66.66.66 | 0      | 100    | 0      | i 66.66.66.66 | VxLAN |
| * i [2]:[0]:[1067]:[48,a82b:b5cf:f806]:[32,10.10.18.2]:[1067] | 66.66.66.66 | 0      | 100    | 0      | i 66.66.66.66 | VxLAN |
| *> [3]:[1050]:[32,51.51.51.51]                                |             |        |        |        |               |       |

## VxLAN-IRB-Inter-VRF Route Leaking

```
51.51.51.51          0          100          32768 i -----
VxLAN
* i [3]:[1067]:[32,66.66.66.66]
66.66.66.66          0          100          0 i 66.66.66.66 VxLAN

RD[4.5.6.8:6]
*>i [5]:[0]:[500]:[0]:[0.0.0.0]:[0.0.0.0]:[500]
66.66.66.66          0          100          0 64603 i 66.66.66.66
VxLAN
*>i [5]:[0]:[500]:[24]:[10.10.18.0]:[0.0.0.0]:[500]
66.66.66.66          0          100          0 ? 66.66.66.66 VxLAN
*>i [5]:[0]:[500]:[24]:[10.10.20.0]:[0.0.0.0]:[500]
66.66.66.66          0          100          0 64603 i 66.66.66.66
VxLAN

RD[66.66.66.66:1050]
*>i [5]:[0]:[500]:[0]:[0.0.0.0]:[0.0.0.0]:[500]
66.66.66.66          0          100          0 64603 i 66.66.66.66
VxLAN
*>i [5]:[0]:[500]:[24]:[10.10.18.0]:[0.0.0.0]:[500]
66.66.66.66          0          100          0 ? 66.66.66.66 VxLAN
*>i [5]:[0]:[500]:[24]:[10.10.20.0]:[0.0.0.0]:[500]
66.66.66.66          0          100          0 64603 i 66.66.66.66
VxLAN

RD[66.66.66.66:1060]
*>i [5]:[0]:[500]:[0]:[0.0.0.0]:[0.0.0.0]:[500]
66.66.66.66          0          100          0 64603 i 66.66.66.66
VxLAN
*>i [5]:[0]:[500]:[24]:[10.10.18.0]:[0.0.0.0]:[500]
66.66.66.66          0          100          0 ? 66.66.66.66 VxLAN
*>i [5]:[0]:[500]:[24]:[10.10.20.0]:[0.0.0.0]:[500]
66.66.66.66          0          100          0 64603 i 66.66.66.66
VxLAN
```

Total number of prefixes 21

VTEP1#

VTEP1#show ip route vrf FAX

Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP

O - OSPF, IA - OSPF inter area

N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2

E1 - OSPF external type 1, E2 - OSPF external type 2

i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,

ia - IS-IS inter area, E - EVPN,

v - vrf leaked

\* - candidate default

IP Route Table for VRF "FAX"

Gateway of last resort is 66.66.66.66 to network 0.0.0.0



```

B*      0.0.0.0/0 [200/0] via 66.66.66.66 (recursive is directly connected,
tunvxlan2), 00:29:26
B       10.10.18.0/24 [200/0] via 66.66.66.66 (recursive is directly connected,
tunvxlan2), 00:30:34
B       10.10.20.0/24 [200/0] via 66.66.66.66 (recursive is directly connected,
tunvxlan2), 00:11:56
C       10.12.32.0/24 is directly connected, irb1050, 01:01:26
B       66.66.66.66/32 [0/0] is directly connected, tunvxlan2, 00:30:34
C       127.0.0.0/8 is directly connected, lo.FAX, 01:01:27

```

VTEP1#show bgp l2vpn evpn prefix-route

RD[4.5.6.8:6]

| ESI<br>IPAddress | Eth-Tag           | Prefix-Length<br>L3VNID | IP-Address<br>Nexthop | Encap   | Router-Mac | GW- |
|------------------|-------------------|-------------------------|-----------------------|---------|------------|-----|
| 0                | 500 0             | 0.0.0.0                 |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |
| 0                | 500 24            | 10.10.18.0              |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |
| 0                | 500 24            | 10.10.20.0              |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |

RD[66.66.66.66:1050]

| ESI<br>IPAddress | Eth-Tag           | Prefix-Length<br>L3VNID | IP-Address<br>Nexthop | Encap   | Router-Mac | GW- |
|------------------|-------------------|-------------------------|-----------------------|---------|------------|-----|
| 0                | 500 0             | 0.0.0.0                 |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |
| 0                | 500 24            | 10.10.18.0              |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |
| 0                | 500 24            | 10.10.20.0              |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |

RD[66.66.66.66:1060]

| ESI<br>IPAddress | Eth-Tag           | Prefix-Length<br>L3VNID | IP-Address<br>Nexthop | Encap   | Router-Mac | GW- |
|------------------|-------------------|-------------------------|-----------------------|---------|------------|-----|
| 0                | 500 0             | 0.0.0.0                 |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |
| 0                | 500 24            | 10.10.18.0              |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |
| 0                | 500 24            | 10.10.20.0              |                       | 0.0.0.0 |            |     |
| 500              | 66.66.66.66 VxLAN | 3c2c:991c:dc7a          |                       |         |            |     |

**Ping to 10.10.20.1 network which is advertised by Firewall from VTEP1 FAX vrf**

```

VTEP1# ping 10.10.20.1 vrf FAX
Press CTRL+C to exit
PING 10.10.20.1 (10.10.20.1) 56(84) bytes of data.
64 bytes from 10.10.20.1: icmp_seq=1 ttl=63 time=0.446 ms
64 bytes from 10.10.20.1: icmp_seq=2 ttl=63 time=0.413 ms
64 bytes from 10.10.20.1: icmp_seq=3 ttl=63 time=0.373 ms

--- 10.10.20.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 73ms

```

## VxLAN-IRB-Inter-VRF Route Leaking

---

```
rtt min/avg/max/mdev = 0.373/0.410/0.446/0.037 ms  
VTEP1#
```

## CHAPTER 12 VxLAN Trunk Access Port Configuration

In VxLAN, most of the use cases demand to carry the complete traffic received on the access interface to another VTEP access-port. Hence this support of accepting all tagged and untagged traffic received on the mapped physical port.

### Topology

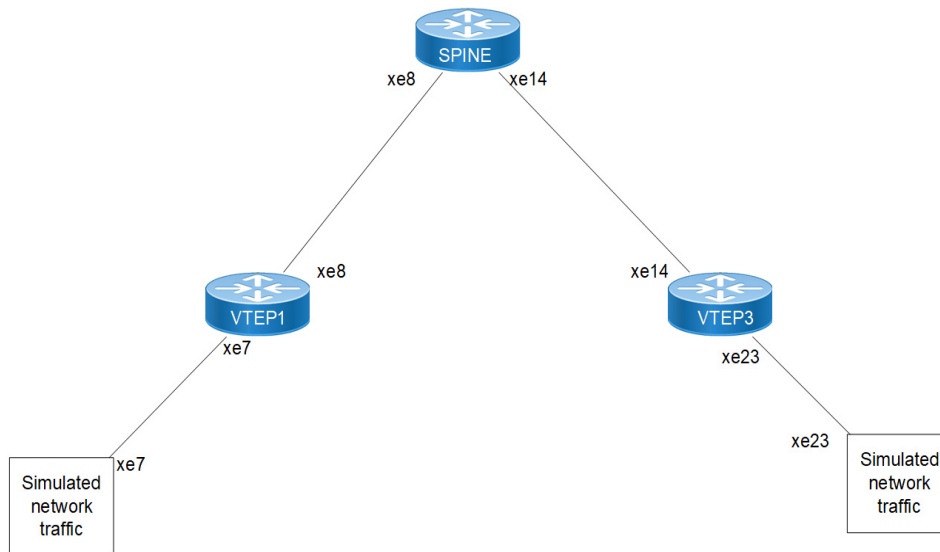


Figure 12-13: VxLAN Trunk Access Port Configuration topology

### Base Configuration - L2 VxLAN

#### VTEP1

Hardware profile and generic configuration:

|   |   |
|---|---|
| #configure terminal                                 | Enter Configure mode.                           |
| (config)#hardware-profile filter vxlan enable       | Enable hardware-profile filter for VxLAN.       |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4. |
| (config)#hardware-profile statistics ac-lif enable  | Enable ac-lif for vxlan access-if port counters |
| (config)#qos enable                                 | Enable qos                                      |
| (config)#commit                                     | Committing the configurations                   |

Interface and loopback configuration:

|                        |                              |
|------------------------|------------------------------|
| (config)#interface xe7 | Enter Interface mode for xe7 |
| (config-if)#switchport | Make it L2 interface         |

## VxLAN Trunk Access Port Configuration

|   |  |
|---|--|
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.  |
| (config)#interface xe8                      | Enter Interface mode for xe8                       |
| (config-if)#ip add 10.10.10.1/24            | Configuring the ip address in the network side     |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.  |
| (config)#interface lo                       | Enter Interface mode for lo                        |
| (config-if)#ip address 1.1.1.1/32 secondary | Configure loopback ip address as 1.1.1.1 for VTEP1 |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.  |
| (config)#commit                             | Committing the interface configurations            |

### OSPF configuration:

|  |   |
|--|---|
| (config)#router ospf 1                             | Enter into router OSPF mode                             |
| (config-router)#ospf router-id 1.1.1.1             | Configure router-id as 1.1.1.1 (lo ip address)          |
| (config-router)#network 1.1.1.1/32 area 0.0.0.0    | Add 1.1.1.1 (lo ip address) network into area 0         |
| (config-router)#network 10.10.10.0/24 area 0.0.0.0 | Add 10.10.10.0(Spine) network into area 0               |
| (config-router)#bfd all-interfaces                 | Enabling bfd on all ospf interface for fast convergence |
| (config-router)#exit                               | Exit Interface mode and return to Configure mode.       |
| (config)#commit                                    | Committing the ospf configurations                      |

### BGP configuration:

|   |  |
|---|--|
| (config)#router bgp 1                                     | Enter into Router BGP mode   |
| (config-router)#bgp router-id 1.1.1.1                     | Configure router-id as 1.1.1.1 (lo ip address)                       |
| (config-router)#neighbor 2.2.2.2 remote-as 1              | Specify a VTEP2 loopback ip address and remote-as defined            |
| (config-router)#neighbor 2.2.2.2 update-source lo         | Configure update as loopback for VTEP2                               |
| (config-router)#neighbor 2.2.2.2 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP2 |
| (config-router)#address-family l2vpn evpn                 | Enter into l2vpn EVPN address family mode                            |
| (config-router-af)#neighbor 2.2.2.2 activate              | Activate 2.2.2.2(VTEP2) into l2vpn evpn address family mode          |
| (config-router-af)#exit-address-family                    | Exit from l2vpn address family mode                                  |
| (config-router)#exit                                      | Exit from Router BGP mode and enter into config mode                 |
| (config)#commit   | Committing the bgp configurations                                    |

### L2 MAC VRF Configuration:

|                                    |   |
|------------------------------------|---|
| (config)#mac vrf L2VRF1            | Create mac routing/forwarding instance with L2VRF1 name and enter into vrf mode                 |
| (config-vrf)#rd 1.1.1.1:1          | Assign RD value   |
| (config-vrf)#route-target both 1:1 | Assign route-target value for same for import and export. Should be same on all node for L2VRF1 |

|                   |                                   |
|-------------------|-----------------------------------|
| (config-vrf)#exit | Exit from vrf mode                |
| (config)#commit   | Committing the vrf configurations |

**L2 VxLAN configuration:**

|   |   |
|---|---|
| (config)#nvo vxlan enable                                     | Enable VxLAN  |
| (config)#nvo vxlan vtep-ip-global 1.1.1.1                     | Configure Source vtep-ip-global configuration - Use loopback ip address   |
| (config)#nvo vxlan id 100 ingress-replication                 | Configure VxLAN Network identifier without inner-vid-disabled configured for vxlan trunk access port and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1 | Assign vrf for evpn-bgp to carry EVPN route   |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#commit   | Committing the vxlan configurations   |

**VTEP2****Hardware profile and generic configuration:**

|   |   |
|---|---|
| #configure terminal                                 | Enter Configure mode.                           |
| (config)#hardware-profile filter vxlan enable       | Enable hardware-profile filter for VxLAN.       |
| (config)#hardware-profile filter egress-ipv4 enable | Enable hardware-profile filter for egress IPv4. |
| (config)#hardware-profile statistics ac-lif enable  | Enable ac-lif for vxlan access-if port counters |
| (config)#qos enable                                 | Enable qos                                      |
| (config)#commit                                     | Committing the configurations                   |

**Interface and loopback configuration:**

|   |  |
|---|--|
| (config)#interface xe23                     | Enter Interface mode for xe23                      |
| (config-if)#switchport                      | Make it L2 interface                               |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.  |
| (config)#interface xe14                     | Enter Interface mode for xe14                      |
| (config-if)#ip add 20.20.20.1/24            | Configuring the ip address in the network side     |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.  |
| (config)#interface lo                       | Enter Interface mode for lo                        |
| (config-if)#ip address 2.2.2.2/32 secondary | Configure loopback ip address as 2.2.2.2 for VTEP2 |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode.  |
| (config)#commit                             | Committing the interface configurations            |

### OSPF configuration:

|  |   |
|--|---|
| (config)#router ospf 1                             | Enter into router OSPF mode                             |
| (config-router)#ospf router-id 2.2.2.2             | Configure router-id as 2.2.2.2 (lo ip address)          |
| (config-router)#network 2.2.2.2/32 area 0.0.0.0    | Add 2.2.2.2 (lo ip address) network into area 0         |
| (config-router)#network 20.20.20.0/24 area 0.0.0.0 | Add 20.20.20.0(Spine) network into area 0               |
| (config-router)#bfd all-interfaces                 | Enabling bfd on all ospf interface for fast convergence |
| (config-router)#exit                               | Exit Interface mode and return to Configure mode.       |
| (config)#commit                                    | Committing the ospf configurations                      |

### BGP configuration:

|   |  |
|---|--|
| (config)#router bgp 1                                     | Enter into Router BGP mode   |
| (config-router)#bgp router-id 2.2.2.2                     | Configure router-id as 2.2.2.2 (lo ip address)                       |
| (config-router)#neighbor 1.1.1.1 remote-as 1              | Specify a VTEP1 loopback ip address and remote-as defined            |
| (config-router)#neighbor 1.1.1.1 update-source lo         | Configure update as loopback for VTEP2                               |
| (config-router)#neighbor 1.1.1.1 advertisement-interval 0 | Configure advertisement-interval as 0 for fast convergence for VTEP1 |
| (config-router)#address-family l2vpn evpn                 | Enter into l2vpn EVPN address family mode                            |
| (config-router-af)#neighbor 1.1.1.1 activate              | Activate 1.1.1.1(VTEP1) into l2vpn evpn address family mode          |
| (config-router-af)#exit-address-family                    | Exit from l2vpn address family mode                                  |
| (config-router)#exit                                      | Exit from Router BGP mode and enter into config mode                 |
| (config)#commit   | Committing the bgp configurations                                    |

### L2 MAC VRF Configuration:

|                                    |   |
|------------------------------------|---|
| (config)#mac vrf L2VRF1            | Create mac routing/forwarding instance with L2VRF1 name and enter into vrf mode                 |
| (config-vrf)#rd 2.2.2.2:1          | Assign RD value   |
| (config-vrf)#route-target both 1:1 | Assign route-target value for same for import and export. Should be same on all node for L2VRF1 |
| (config-vrf)#exit                  | Exit from vrf mode  |
| (config)#commit                    | Committing the vrf configurations   |

### L2 VxLAN configuration:

|   |   |
|---|---|
| (config)#nvo vxlan enable                     | Enable VxLAN  |
| (config)#nvo vxlan vtep-ip-global 2.2.2.2     | Configure Source vtep-ip-global configuration - Use loopback ip address   |
| (config)#nvo vxlan id 100 ingress-replication | Configure VxLAN Network identifier without inner-vid-disabled configured for vxlan trunk access port and enter into VxLAN tenant mode |

|   |  |
|---|--|
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp L2VRF1 | Assign vrf for evpn-bgp to carry EVPN route                    |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode. |
| (config)#commit   | Committing the vxlan configurations                            |

## SPINE

Spine node where all VTEPs are connected.

### Generic configuration:

|                     |                              |
|---------------------|------------------------------|
| #configure terminal | Enter Configure mode.        |
| (config)#qos enable | Enabling qos                 |
| (config)#commit     | Committing the configuration |

### Interface configuration:

|                                      |   |
|--------------------------------------|---|
| (config)#interface xe8               | Enter Interface mode for xe8                                |
| (config-if)#ip address 10.10.10.2/24 | Configure ip address as 10.10.10.2 on network side of VTEP1 |
| (config-if)#exit                     | Exit Interface mode and return to Configure mode.           |
| (config) interface xe14              | Enter into ce5/1 interface mode                             |
| (config-if)#ip address 20.20.20.2/24 | Configure ip address as 20.20.20.2 on network side of VTEP2 |
| (config-if)#exit                     | Exit Interface mode and return to Configure mode.           |
| (config) commit                      | Committing the configuration                                |

### OSPF configuration:

|  |   |
|--|---|
| (config)#router ospf 1                             | Enter into router OSPF mode                             |
| (config-router)#ospf router-id 3.3.3.3             | Configure router-id as 3.3.3.3                          |
| (config-router)#network 10.10.10.0/24 area 0.0.0.0 | Add 10.10.10.0 (VTEP1) network into area 0              |
| (config-router)#network 20.20.20.0/24 area 0.0.0.0 | Add 20.20.20.0 (VTEP2) network into area 0              |
| (config-router)#bfd all-interfaces                 | Enabling bfd on all ospf interface for fast convergence |
| (config-if)#exit                                   | Exit Interface mode and return to Configure mode.       |
| (config) commit                                    | Committing the ospf configuration                       |

## VxLAN Trunk Access port as default

In VxLAN, most of the use cases demand to carry the complete traffic received on the access interface to another VTEP access-port. Hence this support of accepting all tagged and untagged traffic received on the mapped physical port.

**VTEP1**

|   |  |
|---|--|
| (config)#nvo vxlan access-if port xe7 default | Configuring the vxlan access port as default to receive untagged, single and double tagged traffic |
| (config-nvo-acc-if)#map vnid 100              | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)#arp-cache disable         | Disable arp-cache - mandatory  |
| (config-nvo-acc-if)#nd-cache disable          | Disable nd-cache - mandatory   |
| (config-nvo-acc-if)# mac 0000.1111.0001       | Configure static mac-only  |
| (config-nvo-acc-if)#exit                      | Exit from VxLAN access-interface mode and enter into configuration mode                            |
| (config)#commit                               | Committing the vxlan configuration   |

**VTEP2**

|  |  |
|--|--|
| (config)#nvo vxlan access-if port xe23 default | Configuring the vxlan access port as default to receive untagged, single and double tagged traffic |
| (config-nvo-acc-if)#map vnid 100               | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)#arp-cache disable          | Disable arp-cache - mandatory  |
| (config-nvo-acc-if)#nd-cache disable           | Disable nd-cache - mandatory   |
| (config-nvo-acc-if)# mac 0000.2222.0001        | Configure static mac-only  |
| (config-nvo-acc-if)#exit                       | Exit from VxLAN access-interface mode and enter into configuration mode                            |
| (config)#commit                                | Committing the vxlan configuration   |

**Validation**

**VTEP1**

```
VTEP1#sh run nvo vxlan
!
nvo vxlan enable
!
nvo vxlan vtep-ip-global 1.1.1.1
!
nvo vxlan id 100 ingress-replication
  vxlan host-reachability-protocol evpn-bgp L2VRF1
!
nvo vxlan access-if port xe7 default
  map vnid 100
  arp-cache disable
  nd-cache disable
  mac 0000.1111.0001
!
!
```

```
VTEP1#sh nvo vxlan tunnel
VxLAN Network tunnel Entries
Source          Destination      Status           Up/Down         Update
```



```
=====
1.1.1.1          2.2.2.2          Installed          00:02:49          00:02:49
```

Total number of entries are 1

VTEP1#sh nvo vxlan mac-table

```
=====
VxLAN MAC Entries
=====
```

| VNID Type         | Interface | VlanId Status | Vlan-RangeId AccessPortDesc | Inner-VlanId   | Mac-Addr       | VTEP-Ip/ESI |
|-------------------|-----------|---------------|-----------------------------|----------------|----------------|-------------|
| 100 Static Local  | xe7       | ----          | ----                        | ----           | 0000.1111.0001 | 1.1.1.1     |
| 100 Static Remote | ----      | ----          | ----                        | 0000.2222.0001 | 2.2.2.2        |             |
| 100 Dynamic Local | xe7       | ----          | ----                        | ----           | b0da.1d10.6496 | 1.1.1.1     |

Total number of entries are : 3

VTEP1#sh nvo vxlan mac-table hardware

```
=====
VxLAN MAC Entries
=====
```

| VNID Type         | Interface | VlanId Status | Vlan-RangeId Time-out | Inner-VlanId AccessPortDesc | Mac-Addr       | VTEP-Ip/ESI |
|-------------------|-----------|---------------|-----------------------|-----------------------------|----------------|-------------|
| 100 Static Local  | xe7       | ----          | ----                  | ----                        | 0000.1111.0001 | 1.1.1.1     |
| 100 Remote        | ---       | ----          | ----                  | ----                        | 0000.2222.0001 | 2.2.2.2     |
| 100 Dynamic Local | xe7       | ----          | 300                   | ----                        | b0da.1d10.6496 | 1.1.1.1     |

Total number of entries are 3

VTEP1#show nvo vxlan

VxLAN Information

```
=====
Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged
```

| VNID Src-Addr | VNI-Name Dst-Addr | VNI-Type | Type | Interface | ESI | VLAN DF-Status |
|---------------|-------------------|----------|------|-----------|-----|----------------|
|---------------|-------------------|----------|------|-----------|-----|----------------|

## VxLAN Trunk Access Port Configuration

```

100      ----      L2      NW      ----      ----      ---- ----
1.1.1.1      2.2.2.2
100      ----      --      AC      xe7      --- Single Homed Port ---      ---- ----
----      ----

```

Total number of entries are 2  
VTEP1#sh nvo vxlan route-count  
VxLAN Active route count information  
=====

```

Max route count      : 32768
Active route count: 3

```

```

-----
VNID      Total      MACONLY  MACIPv4  MACIPv6
-----
100      3      3      0      0

```

Total number of entries are 1  
VTEP1#sh nvo vxlan access-if-config  
nvo vxlan access-if port xe7 default  
map vnid 100  
arp-cache disable  
nd-cache disable  
mac 0000.1111.0001  
!  
VTEP1#sh nvo vxlan access-if brief

```

          Inner
Interface  Vlan  vlan  Ifindex  Vnid      Admin  Link
          status status
-----
xe7      ---  ---  500000  100      up      up

```

Total number of entries are 1  
VTEP1#sh bgp l2vpn evpn summary  
BGP router identifier 1.1.1.1, local AS number 1  
BGP table version is 2  
1 BGP AS-PATH entries  
0 BGP community entries

```

Neighbor      V  AS  MsgRcv  MsgSen  TblVer  InQ  OutQ  Up/Down  State/
PfxRcd      AD  MACIP  MCAST  ESI  PREFIX-ROUTE
2.2.2.2      4  1  15      17      2      0      0  00:04:52
2      0  1  1      0      0

```

Total number of neighbors 1

Total number of Established sessions 1  
VTEP1#sh bgp l2vpn evpn  
BGP table version is 2, local router ID is 1.1.1.1  
Status codes: s suppressed, d damped, h history, a add-path, \* valid, > best, i - internal,

1 - labeled, S Stale

Origin codes: i - IGP, e - EGP, ? - incomplete

[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]

- 1 - Ethernet Auto-discovery Route
- 2 - MAC/IP Route
- 3 - Inclusive Multicast Route
- 4 - Ethernet Segment Route
- 5 - Prefix Route

| Network Encap                                   | Next Hop | Metric | LocPrf | Weight | Path      | Peer  |
|---|----------|--------|--------|--------|-----------|-------|
| RD[1.1.1.1:1] VRF[L2VRF1]:                      |          |        |        |        |           |       |
| *> [2]:[0]:[100]:[48,0000:1111:0001]:[0]:[100]  | 1.1.1.1  | 0      | 100    | 32768  | i         | ----- |
| VxLAN   |          |        |        |        |           |       |
| * i [2]:[0]:[100]:[48,0000:2222:0001]:[0]:[100] | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 | VxLAN |
| *> [2]:[0]:[100]:[48,b0da:1d10:6496]:[0]:[100]  | 1.1.1.1  | 0      | 100    | 32768  | i         | ----- |
| VxLAN   |          |        |        |        |           |       |
| *> [3]:[100]:[32,1.1.1.1]                       | 1.1.1.1  | 0      | 100    | 32768  | i         | ----- |
| VxLAN   |          |        |        |        |           |       |
| * i [3]:[100]:[32,2.2.2.2]                      | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 | VxLAN |
| RD[2.2.2.2:1]                                   |          |        |        |        |           |       |
| *>i [2]:[0]:[100]:[48,0000:2222:0001]:[0]:[100] | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 | VxLAN |
| *>i [3]:[100]:[32,2.2.2.2]                      | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 | VxLAN |

Total number of prefixes 7  
VTEP1#sh nvo vxlan arp-cache  
VxLAN ARP-CACHE Information

| VNID | Ip-Addr | Mac-Addr | Type | Age-Out | Retries-Left |
|------|---------|----------|------|---------|--------------|
|------|---------|----------|------|---------|--------------|

Total number of entries are 0

VTEP1#sh nvo vxlan nd-cache  
VxLAN ND-CACHE Information

| VNID | Ip-Addr | Mac-Addr | Type | Age-Out |
|------|---------|----------|------|---------|
|------|---------|----------|------|---------|

Total number of entries are 0

VTEP1#

**VTEP2**

```
VTEP2#sh run nvo vxlan
!
nvo vxlan enable
!
nvo vxlan vtep-ip-global 2.2.2.2
!
nvo vxlan id 100 ingress-replication
  vxlan host-reachability-protocol evpn-bgp L2VRF1
!
nvo vxlan access-if port xe23 default
  map vnid 100
  arp-cache disable
  nd-cache disable
  mac 0000.2222.0001
!
!
```

```
VTEP2#sh nvo vxlan tunnel
VxLAN Network tunnel Entries
Source          Destination      Status           Up/Down          Update
=====
2.2.2.2         1.1.1.1         Installed        00:05:47        00:05:47
```

Total number of entries are 1

```
VTEP2#sh nvo vxlan
```

VxLAN Information

```
=====
Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged
```

| VNID     | VNI-Name | VNI-Type | Type | Interface | ESI  | VLAN              | DF-Status |
|----------|----------|----------|------|-----------|------|-------------------|-----------|
| Src-Addr | Dst-Addr |          |      |           |      |                   |           |
| 100      | ----     | L2       | NW   | ----      | ---- | ----              | ----      |
| 2.2.2.2  | 1.1.1.1  |          |      |           |      |                   |           |
| 100      | ----     | --       | AC   | xe23      | ---  | Single Homed Port | ---       |
| ----     | ----     |          |      |           |      |                   |           |

Total number of entries are 2

```
VTEP2#sh nvo vxlan mac-table
```

```
=====
VxLAN MAC Entries
=====
```

| VNID | Interface | VlanId | Vlan-RangeId   | Inner-VlanId | Mac-Addr | VTEP-Ip/ESI |
|------|-----------|--------|----------------|--------------|----------|-------------|
| Type | Status    |        | AccessPortDesc |              |          |             |
|      |           |        |                |              |          |             |

```

100      ----      ----      ----      0000.1111.0001 1.1.1.1
Static Remote -----
100      xe23      ----      ----      ----      0000.2222.0001 2.2.2.2
Static Local -----
100      ----      ----      ----      b0da.1d10.6496 1.1.1.1
Dynamic Remote -----
    
```

Total number of entries are : 3

VTEP2#sh nvo vxlan mac-table hardware

```

=====
=====
                                     VxLAN MAC Entries
=====
=====
VNID      Interface VlanId Vlan-RangeId Inner-VlanId Mac-Addr      VTEP-Ip/ESI
Type              Status      Time-out  AccessPortDesc
-----
100      ---      ----      ----      0000.1111.0001 1.1.1.1
Remote
100      xe23      ----      ----      0000.2222.0001 2.2.2.2
Static Local
100      ---      ----      ----      b0da.1d10.6496 1.1.1.1
Remote
    
```

Total number of entries are 3

VTEP2#sh nvo vxlan route-count

VxLAN Active route count information

=====

Max route count : 32768

Active route count: 3

```

-----
VNID      Total      MACONLY  MACIPv4  MACIPv6
-----
100      3          3        0        0
    
```

Total number of entries are 1

VTEP2#sh nvo vxlan access-if br

```

          Inner      Admin      Link
Interface Vlan  vlan  Ifindex  Vnid      status      status
-----
xe23      ---  ---  500000  100      up          up
    
```

Total number of entries are 1

VTEP2#sh nvo vxlan access-if-config

nvo vxlan access-if port xe23 default

map vnid 100

arp-cache disable

## VxLAN Trunk Access Port Configuration

---

```
nd-cache disable
mac 0000.2222.0001
!
```

```
VTEP2#sh nvo vxlan arp-cache
VxLAN ARP-CACHE Information
```

```
=====
VNID      Ip-Addr      Mac-Addr      Type      Age-Out      Retries-Left
```

---

Total number of entries are 0

```
VTEP2#sh nvo vxlan nd-cache
VxLAN ND-CACHE Information
```

```
=====
VNID      Ip-Addr      Mac-Addr      Type      Age-Out      Retries-Left
```

---

Total number of entries are 0

```
VTEP2#
```

```
VTEP2#sh bgp l2vpn evpn summary
BGP router identifier 2.2.2.2, local AS number 1
BGP table version is 2
1 BGP AS-PATH entries
0 BGP community entries
```

| Neighbor | V  | AS    | MsgRcv | MsgSen | TblVer       | InQ | OutQ | Up/Down | State/ |   |          |
|----------|----|-------|--------|--------|--------------|-----|------|---------|--------|---|----------|
| PfxRcd   | AD | MACIP | MCAST  | ESI    | PREFIX-ROUTE |     |      |         |        |   |          |
| 1.1.1.1  |    |       | 4      | 1      | 27           |     | 27   | 1       | 0      | 0 | 00:09:54 |
| 3        | 0  | 2     | 1      | 0      | 0            |     |      |         |        |   |          |

Total number of neighbors 1

Total number of Established sessions 1

```
VTEP2#sh bgp l2vpn evpn
BGP table version is 2, local router ID is 2.2.2.2
Status codes: s suppressed, d damped, h history, a add-path, * valid, > best, i -
internal,
                l - labeled, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
```

```
[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]
```

- 1 - Ethernet Auto-discovery Route
- 2 - MAC/IP Route
- 3 - Inclusive Multicast Route
- 4 - Ethernet Segment Route
- 5 - Prefix Route

| Network | Next Hop | Metric | LocPrf | Weight | Path | Peer |
|---------|----------|--------|--------|--------|------|------|
|---------|----------|--------|--------|--------|------|------|

---

Encap

```
RD[1.1.1.1:1]
*>i [2]:[0]:[100]:[48,0000:1111:0001]:[0]:[100]
```

---

```

1.1.1.1      0      100      0      i  1.1.1.1      VxLAN
*>i  [2]:[0]:[100]:[48,b0da:1d10:6496]:[0]:[100]
1.1.1.1      0      100      0      i  1.1.1.1      VxLAN
*>i  [3]:[100]:[32,1.1.1.1]
1.1.1.1      0      100      0      i  1.1.1.1      VxLAN

RD[2.2.2.2:1] VRF[L2VRF1]:
* i  [2]:[0]:[100]:[48,0000:1111:0001]:[0]:[100]
1.1.1.1      0      100      0      i  1.1.1.1      VxLAN
*>  [2]:[0]:[100]:[48,0000:2222:0001]:[0]:[100]
2.2.2.2      0      100      32768  i  -----
VxLAN
* i  [2]:[0]:[100]:[48,b0da:1d10:6496]:[0]:[100]
1.1.1.1      0      100      0      i  1.1.1.1      VxLAN
* i  [3]:[100]:[32,1.1.1.1]
1.1.1.1      0      100      0      i  1.1.1.1      VxLAN
*>  [3]:[100]:[32,2.2.2.2]
2.2.2.2      0      100      32768  i  -----
VxLAN

Total number of prefixes 8
VTEP2#

```

## VxLAN Trunk access port with vlan range

When an access port with a specific vlan range configured, all the traffic in that specific range are accepted and forwarded.

### VTEP1

|  |  |
|--|--|
| (config)#nvo vxlan access-if port-vlan xe7 2-100 | Configuring the vxlan access port with vlan range 2-100 where traffic in the vlan range 2-100 are accepted |
| (config-nvo-acc-if)#map vnid 100                 | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)#arp-cache disable            | Disable arp-cache - mandatory  |
| (config-nvo-acc-if)#nd-cache disable             | Disable nd-cache - mandatory   |
| (config-nvo-acc-if)# mac 0000.1111.0001          | Configure static mac-only  |
| (config-nvo-acc-if)#exit                         | Exit from VxLAN access-interface mode and enter into configuration mode                                    |
| (config)#commit                                  | Committing the vxlan configuration   |

### VTEP2

|   |  |
|---|--|
| (config)#nvo vxlan access-if port-vlan xe23 2-100 | Configuring the vxlan access port with vlan range 2-100 where traffic in the vlan range 2-100 are accepted |
| (config-nvo-acc-if)#map vnid 100                  | Map VxLAN Identified to access-port for VxLAN  |
| (config-nvo-acc-if)#arp-cache disable             | Disable arp-cache - mandatory  |
| (config-nvo-acc-if)#nd-cache disable              | Disable nd-cache - mandatory   |
| (config-nvo-acc-if)# mac 0000.2222.0001           | Configure static mac-only  |

## VxLAN Trunk Access Port Configuration

---

|                          |   |
|--------------------------|---|
| (config-nvo-acc-if)#exit | Exit from VxLAN access-interface mode and enter into configuration mode |
| (config)#commit          | Committing the vxlan configuration                                      |

---

## Validations

### VTEP1

```
VTEP1#sh run nvo vx
!  
nvo vxlan enable  
!  
nvo vxlan vtep-ip-global 1.1.1.1  
!  
nvo vxlan id 100 ingress-replication  
vxlan host-reachability-protocol evpn-bgp L2VRF1  
!  
nvo vxlan access-if port-vlan xe7 2-100  
map vnid 100  
arp-cache disable  
nd-cache disable  
mac 0000.1111.0001  
!  
!
```

VTEP1#

```
VTEP1#sh nvo vxlan tunnel summary
```

Total number of entries: 1 [Installed: 1, Resolved: 0, Unresolved: 0]

Total number of entries are 1

```
VTEP1#sh nvo vxlan tunnel
```

VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 1.1.1.1 | 2.2.2.2     | Installed | 00:20:10 | 00:20:10 |

Total number of entries are 1

```
VTEP1#sh nvo vx
```

VxLAN Information

=====

Codes: NW - Network Port  
AC - Access Port  
(u) - Untagged

| VNID     | VNI-Name | VNI-Type | Type | Interface | ESI | VLAN | DF-Status |
|----------|----------|----------|------|-----------|-----|------|-----------|
| Src-Addr | Dst-Addr |          |      |           |     |      |           |

---

|         |         |    |    |      |      |      |      |
|---------|---------|----|----|------|------|------|------|
| 100     | ----    | L2 | NW | ---- | ---- | ---- | ---- |
| 1.1.1.1 | 2.2.2.2 |    |    |      |      |      |      |

---



```
100      ----      --      AC   xe7      --- Single Homed Port ---      2      ----
-----      -----
```

Total number of entries are 2

VTEP1#sh nvo vxlan mac-table

```
=====
=====
```

VxLAN MAC Entries

```
=====
=====
```

| VNID<br>Type | Interface | VlanId<br>Status | Vlan-RangeId<br>AccessPortDesc | Inner-VlanId | Mac-Addr | VTEP-Ip/ESI |
|--------------|-----------|------------------|--------------------------------|--------------|----------|-------------|
|--------------|-----------|------------------|--------------------------------|--------------|----------|-------------|

|               |      |       |       |      |                |         |
|---------------|------|-------|-------|------|----------------|---------|
| 100           | xe7  | ----- | 2-100 | ---- | 0000.1111.0001 | 1.1.1.1 |
| Static Local  |      | ----- | ----- |      |                |         |
| 100           | ---- | ----  | ----  |      | 0000.2222.0001 | 2.2.2.2 |
| Static Remote |      | ----- | ----- |      |                |         |
| 100           | xe7  | ----- | 2-100 | ---- | b0da.1d10.6496 | 1.1.1.1 |
| Dynamic Local |      | ----- | ----- |      |                |         |

Total number of entries are : 3

VTEP1#sh nvo vxlan mac-table hardware

```
=====
=====
```

VxLAN MAC Entries

```
=====
=====
```

| VNID<br>Type | Interface | VlanId<br>Status | Vlan-RangeId<br>Time-out | Inner-VlanId<br>AccessPortDesc | Mac-Addr | VTEP-Ip/ESI |
|--------------|-----------|------------------|--------------------------|--------------------------------|----------|-------------|
|--------------|-----------|------------------|--------------------------|--------------------------------|----------|-------------|

|               |     |       |       |       |                |         |
|---------------|-----|-------|-------|-------|----------------|---------|
| 100           | xe7 | ----- | 2-100 | ----  | 0000.1111.0001 | 1.1.1.1 |
| Static Local  |     | ----- | ---   | ----- |                |         |
| 100           | --- | ----  | ----  |       | 0000.2222.0001 | 2.2.2.2 |
| Remote        |     | ----- | ---   | ----- |                |         |
| 100           | xe7 | ----- | 2-100 | ----  | b0da.1d10.6496 | 1.1.1.1 |
| Dynamic Local |     | ----- | 300   | ----- |                |         |

Total number of entries are 3

VTEP1#sh nvo vxlan arp-cache

VxLAN ARP-CACHE Information

```
=====
```

| VNID | Ip-Addr | Mac-Addr | Type | Age-Out | Retries-Left |
|------|---------|----------|------|---------|--------------|
|------|---------|----------|------|---------|--------------|

Total number of entries are 0

VTEP1#sh nvo vxlan nd-cache

VxLAN ND-CACHE Information

```
=====
```

| VNID | Ip-Addr | Mac-Addr | Type | Age-Out |
|------|---------|----------|------|---------|
|------|---------|----------|------|---------|

Retries-Left

## VxLAN Trunk Access Port Configuration

---

```
Total number of entries are 0
VTEP1#sh nvo vxlan access-if-config
nvo vxlan access-if port-vlan xe7 2-100
map vnid 100
arp-cache disable
nd-cache disable
mac 0000.1111.0001
!
VTEP1#sh nvo vxlan access-if brief
```

| Interface | Vlan | Inner<br>vlan | Ifindex | Vnid | Admin<br>status | Link<br>status |
|-----------|------|---------------|---------|------|-----------------|----------------|
| xe7       | 2    | ---           | 500000  | 100  | up              | up             |

```
Total number of entries are 1
VTEP1#
VTEP1#sh nvo vxlan route-count
VxLAN Active route count information
=====
Max route count : 32768
Active route count: 3
```

| VNID | Total | MACONLY | MACIPv4 | MACIPv6 |
|------|-------|---------|---------|---------|
| 100  | 3     | 3       | 0       | 0       |

```
Total number of entries are 1
VTEP1#sh bgp l2vpn evpn summary
BGP router identifier 1.1.1.1, local AS number 1
BGP table version is 5
1 BGP AS-PATH entries
0 BGP community entries
```

| Neighbor<br>PfxRcd | AD | MACIP | V<br>MCAST | AS | MsgRcv<br>ESI | MsgSen<br>PREFIX-ROUTE | TblVer | InQ | OutQ | Up/Down  | State/ |
|--------------------|----|-------|------------|----|---------------|------------------------|--------|-----|------|----------|--------|
| 2.2.2.2            |    |       | 4          | 1  | 58            | 61                     | 5      | 0   | 0    | 00:22:05 |        |
| 2                  | 0  | 1     | 1          | 0  | 0             |                        |        |     |      |          |        |

```
Total number of neighbors 1
```

```
Total number of Established sessions 1
VTEP1#sh bgp l2vpn evpn
BGP table version is 5, local router ID is 1.1.1.1
Status codes: s suppressed, d damped, h history, a add-path, * valid, > best, i -
internal,
                l - labeled, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
```

[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]

- 1 - Ethernet Auto-discovery Route
- 2 - MAC/IP Route
- 3 - Inclusive Multicast Route
- 4 - Ethernet Segment Route
- 5 - Prefix Route

| Network   | Next Hop | Metric | LocPrf | Weight | Path      | Peer  |
|---|----------|--------|--------|--------|-----------|-------|
| Encap   |          |        |        |        |           |       |
| RD[1.1.1.1:1] VRF[L2VRF1]:                      |          |        |        |        |           |       |
| *> [2]:[0]:[100]:[48,0000:1111:0001]:[0]:[100]  | 1.1.1.1  | 0      | 100    | 32768  | i         | ----- |
| VxLAN   |          |        |        |        |           |       |
| * i [2]:[0]:[100]:[48,0000:2222:0001]:[0]:[100] | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 | VxLAN |
| *> [2]:[0]:[100]:[48,b0da:1d10:6496]:[0]:[100]  | 1.1.1.1  | 0      | 100    | 32768  | i         | ----- |
| VxLAN   |          |        |        |        |           |       |
| *> [3]:[100]:[32,1.1.1.1]                       | 1.1.1.1  | 0      | 100    | 32768  | i         | ----- |
| VxLAN   |          |        |        |        |           |       |
| * i [3]:[100]:[32,2.2.2.2]                      | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 | VxLAN |
| RD[2.2.2.2:1]                                   |          |        |        |        |           |       |
| *>i [2]:[0]:[100]:[48,0000:2222:0001]:[0]:[100] | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 | VxLAN |
| *>i [3]:[100]:[32,2.2.2.2]                      | 2.2.2.2  | 0      | 100    | 0      | i 2.2.2.2 | VxLAN |

Total number of prefixes 7

VTEP2

```
VTEP2#sh run nvo vxlan
!
nvo vxlan enable
!
nvo vxlan vtep-ip-global 2.2.2.2
!
nvo vxlan id 100 ingress-replication
  vxlan host-reachability-protocol evpn-bgp L2VRF1
!
nvo vxlan access-if port-vlan xe23 2-100
  map vnid 100
  arp-cache disable
  nd-cache disable
  mac 0000.2222.0001
!
```

## VxLAN Trunk Access Port Configuration

```

!
VTEP2#sh nvo vxlan tunnel
VxLAN Network tunnel Entries
Source          Destination      Status           Up/Down          Update
=====
2.2.2.2         1.1.1.1         Installed        00:19:28        00:19:28

```

Total number of entries are 1

```

VTEP2#sh nvo vxlan tunnel
VxLAN Network tunnel Entries
Source          Destination      Status           Up/Down          Update
=====
2.2.2.2         1.1.1.1         Installed        00:21:06        00:21:06

```

Total number of entries are 1

```

VTEP2#sh nvo vxlan
VxLAN Information
=====
Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged

```

| VNID     | VNI-Name | VNI-Type | Type | Interface | ESI  | VLAN              | DF-Status |
|----------|----------|----------|------|-----------|------|-------------------|-----------|
| Src-Addr | Dst-Addr |          |      |           |      |                   |           |
| 100      | ----     | L2       | NW   | ----      | ---- | ----              | ----      |
| 2.2.2.2  | 1.1.1.1  |          |      |           |      |                   |           |
| 100      | ----     | --       | AC   | xe23      | ---  | Single Homed Port | ---       |
| ----     | ----     | ----     |      |           |      | 2                 | ----      |

Total number of entries are 2

```

VTEP2#sh nvo vxlan mac-table
=====
VxLAN MAC Entries
=====
VNID      Interface VlanId Vlan-RangeId Inner-VlanId Mac-Addr      VTEP-Ip/ESI
Type      Status   AccessPortDesc
=====
100      ----    ----    ----          0000.1111.0001 1.1.1.1
Static Remote
100      xe23    ----    2-100 ----    0000.2222.0001 2.2.2.2
Static Local
100      ----    ----    ----          b0da.1d10.6496 1.1.1.1
Dynamic Remote

```

Total number of entries are : 3

```

VTEP2#sh nvo vxlan mac-table hardware

```

VxLAN MAC Entries

| VNID Type        | Interface | VlanId Status | Vlan-RangeId Time-out | Inner-VlanId AccessPortDesc | Mac-Addr       | VTEP-Ip/ESI |
|------------------|-----------|---------------|-----------------------|-----------------------------|----------------|-------------|
| 100 Remote       | ---       | ----          | ----                  | 0000.1111.0001              | 1.1.1.1        |             |
| 100 Static Local | xe23      | -----         | 2-100                 | ----                        | 0000.2222.0001 | 2.2.2.2     |
| 100 Remote       | ---       | ----          | ----                  | b0da.1d10.6496              | 1.1.1.1        |             |

Total number of entries are 3  
VTEP2#sh nvo vxlan route-count  
VxLAN Active route count information  
=====

Max route count : 32768  
Active route count: 3

| VNID | Total | MACONLY | MACIPv4 | MACIPv6 |
|------|-------|---------|---------|---------|
| 100  | 3     | 3       | 0       | 0       |

Total number of entries are 1  
VTEP2#sh nvo vxlan arp-cache  
VxLAN ARP-CACHE Information  
=====

| VNID | Ip-Addr | Mac-Addr | Type | Age-Out | Retries-Left |
|------|---------|----------|------|---------|--------------|
|------|---------|----------|------|---------|--------------|

Total number of entries are 0  
VTEP2#sh nvo vxlan nd-cache  
VxLAN ND-CACHE Information  
=====

| VNID | Ip-Addr | Mac-Addr | Type | Age-Out |
|------|---------|----------|------|---------|
|------|---------|----------|------|---------|

Total number of entries are 0  
VTEP2#  
VTEP2#  
VTEP2#sh nvo vxlan access-if brief

| Interface | Vlan | Inner vlan | Ifindex | Vnid | Admin status | Link status |
|-----------|------|------------|---------|------|--------------|-------------|
| xe23      | 2    | ---        | 500000  | 100  | up           | up          |

## VxLAN Trunk Access Port Configuration

---

Total number of entries are 1

```
VTEP2#sh nvo vxlan access-if-config
nvo vxlan access-if port-vlan xe23 2-100
map vnid 100
arp-cache disable
nd-cache disable
mac 0000.2222.0001
!
```

```
VTEP2#sh bgp l2vpn evpn summary
BGP router identifier 2.2.2.2, local AS number 1
BGP table version is 4
1 BGP AS-PATH entries
0 BGP community entries
```

| Neighbor<br>PfxRcd | AD | MACIP | V<br>MCAST | AS | MsgRcv<br>ESI | MsgSen<br>PREFIX-ROUTE | TblVer | InQ | OutQ | Up/Down  | State/ |
|--------------------|----|-------|------------|----|---------------|------------------------|--------|-----|------|----------|--------|
| 1.1.1.1            |    |       | 4          | 1  | 59            | 57                     | 3      | 0   | 0    | 00:21:48 |        |
| 3                  | 0  | 2     | 1          | 0  | 0             |                        |        |     |      |          |        |

Total number of neighbors 1

Total number of Established sessions 1

```
VTEP2#sh bgp l2vpn evpn
BGP table version is 4, local router ID is 2.2.2.2
Status codes: s suppressed, d damped, h history, a add-path, * valid, > best, i -
internal,
l - labeled, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete
```

[EVPN route type]:[ESI]:[VNID]:[relevent route informantion]

- 1 - Ethernet Auto-discovery Route
- 2 - MAC/IP Route
- 3 - Inclusive Multicast Route
- 4 - Ethernet Segment Route
- 5 - Prefix Route

| Network<br>Encap                                | Next Hop | Metric | LocPrf | Weight | Path      | Peer  |
|---|----------|--------|--------|--------|-----------|-------|
| RD[1.1.1.1:1]                                   |          |        |        |        |           |       |
| *>i [2]:[0]:[100]:[48,0000:1111:0001]:[0]:[100] | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 | VxLAN |
| *>i [2]:[0]:[100]:[48,b0da:1d10:6496]:[0]:[100] | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 | VxLAN |
| *>i [3]:[100]:[32,1.1.1.1]                      | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 | VxLAN |
| RD[2.2.2.2:1] VRF[L2VRF1]:                      |          |        |        |        |           |       |
| * i [2]:[0]:[100]:[48,0000:1111:0001]:[0]:[100] | 1.1.1.1  | 0      | 100    | 0      | i 1.1.1.1 | VxLAN |

---

---

```
*> [2]:[0]:[100]:[48,0000:2222:0001]:[0]:[100]
      2.2.2.2          0          100          32768 i -----
VxLAN
* i [2]:[0]:[100]:[48,b0da:1d10:6496]:[0]:[100]
      1.1.1.1          0          100          0 i 1.1.1.1          VxLAN
* i [3]:[100]:[32,1.1.1.1]
      1.1.1.1          0          100          0 i 1.1.1.1          VxLAN
*> [3]:[100]:[32,2.2.2.2]
      2.2.2.2          0          100          32768 i -----
VxLAN

Total number of prefixes 8
VTEP2#
```





## CHAPTER 13 DHCP Relay Over IRB Interface

This chapter contains configurations for DHCP relay over IRB interface.

### Overview

Dynamic Host Configuration Protocol (DHCP) is a protocol that allows a DHCP server to dynamically allocate IP addresses to DHCP clients. The DHCP relay agent forwards DHCP messages between DHCP clients and DHCP servers when they are on different networks.

For DHCP relay to function, uplink interface (server facing) and downlink interface (client facing) are to be configured along with DHCP server address. These configurations are done in the interface mode.

In the IRB deployment, IRB interface acts as gateway and hence it might need to provide the service of DHCP for the hosts connected to IRB network per L2 VPN. Since the DHCP server will not be present in the VTEP, it can forward the DHCP requests to the DHCP server acting as relay agent.

### Topology

The procedures in this section use the topology in [Figure 13-14](#).



Figure 13-14: DHCP Relay over IRB

#### ROUTER-1

|   |  |
|---|--|
| #configure terminal                           | Enter Configure mode.  |
| (config)#interface lo                         | Enter Interface mode for loopback.   |
| (config-if)#ip address 1.1.1.1/32 secondary   | Assign secondary IP address.   |
| (config-if)#exit                              | Exit Interface mode and return to Configure mode.  |
| (config)#hardware-profile filter vxlan enable | Enable hardware-profile filter for VxLAN.  |
| (config)#nvo vxlan enable                     | Enable VxLAN   |
| (config)#nvo vxlan irb                        | Enable VxLAN IRB   |
| (config)#ip vrf vrf1                          | Create routing/forwarding instance with VRF1 name and enter into VRF mode                |
| (config-vrf)#rd 200:1                         | Assign RD value  |
| (config-vrf)#route-target both 200:1          | Assign route target value  |
| (config-vrf)#ip dhcp relay address 40.40.40.1 | The relay address configured should be server interface address connected to DUT machine |
| (config-vrf)#ip dhcp relay uplink evpn        | Configure the uplink interface as L3 VNI interface for specific VRF                      |
| (config-vrf)#l3vni 45001                      | Configure L3VNI as 45001 for VRF1  |

## DHCP Relay Over IRB Interface

|  |   |
|--|---|
| <code>(config-vrf)#exit</code>   | Exit IP VRF mode  |
| <code>(config)#mac vrf vrfred</code>   | Create MAC VRF instance with vrfred name and enter into VRF mode  |
| <code>(config-vrf)#rd 1.1.1.1:1</code>                                       | Assign RD value   |
| <code>(config-vrf)#route-target both 1.1.1.1:1</code>                        | Assign route target value   |
| <code>(config-vrf)#exit</code>   | Exit MAC VRF mode   |
| <code>(config)#interface irb 1</code>  | Configure IRB interface   |
| <code>(config-irb-if)#ip vrf forwarding vrf1</code>                          | Configure IP VRF forwarding   |
| <code>(config-irb-if)#ip address 11.1.1.1/24</code>                          | Assign IP address on IRB interface.   |
| <code>(config-irb-if)#ip dhcp relay</code>                                   | Relay should be configured on the interface connecting to the relay   |
| <code>(config-irb-if)#exit</code>  | Exit IRB interface mode   |
| <code>(config)#interface irb 2</code>  | Configure irb interface   |
| <code>(config-irb-if)#ip vrf forwarding vrf1</code>                          | Configure IP VRF forwarding   |
| <code>(config-irb-if)#ip address 70.70.70.1/24</code>                        | Assign IP address on IRB interface.   |
| <code>(config-irb-if)#exit</code>  | Exit IRB interface mode   |
| <code>(config)#interface ce49</code>   | Enter Interface mode for ce49.  |
| <code>(config-if)#ip address 10.1.1.0/31</code>                              | Assign IP address on ce49 interface.  |
| <code>(config-if)#exit</code>  | Exit Interface mode and return to Configure mode.   |
| <code>(config)#interface xe5</code>  | Enter Interface mode for xe5.   |
| <code>(config-if)#switchport</code>  | Configure interface as L2 interface   |
| <code>(config-if)#exit</code>  | Exit Interface mode and return to Configure mode.   |
| <code>(config)#router ospf</code>  | Enter the Router OSPF mode  |
| <code>(config-router)#network 1.1.1.1/32 area 0.0.0.0</code>                 | Advertise loopback address in OSPF  |
| <code>(config-router)#network 10.1.1.0/31 area 0.0.0.0</code>                | Advertise network address in OSPF   |
| <code>(config-router)#exit</code>  | Exit from Router OSPF mode and enter into config mode   |
| <code>(config)#router bgp 1</code>   | Enter into BGP router mode  |
| <code>(config-router)#neighbor 2.2.2.2 remote-as 1</code>                    | Specify a VTEP2 loopback IP address and remote-as defined   |
| <code>(config-router)#neighbor 2.2.2.2 update-source 1.1.1.1</code>          | Configure update as loopback for VTEP2  |
| <code>(config-router)#address-family l2vpn evpn</code>                       | Enter into L2VPN EVPN address family mode   |
| <code>(config-router-af)#neighbor 2.2.2.2 activate</code>                    | Activate neighbor in L2VPN mode   |
| <code>(config-router-af)#exit-address-family</code>                          | Exit from Address family mode   |
| <code>(config-router)#address-family ipv4 vrf vrf1</code>                    | Enter into address-family mode for VRF1   |
| <code>(config-router-af)#redistribute connected</code>                       | Configure Redistribute connected  |
| <code>(config-router-af)#exit-address-family</code>                          | Exit from Address family mode   |
| <code>(config-router)#exit</code>  | Exit from router BGP mode and enter into config mode  |
| <code>(config)#nvo vxlan vtep-ip-global 1.1.1.1</code>                       | Configure Source VTEP-IP-global configuration. Use loopback IP address  |
| <code>(config)#nvo vxlan id 10 ingress-replication inner-vid-disabled</code> | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |

|   |   |
|---|---|
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrfred   | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)#evpn irb1  | Configure IRB1 under VxLAN ID 10  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan id 30 ingress-replication inner-vid-disabled | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vrfred   | Assign VRF for EVPN-BGP to carry EVPN route   |
| (config-nvo)#evpn irb2  | Configure IRB2 under VxLAN ID 30  |
| (config-nvo)#exit   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| (config)#nvo vxlan access-if port-vlan xe5 2                    | Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port                      |
| (config-nvo-acc-if)#map vnid 10                                 | Map VxLAN Identified to access-port for VxLAN   |
| (config-nvo-acc-if)#exit  | Exit from VxLAN access-interface mode and enter into configuration mode                                       |
| (config)#commit   | Commit the candidate configuration to the running configuration   |
| (config)#exit   | Exit from configuration mode  |

## ROUTER-2

|  |   |
|--|---|
| #configure terminal                                | Enter Configure mode.   |
| (config)#interface ce0                             | Enter Interface mode for ce0.                                   |
| (config-if)#ip address 10.1.1.1/31                 | Assign IP address on ce0 interface.                             |
| (config-if)#exit                                   | Exit Interface mode and return to Configure mode.               |
| (config)#interface xe13                            | Enter Interface mode for xe13.                                  |
| (config-if)#ip address 30.1.1.1/31                 | Assign IP address on xe13 interface.                            |
| (config-if)#exit                                   | Exit Interface mode and return to Configure mode.               |
| (config)#router ospf                               | Enter the Router OSPF mode                                      |
| (config-router)#network 10.1.1.0/24 area 0.0.0.0   | Advertise network address in OSPF                               |
| (config-router)#network 30.30.30.0/24 area 0.0.0.0 | Advertise network address in OSPF                               |
| (config-router)#exit                               | Exit from Router OSPF mode and enter into config mode           |
| (config)#commit                                    | commit the candidate configuration to the running configuration |
| (config)#exit                                      | Exit from configuration mode                                    |

## ROUTER-3

|   |   |
|---|---|
| #configure terminal                         | Enter Configure mode.                             |
| (config)#interface lo                       | Enter Interface mode for loopback.                |
| (config-if)#ip address 2.2.2.2/32 secondary | Assign secondary IP address.                      |
| (config-if)#exit                            | Exit Interface mode and return to Configure mode. |

## DHCP Relay Over IRB Interface

|  |   |
|--|---|
| (config)#hardware-profile filter vxlan enable          | Enable hardware-profile filter for VxLAN.                                 |
| (config)#nvo vxlan enable                              | Enable VxLAN  |
| (config)#nvo vxlan irb                                 | Enable VxLAN IRB  |
| (config)#ip vrf vrf1                                   | Create routing/forwarding instance with VRF1 name and enter into VRF mode |
| (config-vrf)#rd 300:1                                  | Assign RD value   |
| (config-vrf)#route-target both 200:1                   | Assign route target value   |
| (config-vrf)#ip dhcp relay uplink evpn                 | Configure the uplink interface as L3 VNI interface for specific VRF       |
| (config-vrf)#l3vni 45001                               | Configure L3VNI as 45001 for VRF1   |
| (config-vrf)#exit                                      | Exit IP VRF mode  |
| (config)#mac vrf vrfred                                | Create MAC VRF instance with vrfred name and enter into VRF mode          |
| (config-vrf)#rd 2.2.2.1:1                              | Assign RD value   |
| (config-vrf)#route-target both 1.1.1.1:1               | Assign route target value   |
| (config-vrf)#exit                                      | Exit MAC VRF mode   |
| (config)#interface irb 2                               | Configure IRB interface   |
| (config-irb-if)#ip vrf forwarding vrf1                 | Configure IP VRF forwarding   |
| (config-irb-if)#ip address 40.40.40.2/24               | Assign IP address on IRB interface.                                       |
| (config-irb-if)#exit                                   | Exit IRB interface mode   |
| (config)#interface xe13                                | Enter Interface mode for xe13.  |
| (config-if)#ip address 30.1.1.0/31                     | Assign IP address on xe13 interface.                                      |
| (config-if)#exit                                       | Exit Interface mode and return to Configure mode.                         |
| (config)#interface xe19                                | Enter Interface mode for xe19.  |
| (config-if)#switchport                                 | Configure interface as L2 interface                                       |
| (config-if)#exit                                       | Exit Interface mode and return to Configure mode.                         |
| (config)#router ospf                                   | Enter the Router OSPF mode  |
| (config-router)#network 2.2.2.2/32 area 0.0.0.0        | Advertise loopback address in OSPF  |
| (config-router)#network 30.1.1.0/24 area 0.0.0.0       | Advertise network address in OSPF   |
| (config-router)#network 40.1.1.0/24 area 0.0.0.0       | Advertise network address in OSPF   |
| (config-router)#exit                                   | Exit from Router OSPF mode and enter into config mode                     |
| (config)#router bgp 1                                  | Enter into BGP router mode  |
| (config-router)#neighbor 1.1.1.1 remote-as 1           | Specify a VTEP1 loopback IP address and remote-as defined                 |
| (config-router)#neighbor 1.1.1.1 update-source 2.2.2.2 | Configure update as loopback for VTEP1                                    |
| (config-router)#address-family l2vpn evpn              | Enter into L2VPN EVPN address family mode                                 |
| (config-router-af)#neighbor 1.1.1.1 activate           | Activate neighbor in L2VPN mode   |
| (config-router-af)#exit-address-family                 | Exit from Address family mode   |
| (config-router)#address-family ipv4 vrf vrf1           | Enter into address-family mode for VRF1                                   |
| (config-router-af)#redistribute connected              | Configure Redistribute connected  |

|  |   |
|--|---|
| <code>(config-router-af)#exit-address-family</code>                          | Exit from Address family mode   |
| <code>(config-router)#exit</code>  | Exit from router BGP mode and enter into config mode  |
| <code>(config)#nvo vxlan vtep-ip-global 2.2.2.2</code>                       | Configure Source VTEP-IP-global configuration. Use loopback IP address  |
| <code>(config)#nvo vxlan id 10 ingress-replication inner-vid-disabled</code> | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| <code>(config-nvo)#vxlan host-reachability-protocol evpn-bgp vrfred</code>   | Assign VRF for EVPN-BGP to carry EVPN route   |
| <code>(config-nvo)#exit</code>   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| <code>(config)#nvo vxlan id 20 ingress-replication inner-vid-disabled</code> | Configure VxLAN Network identifier with/without inner-vid-disabled configure and enter into VxLAN tenant mode |
| <code>(config-nvo)#vxlan host-reachability-protocol evpn-bgp vrfred</code>   | Assign VRF for EVPN-BGP to carry EVPN route   |
| <code>(config-nvo)#evpn irb2</code>  | Configure IRB2 under VxLAN ID 20  |
| <code>(config-nvo)#exit</code>   | Exit from VxLAN tenant mode and enter into configuration mode.  |
| <code>(config)#nvo vxlan access-if port xe19</code>                          | Enable port mapping i.e. access port  |
| <code>(config-nvo-acc-if)#map vnid 20</code>                                 | Map VxLAN Identified to access-port for VxLAN   |
| <code>(config-nvo-acc-if)#exit</code>  | Exit from VxLAN access-interface mode and enter into configuration mode                                       |
| <code>(config)#commit</code>   | Commit the candidate configuration to the running configuration   |
| <code>(config)#exit</code>   | Exit from configuration mode  |

## Validation

### ROUTER-1

```

VTEP1#show running-config nvo vxlan
!
nvo vxlan enable
!
nvo vxlan irb
!
nvo vxlan vtep-ip-global 1.1.1.1
!
nvo vxlan id 10 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp vrfred
  evpn irb1
!
nvo vxlan id 30 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp vrfred
  evpn irb2
!
nvo vxlan access-if port xe2
  map vnid 10
!
nvo vxlan access-if port-vlan xe5 2
  map vnid 10

```

## DHCP Relay Over IRB Interface

```
!  
VTEP1#show ip dhcp relay  
DHCP relay service is Enabled.  
VRF Name: vrf1  
  Option 82: Disabled  
  DHCP Servers configured: 40.40.40.1  
  
Interface                Uplink/Downlink  
-----                -  
irb1                     Downlink  
evpn                     uplink  
Incoming DHCPv4 packets which already contain relay agent option are FORWARDED  
unchanged.
```

```
VTEP1#show nvo vxlan mac-table  
=====
```

| VxLAN MAC Entries |           |        |              |                |                |             |               |        |
|-------------------|-----------|--------|--------------|----------------|----------------|-------------|---------------|--------|
| VNID              | Interface | VlanId | Vlan-RangeId | Inner-VlanId   | Mac-Addr       | VTEP-Ip/ESI | Type          | Status |
| AccessPortDesc    |           |        |              |                |                |             |               |        |
| 10                | xe5       | 2      | ----         | ----           | 0000.2837.ddf5 | 1.1.1.1     | Dynamic Local | -----  |
| 10                | irb1      |        |              | b86a.97f9.85be | 1.1.1.1        |             | Static Local  | -----  |
| 30                | irb2      |        |              | b86a.97f9.85be | 1.1.1.1        |             | Static Local  | -----  |

```
Total number of entries are : 3
```

```
VTEP1#show nvo vxlan arp-cache  
VxLAN ARP-CACHE Information  
=====
```

| VNID | Ip-Addr    | Mac-Addr       | Type          | Age-Out | Retries-Left |
|------|------------|----------------|---------------|---------|--------------|
| 30   | 70.70.70.1 | b86a.97f9.85be | Static Local  | ----    |              |
| 10   | 11.1.1.1   | b86a.97f9.85be | Static Local  | ----    |              |
| 10   | 11.1.1.30  | 0000.2837.ddf5 | Dynamic Local | ----    |              |

```
Total number of entries are 3
```

```
VTEP1#show nvo vxlan tunnel  
VxLAN Network tunnel Entries  
Source                Destination            Status                Up/Down              Update  
=====
```

|         |         |           |          |          |
|---------|---------|-----------|----------|----------|
| 1.1.1.1 | 2.2.2.2 | Installed | 01:51:11 | 01:51:11 |
|---------|---------|-----------|----------|----------|

```
Total number of entries are 1
```

## ROUTER-2

```
VTEP2#show running-config nvo vxlan  
!  
nvo vxlan enable  
!  
nvo vxlan irb  
!
```

```
nvo vxlan vtep-ip-global 2.2.2.2
!
nvo vxlan id 10 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp vrfred
!
nvo vxlan id 20 ingress-replication inner-vid-disabled
  vxlan host-reachability-protocol evpn-bgp vrfred
  evpn irb2
!
nvo vxlan access-if port xe19
  map vnid 20
!
!
```

```
VTEP2#show nvo vxlan arp-cache
```

```
VxLAN ARP-CACHE Information
```

```
=====
```

| VNID | Ip-Addr      | Mac-Addr       | Type    | Age-Out | Retries-Left |
|------|--------------|----------------|---------|---------|--------------|
| 20   | 40.40.40.2   | b86a.9761.ea3d | Static  | Local   | ----         |
| 20   | 40.40.40.1   | 0002.a54f.1577 | Dynamic | Local   | ----         |
| 20   | 40.40.40.101 | 0000.2837.ddf3 | Dynamic | Local   | ----         |
| 10   | 11.1.1.1     | b86a.97f9.85be | Static  | Remote  | ----         |
| 10   | 11.1.1.30    | 0000.2837.ddf6 | Dynamic | Remote  | ----         |

```
Total number of entries are 5
```

```
VTEP2#show running-config dhcp
```

```
interface eth0
  ip address dhcp
!
!
```

```
ip vrf vrf1
  ip dhcp relay uplink evpn
```





# CHAPTER 14 VxLAN Eline xConnect Configuration

This chapter contains examples of VxLAN Eline xConnect using single-homed and multi-homed topologies.

Vxlan Eline xConnect is a mechanism for a point-to-point tunnel for data and control packets from one leaf to another. It helps in achieving pseudowire between two endpoints. Since there are only two endpoints in this, there is no need for MAC learning and hence the differentiation of Unicast/Broadcast-Unicast-Multicast traffic is not seen. Inner Tags are preserved and VxLAN encapsulated within the outer VNID which is specified as the Xconnect VNID.

## Single-Homed VxLAN Eline xConnect

### Topology

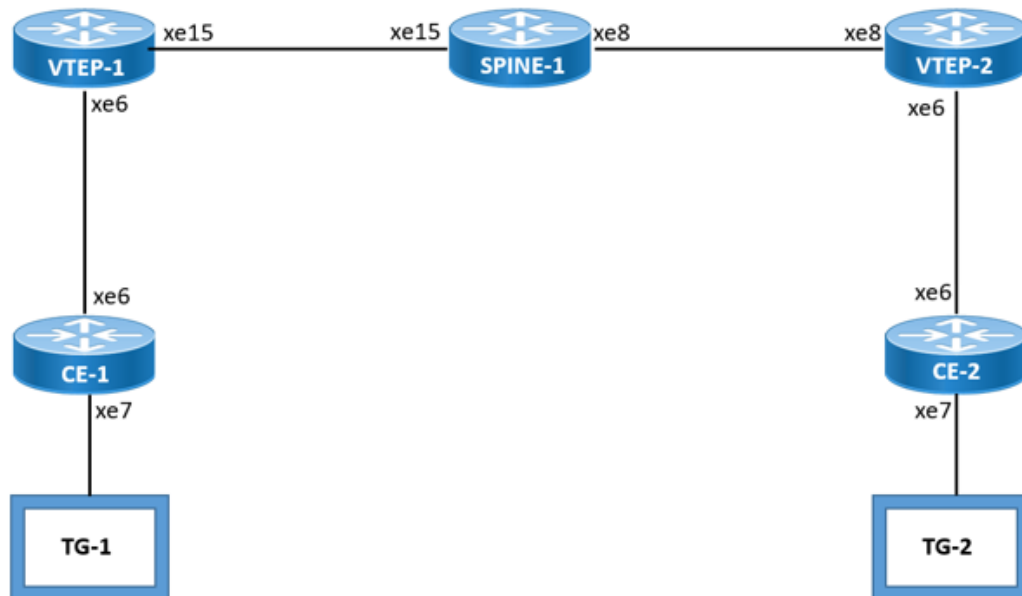


Figure 14-15: Single-homed VxLAN Eline xConnect topology

L2, IPv4, and IPv6 traffic streams are sent from TG-1 and TG-2.

### CE1

|   |                                       |
|---|---------------------------------------|
| (config)#hostname CE1                       | Configure host name                   |
| (config)#bridge 1 protocol ieee vlan-bridge | Configure bridge as IEEE VLAN bridge  |
| (config)#interface xe6                      | Enter interface mode                  |
| (config-if)#switchport                      | Configure the interface as switchport |
| (config-if)#exit                            | Exit interface mode                   |
| (config)#interface xe7                      | Enter interface mode                  |
| (config-if)#switchport                      | Configure the interface as switchport |

|   |  |
|---|--|
| (config-if)#bridge-group 1                    | Associate bridge to an interface.                                |
| (config-if)#switchport mode trunk             | Configure port as a trunk.                                       |
| (config-if)#switchport trunk allowed vlan all | Allow all VLANs on the interface.                                |
| (config-if)#commit                            | Commit the candidate configuration to the running configuration. |

**VTEP-1**

|   |  |
|---|--|
| #con t  | Enter configure mode   |
| (config)#hostname VTEP-1                                | Configure host name  |
| (config)#hardware-profile filter vxlan enable           | Enable hardware-profile filter for VxLAN                             |
| (config)#hardware-profile statistics ingress-acl enable | Configure hardware profile statistics ingress-acl                    |
| (config)#nvo vxlan enable                               | Enable VxLAN globally on this vtep                                   |
| (config)#mac vrf evpn_sh                                | Configure a new VRF  |
| (config-vrf)#rd 1.1.1.1:1                               | Assign the Route Distinguisher value.                                |
| (config-vrf)#route-target both 10:1                     | Configure route target to import and export the routes               |
| (config-vrf)#exit                                       | Exit vrf mode  |
| (config)#bridge 1 protocol ieee vlan-bridge             | Configure bridge as IEEE VLAN bridge                                 |
| (config)#interface xe6                                  | Enter interface mode   |
| (config-if)#switchport                                  | Configure the interface as switchport                                |
| (config-if)#exit  | Exit interface mode  |
| (config)#interface xe15                                 | Enter interface mode   |
| (config-if)#ip address 10.10.10.1/24                    | Configure IP address on the interface                                |
| (config-if)#exit  | Exit interface mode  |
| (config)#interface lo                                   | Enter interface mode   |
| (config-if)#ip address 1.1.1.1/32 secondary             | Configure IP address on the interface                                |
| (config-if)#exit  | Exit interface mode  |
| (config)#router ospf 100                                | Enter router mode for OSPF   |
| (config-router)#bfd all-interfaces                      | Enable BFD for all-interface into OSPF                               |
| (config-router)#network 1.1.1.1/32 area 0.0.0.0         | Add 1.1.1.1 network into area 0                                      |
| (config-router)#network 10.10.10.0/24 area 0.0.0.0      | Add 10.10.10.0 network into area 0                                   |
| (config)#router bgp 100                                 | Enter BGP router mode  |
| (config-router)#bgp router-id 1.1.1.1                   | Assign BGP router ID   |
| (config-router)#neighbor 2.2.2.2 remote-as 100          | Specify a neighbor router with peer ip address and remote-as defined |
| (config-router)#neighbor 2.2.2.2 update-source lo       | Specify the neighbor to use loopback address as source               |
| (config-router)#address-family l2vpn evpn               | Enter into l2vpn address family mode                                 |
| (config-router-af)#neighbor 2.2.2.2 activate            | Activate the peer into address family mode                           |

|  |   |
|--|---|
| (config-router-af)#exit-address-family                         | Exit I2vpn address family mode  |
| (config-router)#exit   | Exit BGP router mode  |
| (config)#nvo vxlan vtep-ip-global 1.1.1.1                      | Configure Source vtep-ip-global configuration   |
| (config)#nvo vxlan id 10 xconnect target-vxlan-id 20           | add a tenant and the type of VPN. This creates an ELAN with source and target identifier for ELINE XConnect |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp evpn_sh | Set the host reachable protocol to Ethernet-  |
| (config-nvo)#nvo vxlan access-if port-vlan xe6 2               | Map the access port xe6 of this VTEP with vlan 2  |
| (config-nvo-acc-if)#map vnid 10                                | Map the VNID to access-port   |
| (config-nvo-acc-if)#commit                                     | Commit the candidate configuration to the running configuration.  |

**SPINE-1**

|   |  |
|---|--|
| (config)#hostname SPINE-1                               | Configure hostname   |
| (config)#hardware-profile statistics ingress-acl enable | Configure hardware profile statistics ingress-acl                |
| (config)#interface xe8                                  | Enter interface mode   |
| (config-if)#ip address 20.20.20.1/24                    | Configure IP address on the interface                            |
| (config-if)#exit  | Exit interface mode  |
| (config)#interface xe15                                 | Enter interface mode   |
| (config-if)#ip address 10.10.10.2/24                    | Configure IP address on the interface                            |
| (config-if)#exit  | Exit interface mode  |
| (config)#router ospf 100                                | Enter OSPF router mode   |
| (config-router)#bfd all-interfaces                      | Enable BFD for all-interface into OSPF                           |
| (config-router)#network 10.10.10.0/24 area 0.0.0.0      | Add 10.10.10.0 network into area 0                               |
| (config-router)#network 20.20.20.0/24 area 0.0.0.0      | Add 20.20.20.0 network into area 0                               |
| (config-router)#commit                                  | Commit the candidate configuration to the running configuration. |

**VTEP-2**

|   |  |
|---|--|
| #con t  | Enter configure mode                                   |
| (config)#hostname VTEP-2                                | Configure hostname                                     |
| (config)#hardware-profile filter vxlan enable           | Enable hardware-profile filter for VxLAN               |
| (config)#hardware-profile statistics ingress-acl enable | Configure hardware profile statistics ingress-acl      |
| (config)#nvo vxlan enable                               | Enable VxLAN globally on this vtep                     |
| (config)#mac vrf evpn_sh                                | Configure a new VRF                                    |
| (config-vrf)#rd 2.2.2.2:1                               | Assign the Route Distinguisher value.                  |
| (config-vrf)#route-target both 10:1                     | Configure route target to import and export the routes |

## VxLAN Eline xConnect Configuration

|  |   |
|--|---|
| (config-vrf)#exit  | Exit vrf mode   |
| (config)#bridge 1 protocol ieee vlan-bridge                    | Configure bridge as IEEE VLAN bridge  |
| (config)#interface xe6   | Enter interface mode  |
| (config-if)#switchport   | Configure the interface as switchport   |
| (config-if)#exit   | Exit interface mode   |
| (config)#interface xe8   | Enter interface mode  |
| (config-if)#ip address 20.20.20.2/24                           | Configure IP address on the interface   |
| (config-if)#exit   | Exit interface mode   |
| (config)#interface lo  | Enter interface mode  |
| (config-if)#ip address 2.2.2.2/32 secondary                    | Configure IP address on the interface   |
| (config-if)#exit   | Exit interface mode   |
| (config)#router ospf 100                                       | Enter into router ospf mode   |
| (config-router)#bfd all-interfaces                             | Enable BFD for all-interface into OSPF  |
| (config-router)#network 2.2.2.2/32 area 0.0.0.0                | Add lo ip address 2.2.2.2 as network into area 0  |
| (config-router)#network 20.20.20.0/24 area 0.0.0.0             | Add 20.20.20.0 network into area 0  |
| (config-router)#exit   | Exit router mode  |
| (config)#router bgp 100  | Enter BGP router mode   |
| (config-router)#bgp router-id 2.2.2.2                          | Assign BGP router ID  |
| (config-router)#neighbor 1.1.1.1 remote-as 100                 | Specify a neighbor router with peer ip address and remote-as defined  |
| (config-router)#neighbor 1.1.1.1 update-source lo              | Specify the neighbor to use loopback address as source  |
| (config-router)#address-family l2vpn evpn                      | Enter into l2vpn address family mode  |
| (config-router-af)#neighbor 1.1.1.1 activate                   | Activate the peer into address family mode  |
| (config-router-af)#exit-address-family                         | Exit l2vpn address family mode  |
| (config-router)#exit   | Exit BGP router mode  |
| (config)#nvo vxlan vtep-ip-global 2.2.2.2                      | Configure Source vtep-ip-global configuration   |
| (config)#nvo vxlan id 20 xconnect target-vxlan-id 10           | add a tenant and the type of VPN. This creates an ELAN with source and target identifier for ELINE XConnect |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp evpn_sh | Set the host reachable protocol to Ethernet-  |
| (config-nvo)#nvo vxlan access-if port-vlan xe6 2               | Map the access port xe6 of this VTEP with vlan 2  |
| (config-nvo-acc-if)#map vnid 20                                | Map the VNID to access-port   |
| (config-nvo-acc-if)#commit                                     | Commit the candidate configuration to the running configuration.  |

## CE2

|   |                                      |
|---|--------------------------------------|
| (config)#hostname CE1                       | Configure host name                  |
| (config)#bridge 1 protocol ieee vlan-bridge | Configure bridge as IEEE VLAN bridge |
| (config)#interface xe6                      | Enter interface mode                 |

|   |  |
|---|--|
| (config-if)#switchport                        | Configure the interface as switchport                            |
| (config-if)#exit                              | Exit interface mode  |
| (config)#interface xe7                        | Enter interface mode   |
| (config-if)#switchport                        | Configure the interface as switchport                            |
| (config-if)#bridge-group 1                    | Associate bridge to an interface.                                |
| (config-if)#switchport mode trunk             | Configure port as a trunk.                                       |
| (config-if)#switchport trunk allowed vlan all | Allow all VLANs on the interface.                                |
| (config-if)#commit                            | Commit the candidate configuration to the running configuration. |

## Validation

```
VTEP-1#sh nvo vxlan xconnect
EVPN Xconnect Info
=====
AC-AC: Local-Cross-connect
AC-NW: Cross-connect to Network
AC-UP: Access-port is up
AC-DN: Access-port is down
NW-UP: Network is up
NW-DN: Network is down
NW-SET: Network and AC both are up
```

```
Local                               Remote                               Connection-Details
=====
=====
VPN-ID      EVI-Name      MTU  VPN-ID      Source      Destination
PE-IP      MTU  Type  NW-Status
=====
=====
10          ----          1500  20          xe6 2      --- Single Homed Port ---
2.2.2.2      1500  AC-NW  NW-SET
```

Total number of entries are 1

```
VTEP-1#sh nvo vxlan tunnel
VxLAN Network tunnel Entries
Source      Destination      Status      Up/Down      Update
=====
1.1.1.1      2.2.2.2          Installed   00:02:01     00:02:01
```

Total number of entries are 1

VTEP-1#

```
VTEP-2#sh nvo vxlan xconnect
EVPN Xconnect Info
=====
AC-AC: Local-Cross-connect
```

AC-NW: Cross-connect to Network  
 AC-UP: Access-port is up  
 AC-DN: Access-port is down  
 NW-UP: Network is up  
 NW-DN: Network is down  
 NW-SET: Network and AC both are up

| Local   |          | Remote |           | Connection-Details |                           |
|---------|----------|--------|-----------|--------------------|---------------------------|
| VPN-ID  | EVI-Name | MTU    | VPN-ID    | Source             | Destination               |
| PE-IP   | MTU      | Type   | NW-Status |                    |                           |
| 20      | ----     | 1500   | 10        | xe6 2              | --- Single Homed Port --- |
| 1.1.1.1 | 1500     | AC-NW  | NW-SET    |                    |                           |

Total number of entries are 1

VTEP-2#sh nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 2.2.2.2 | 1.1.1.1     | Installed | 00:01:16 | 00:01:16 |

Total number of entries are 1

VTEP-2#

## Multi-Homed VxLAN Eline xConnect

### Topology

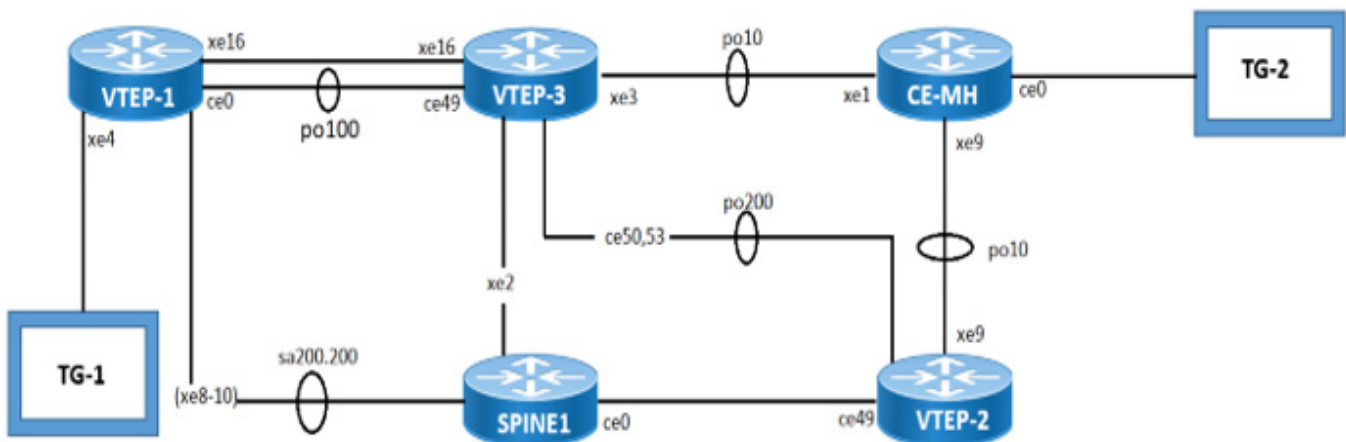


Figure 14-16: Multi-homed VxLAN Eline xConnect topology

L2, IPv4, and IPv6 traffic streams are sent from TG-1 and TG-2.

**VTEP-1**

|   |   |
|---|---|
| #con t  | Enter configure mode  |
| (config)#hostname VTEP1                                 | Configure hostname  |
| (config)#hardware-profile filter egress-ipv4 enable     | Enable hardware filter for egress ipv4  |
| (config)#hardware-profile filter vxlan enable           | Enable hardware-profile filter for VxLAN  |
| (config)#hardware-profile filter vxlan-mh enable        | Enable hardware-profile filter for multi-homed VxLAN  |
| (config)#hardware-profile statistics ingress-acl enable | Configure hardware profile statistics ingress-acl   |
| (config)#nvo vxlan enable                               | Enable VxLAN globally on this vtep  |
| (config)#mac vrf evpn_mh_eline                          | Configure a new VRF   |
| (config-vrf)#rd 1.1.1.1:2                               | Assign the Route Distinguisher value.   |
| (config-vrf)#route-target both 2:2                      | Configure route target to import and export the routes  |
| (config-vrf)#evpn vxlan multihoming enable              | Enable evpn vxlan multihoming   |
| (config-vrf)#exit                                       | Exit vrf mode   |
| (config)#interface po100                                | Enter interface mode  |
| (config-if)#ip address 51.1.1.1/24                      | Configure IP address on the interface   |
| (config-if)#isis circuit-type level-1                   | Configure instance as level-1-only routing.   |
| (config-if)#ip router isis VxLAN                        | Enable IS-IS routing on the interface   |
| (config-if)#exit  | Exit interface mode   |
| (config)#interface sa200                                | Enter interface mode  |
| (config-if)#interface sa200.200                         | Enter interface mode  |
| (config-if)#encapsulation dot1q 200                     | Configure the encapsulation as dot1q matching vlan 200  |
| (config-if)#ip address 61.1.1.1/24                      | Configure IP address on the interface   |
| (config-if)#isis circuit-type level-1                   | Configure instance as level-1-only routing.   |
| (config-if)#ip router isis VxLAN                        | Enable IS-IS routing on the interface   |
| (config-if)#interface ce0                               | Enter interface mode  |
| (config-if)#channel-group 100 mode active               | Add this interface to channel group 100 and enable link aggregation so that it can be selected for aggregation by the local system. |
| (config-if)#interface lo                                | Enter interface mode  |
| (config-if)#ip address 1.1.1.1/32 secondary             | Configure IP address on the interface   |
| (config-if)#ip router isis VxLAN                        | Enable IS-IS routing on the interface   |
| (config-if)#interface xe4                               | Enter interface mode  |
| (config-if)#switchport                                  | Configure the interface as switchport   |
| (config-if)#interface xe8                               | Enter interface mode  |
| (config-if)#static-channel-group 200                    | Add this interface to channel group 200 and enable link aggregation so that it can be selected for aggregation by the local system. |
| (config-if)#interface xe9                               | Enter interface mode  |

## VxLAN Eline xConnect Configuration

|  |   |
|--|---|
| (config-if)#static-channel-group 200                                 | Add this interface to channel group 200 and enable link aggregation so that it can be selected for aggregation by the local system. |
| (config-if)#interface xe10   | Enter interface mode  |
| (config-if)#static-channel-group 200                                 | Add this interface to channel group 200 and enable link aggregation so that it can be selected for aggregation by the local system. |
| (config-if)#interface xe16.100                                       | Enter interface mode  |
| (config-if)#encapsulation dot1q 100                                  | Configure the encapsulation as dot1q matching vlan 100  |
| (config-if)#ip address 50.1.1.1/24                                   | Configure IP address on the interface   |
| (config-if)#isis circuit-type level-1                                | Configure instance as level-1-only routing.   |
| (config-if)#ip router isis VxLAN                                     | Enable IS-IS routing on the interface   |
| (config-if)#exit   | Exit interface mode   |
| (config)#router isis VxLAN   | Create an IS-IS routing instance  |
| (config-router)#is-type level-1                                      | Configure instance as level-1-only routing  |
| (config-router)#spf-interval-exp 0 0                                 | Set the minimum and maximum hold intervals between Shortest Path First (SPF) calculations   |
| (config-router)#metric-style wide                                    | Configure the new style of metric type as wide.   |
| (config-router)#mpls traffic-eng level-1                             | Enable MPLS-TE in is-type Level-1.  |
| (config-router)#dynamic-hostname                                     | Configure a hostname to use for the Dynamic Hostname Exchange Mechanism and System-ID to hostname translation                       |
| (config-router)#bfd all-interfaces                                   | Enable BFD for all-interface on ISIS  |
| (config-router)#net 49.0000.0000.0001.00                             | Set a Network Entity Title for this instance, specifying the area address and the system ID.  |
| (config-router)#exit   | Exit router mode  |
| (config)#router bgp 100  | Enter BGP router mode   |
| (config-router)#bgp router-id 1.1.1.1                                | Assign BGP router ID  |
| (config-router)#neighbor 3.3.3.3 remote-as 100                       | Specify a neighbor router with peer ip address and remote-as defined  |
| (config-router)#neighbor 4.4.4.4 remote-as 100                       | Specify a neighbor router with peer ip address and remote-as defined  |
| (config-router)#neighbor 3.3.3.3 update-source lo                    | Specify the neighbor to use loopback address as source  |
| (config-router)#neighbor 4.4.4.4 update-source lo                    | Specify the neighbor to use loopback address as source  |
| (config-router)#address-family l2vpn evpn                            | Enter into l2vpn address family mode  |
| (config-router-af)#neighbor 3.3.3.3 activate                         | Activate the peer into address family mode  |
| (config-router-af)#neighbor 4.4.4.4 activate                         | Activate the peer into address family mode  |
| (config-router-af)#exit-address-family                               | Exit l2vpn address family mode  |
| (config-router)#nvo vxlan vtep-ip-global 1.1.1.1                     | Configure Source vtep-ip-global configuration   |
| (config)#nvo vxlan id 2 xconnect target-vxlan-id 1002                | add a tenant and the type of VPN. This creates an ELAN with source and target identifier for ELINE XConnect                         |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp evpn_mh_eline | Set the host reachable protocol to Ethernet-  |



|  |  |
|--|--|
| (config-nvo)#nvo vxlan access-if port-vlan xe4 2           | Map the access port xe4 of this VTEP with vlan 2                 |
| (config-nvo-acc-if)#map vnid 2                             | Map the VNID to access-port                                      |
| (config-nvo-acc-if)#nvo vxlan access-if port-vlan xe4 2000 | Map the access port xe4 of this VTEP with vlan 2000              |
| (config-nvo-acc-if)#map vnid 2000                          | Map the VNID to access-port                                      |
| (config-nvo-acc-if)#commit                                 | Commit the candidate configuration to the running configuration. |

## VTEP-2

|   |  |
|---|--|
| #con t  | Enter configure mode                                   |
| (config)#hostname VTEP2                                 | Configure hostname                                     |
| (config)#hardware-profile filter egress-ipv4 enable     | Enable hardware filter for egress ipv4                 |
| (config)#hardware-profile filter vxlan enable           | Enable hardware-profile filter for VxLAN               |
| (config)#hardware-profile filter vxlan-mh enable        | Enable hardware-profile filter for multi-homed VxLAN   |
| (config)#hardware-profile statistics ingress-acl enable | Configure hardware profile statistics ingress-acl      |
| (config)#nvo vxlan enable                               | Enable VxLAN globally on this vtep                     |
| (config)#mac vrf evpn_mh_eline                          | Configure a new VRF                                    |
| (config-vrf)#rd 4.4.4.4:2                               | Assign the Route Distinguisher value.                  |
| (config-vrf)#route-target both 2:2                      | Configure route target to import and export the routes |
| (config-vrf)#evpn vxlan multihoming enable              | Enable evpn vxlan multihoming                          |
| (config)#vlan database                                  | Enter VLAN configure mode                              |
| (config-vlan)#vlan 200 bridge 1                         | Configure a VLAN and add it to the bridge.             |
| (config-vlan)#interface po10                            | Enter interface mode                                   |
| (config-if)#switchport                                  | Configure the interface as switchport                  |
| (config-if)#evpn multi-homed system-mac 0000.0000.1111  | Configure system mac as ESI value for the interface    |
| (config-if)#interface po200                             | Enter interface mode                                   |
| (config-if)#ip address 63.1.1.2/24                      | Configure IP address on the interface                  |
| (config-if)#isis circuit-type level-1                   | Configure instance as level-1-only routing.            |
| (config-if)#ip router isis VxLAN                        | Enable IS-IS routing on the interface                  |
| (config-if)#interface ce49                              | Enter interface mode                                   |
| (config-if)#switchport                                  | Configure the interface as switchport                  |
| (config-if)#bridge-group 1                              | Associate bridge to an interface.                      |
| (config-if)#switchport mode trunk                       | Configure port as a trunk.                             |
| (config-if)#switchport trunk allowed vlan add 200       | Allow VLAN 200 on the interface.                       |
| (config-if)#interface ce50                              | Enter interface mode                                   |

## VxLAN Eline xConnect Configuration

|   |   |
|---|---|
| (config-if)#channel-group 200 mode active         | Add this interface to channel group 200 and enable link aggregation so that it can be selected for aggregation by the local system. |
| (config-if)#interface ce53                        | Enter interface mode  |
| (config-if)#channel-group 200 mode active         | Add this interface to channel group 200 and enable link aggregation so that it can be selected for aggregation by the local system. |
| (config-if)#interface lo                          | Enter interface mode  |
| (config-if)#ip address 4.4.4.4/32 secondary       | Configure IP address on the interface   |
| (config-if)#ip router isis VxLAN                  | Enable IS-IS routing on the interface   |
| (config-if)#interface vlan1.200                   | Enter interface mode  |
| (config-if)#ip address 20.1.1.2/24                | Configure IP address on the interface   |
| (config-if)#isis circuit-type level-1             | Configure instance as level-1-only routing.   |
| (config-if)#ip router isis VxLAN                  | Enable IS-IS routing on the interface   |
| (config-if)#interface xe9                         | Enter interface mode  |
| (config-if)#channel-group 10 mode active          | Add this interface to channel group 10 and enable link aggregation so that it can be selected for aggregation by the local system.  |
| (config-if)#exit                                  | Exit interface mode   |
| (config)#router isis VxLAN                        | Create an IS-IS routing instance  |
| (config-router)#is-type level-1                   | Configure instance as level-1-only routing  |
| (config-router)#spf-interval-exp 0 0              | Set the minimum and maximum hold intervals between Shortest Path First (SPF) calculations   |
| (config-router)#metric-style wide                 | Configure the new style of metric type as wide.   |
| (config-router)#mpls traffic-eng level-1          | Enable MPLS-TE in is-type Level-1.  |
| (config-router)#dynamic-hostname                  | Configure a hostname to use for the Dynamic Hostname Exchange Mechanism and System-ID to hostname translation                       |
| (config-router)#bfd all-interfaces                | Enable BFD for all-interface on ISIS  |
| (config-router)#net 49.0000.0000.0004.00          | Set a Network Entity Title for this instance, specifying the area address and the system ID.  |
| (config-router)#exit                              | Exit isis interface mode  |
| (config-router)#router bgp 100                    | Enter BGP router mode   |
| (config-router)#bgp router-id 4.4.4.4             | Assign BGP router ID  |
| (config-router)#neighbor 1.1.1.1 remote-as 100    | Specify a neighbor router with peer ip address and remote-as defined  |
| (config-router)#neighbor 3.3.3.3 remote-as 100    | Specify a neighbor router with peer ip address and remote-as defined  |
| (config-router)#neighbor 1.1.1.1 update-source lo | Specify the neighbor to use loopback address as source  |
| (config-router)#neighbor 3.3.3.3 update-source lo | Specify the neighbor to use loopback address as source  |
| (config-router)#address-family l2vpn evpn         | Enter into l2vpn address family mode  |
| (config-router-af)#neighbor 1.1.1.1 activate      | Activate the peer into address family mode  |
| (config-router-af)#neighbor 3.3.3.3 activate      | Activate the peer into address family mode  |
| (config-router-af)#exit-address-family            | Exit l2vpn address family mode  |

|  |   |
|--|---|
| (config-router)#nvo vxlan vtep-ip-global<br>4.4.4.4                      | Configure Source vtep-ip-global configuration   |
| (config)#nvo vxlan id 3000 xconnect target-<br>vxlan-id 2000             | add a tenant and the type of VPN. This creates an ELAN with source and target identifier for ELINE XConnect |
| (config-nvo)#vxlan host-reachability-<br>protocol evpn-bgp evpn_mh_eline | Set the host reachable protocol to Ethernet-  |
| (config-nvo)#nvo vxlan access-if port-vlan<br>po10 2000                  | Map the access port po10 of this VTEP with vlan 2000  |
| (config-nvo-acc-if)#map vnid 3000  | Map the VNID to access-port   |
| (config-nvo-acc-if)#commit   | Commit the candidate configuration to the running configuration.  |

### VTEP-3

|  |  |
|--|--|
| #con t   | Enter configure mode                                   |
| (config)#hostname VTEP3                                    | Configure host name                                    |
| (config)#hardware-profile filter egress-ipv4<br>enable     | Enable hardware filter for egress ipv4                 |
| (config)#hardware-profile filter vxlan<br>enable           | Enable hardware-profile filter for VxLAN               |
| (config)#hardware-profile filter vxlan-mh<br>enable        | Enable hardware-profile filter for multi-homed VxLAN   |
| (config)#hardware-profile statistics<br>ingress-acl enable | Configure hardware profile statistics ingress-acl      |
| (config)#nvo vxlan enable                                  | Enable VxLAN globally on this vtep                     |
| (config)#mac vrf evpn_mh_eline                             | Configure a new VRF                                    |
| (config-vrf)#rd 3.3.3.3:2                                  | Assign the Route Distinguisher value.                  |
| (config-vrf)#route-target both 2:2                         | Configure route target to import and export the routes |
| (config-vrf)#evpn vxlan multihoming enable                 | Enable evpn vxlan multihoming                          |
| (config)#bridge 1 protocol ieee vlan-bridge                | Configure bridge as IEEE VLAN bridge                   |
| (config)#vlan database                                     | Enter VLAN configure mode                              |
| (config-vlan)#vlan 300 bridge 1                            | Configure a VLAN and add it to the bridge.             |
| (config-vlan)#interface po10                               | Enter interface mode                                   |
| (config-if)#switchport                                     | Configure the interface as switchport                  |
| (config-if)#evpn multi-homed system-mac<br>0000.0000.1111  | Configure system mac as ESI value for the interface    |
| (config-if)#interface po100                                | Enter interface mode                                   |
| (config-if)#ip address 51.1.1.2/24                         | Configure IP address on the interface                  |
| (config-if)#isis circuit-type level-1                      | Configure instance as level-1-only routing.            |
| (config-if)#ip router isis VxLAN                           | Enable IS-IS routing on the interface                  |
| (config-if)#interface po200                                | Enter interface mode                                   |
| (config-if)#ip address 63.1.1.1/24                         | Configure IP address on the interface                  |
| (config-if)#isis circuit-type level-1                      | Configure instance as level-1-only routing.            |
| (config-if)#ip router isis VxLAN                           | Enable IS-IS routing on the interface                  |
| (config-if)#interface ce49                                 | Enter interface mode                                   |

## VxLAN Eline xConnect Configuration

|   |   |
|---|---|
| (config-if)#channel-group 100 mode active   | Add this interface to channel group 100 and enable link aggregation so that it can be selected for aggregation by the local system. |
| (config-if)#interface ce50                  | Enter interface mode  |
| (config-if)#channel-group 200 mode active   | Add this interface to channel group 200 and enable link aggregation so that it can be selected for aggregation by the local system. |
| (config-if)#interface ce53                  | Enter interface mode  |
| (config-if)#channel-group 200 mode active   | Add this interface to channel group 200 and enable link aggregation so that it can be selected for aggregation by the local system. |
| (config-if)#interface lo                    | Enter interface mode  |
| (config-if)#ip address 3.3.3.3/32 secondary | Configure IP address on the interface   |
| (config-if)#ip router isis VxLAN            | Enable IS-IS routing on the interface   |
| (config-if)#interface vlan1.300             | Enter interface mode  |
| (config-if)#ip address 40.1.1.2/24          | Configure IP address on the interface   |
| (config-if)#isis circuit-type level-1       | Configure instance as level-1-only routing.   |
| (config-if)#ip router isis VxLAN            | Enable IS-IS routing on the interface   |
| (config-if)#interface xe2                   | Enter interface mode  |
| (config-if)#ip address 62.1.1.1/24          | Configure IP address on the interface   |
| (config-if)#isis circuit-type level-1       | Configure instance as level-1-only routing.   |
| (config-if)#ip router isis VxLAN            | Enable IS-IS routing on the interface   |
| (config-if)#interface xe3                   | Enter interface mode  |
| (config-if)#channel-group 10 mode active    | Add this interface to channel group 10 and enable link aggregation so that it can be selected for aggregation by the local system.  |
| (config-if)#interface xe16.100              | Enter interface mode  |
| (config-if)#encapsulation dot1q 100         | Configure the encapsulation as dot1q matching vlan 100  |
| (config-if)#ip address 50.1.1.2/24          | Configure IP address on the interface   |
| (config-if)#isis circuit-type level-1       | Configure instance as level-1-only routing.   |
| (config-if)#ip router isis VxLAN            | Enable IS-IS routing on the interface   |
| (config-if)#exit                            | Exit interface mode   |
| (config)#router isis VxLAN                  | Create an IS-IS routing instance  |
| (config-router)#is-type level-1             | Configure instance as level-1-only routing  |
| (config-router)#spf-interval-exp 0 0        | Set the minimum and maximum hold intervals between Shortest Path First (SPF) calculations   |
| (config-router)#metric-style wide           | Configure the new style of metric type as wide.   |
| (config-router)#mpls traffic-eng level-1    | Enable MPLS-TE in is-type Level-1.  |
| (config-router)#dynamic-hostname            | Configure a host name to use for the Dynamic Hostname Exchange Mechanism and System-ID to host name translation                     |
| (config-router)#bfd all-interfaces          | Enable BFD for all-interface on ISIS  |
| (config-router)#net 49.0000.0000.0006.00    | Set a Network Entity Title for this instance, specifying the area address and the system ID.  |
| (config-router)#exit                        | Exit isis router mode   |

|  |   |
|--|---|
| (config)#router bgp 100  | Enter BGP router mode   |
| (config-router)#bgp router-id 3.3.3.3                                | Assign BGP router ID  |
| (config-router)#neighbor 1.1.1.1 remote-as 100                       | Specify a neighbor router with peer ip address and remote-as defined  |
| (config-router)#neighbor 4.4.4.4 remote-as 100                       | Specify a neighbor router with peer ip address and remote-as defined  |
| (config-router)#neighbor 1.1.1.1 update-source lo                    | Specify the neighbor to use loopback address as source  |
| (config-router)#neighbor 4.4.4.4 update-source lo                    | Specify the neighbor to use loopback address as source  |
| (config-router)#address-family l2vpn evpn                            | Enter into l2vpn address family mode  |
| (config-router-af)#neighbor 1.1.1.1 activate                         | Activate the peer into address family mode  |
| (config-router-af)#neighbor 4.4.4.4 activate                         | Activate the peer into address family mode  |
| (config-router-af)#exit-address-family                               | Exit l2vpn address family mode  |
| (config-router)#nvo vxlan vtep-ip-global 3.3.3.3                     | Configure Source vtep-ip-global configuration   |
| (config)#nvo vxlan id 3000 xconnect target-vxlan-id 2000             | add a tenant and the type of VPN. This creates an ELAN with source and target identifier for ELINE XConnect |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp evpn_mh_eline | Set the host reachable protocol to Ethernet-  |
| (config-nvo)#nvo vxlan access-if port-vlan po10 2000                 | Map the access port po10 of this VTEP with vlan 2000  |
| (config-nvo-acc-if)#map vnid 3000                                    | Map the VNID to access-port   |
| (config-nvo-acc-if)#commit   | Commit the candidate configuration to the running configuration.  |

## SPINE

|   |  |
|---|--|
| #con t  | Enter configure mode                                   |
| (config)#hostname SPINE                                 | Configure host name                                    |
| (config)#hardware-profile statistics ingress-acl enable | Configure hardware profile statistics ingress-acl      |
| (config)#bridge 1 protocol ieee vlan-bridge             | Configure bridge as IEEE VLAN bridge                   |
| (config)#vlan database                                  | Enter VLAN configure mode                              |
| (config-vlan)#vlan 200 bridge 1                         | Configure a VLAN and add it to the bridge.             |
| (config-if)#interface sa200                             | Enter interface mode                                   |
| (config-if)#interface sa200.200                         | Enter interface mode                                   |
| (config-if)#encapsulation dot1q 200                     | Configure the encapsulation as dot1q matching vlan 200 |
| (config-if)#ip address 61.1.1.2/24                      | Configure IP address on the interface                  |
| (config-if)#isis circuit-type level-1                   | Configure instance as level-1-only routing.            |
| (config-if)#ip router isis VxLAN                        | Enable IS-IS routing on the interface                  |
| (config-if)#interface ce0                               | Enter interface mode                                   |
| (config-if)#switchport                                  | Configure the interface as switchport                  |
| (config-if)#bridge-group 1                              | Associate bridge to an interface.                      |
| (config-if)#switchport mode trunk                       | Configure port as a trunk.                             |

## VxLAN Eline xConnect Configuration

|   |   |
|---|---|
| (config-if)#switchport trunk allowed vlan add 200 | Allow VLAN 200 on the interface.  |
| (config-if)#interface lo                          | Enter interface mode  |
| (config-if)#ip address 11.11.11.11/32 secondary   | Configure IP address on the interface   |
| (config-if)#ip router isis VxLAN                  | Enable IS-IS routing on the interface   |
| (config-if)#interface vlan1.200                   | Enter interface mode  |
| (config-if)#ip address 20.1.1.1/24                | Configure IP address on the interface   |
| (config-if)#isis circuit-type level-1             | Configure instance as level-1-only routing.   |
| (config-if)#ip router isis VxLAN                  | Enable IS-IS routing on the interface   |
| (config-if)#interface xe2                         | Enter interface mode  |
| (config-if)#ip address 62.1.1.2/24                | Configure IP address on the interface   |
| (config-if)#isis circuit-type level-1             | Configure instance as level-1-only routing.   |
| (config-if)#ip router isis VxLAN                  | Enable IS-IS routing on the interface   |
| (config-if)#interface xe8                         | Enter interface mode  |
| (config-if)#static-channel-group 200              | Add this interface to channel group 200 and enable link aggregation so that it can be selected for aggregation by the local system. |
| (config-if)#interface xe9                         | Enter interface mode  |
| (config-if)#static-channel-group 200              | Add this interface to channel group 200 and enable link aggregation so that it can be selected for aggregation by the local system. |
| (config-if)#interface xe10                        | Enter interface mode  |
| (config-if)#static-channel-group 200              | Add this interface to channel group 200 and enable link aggregation so that it can be selected for aggregation by the local system. |
| (config-if)#exit                                  | Exit interface mode   |
| (config-if)#router isis VxLAN                     | Create an IS-IS routing instance  |
| (config-router)#is-type level-1                   | Configure instance as level-1-only routing  |
| (config-router)#spf-interval-exp 0 0              | Set the minimum and maximum hold intervals between Shortest Path First (SPF) calculations   |
| (config-router)#metric-style wide                 | Configure the new style of metric type as wide.   |
| (config-router)#mpls traffic-eng level-1          | Enable MPLS-TE in is-type Level-1.  |
| (config-router)#dynamic-hostname                  | Configure a host name to use for the Dynamic Hostname Exchange Mechanism and System-ID to host name translation                     |
| (config-router)#bfd all-interfaces                | Enable BFD for all-interface on ISIS  |
| (config-router)#net 49.0000.0000.0003.00          | Set a Network Entity Title for this instance, specifying the area address and the system ID.  |
| (config-router)#exit                              | Exit isis interface mode  |
| (config)#router bgp 100                           | Enter BGP router mode   |
| (config-router)#neighbor 1.1.1.1 remote-as 100    | Assign BGP router ID  |
| (config-router)#neighbor 5.5.5.5 remote-as 100    | Specify a neighbor router with peer ip address and remote-as defined  |
| (config-router)#address-family l2vpn evpn         | Enter into l2vpn address family mode  |

|  |  |
|--|--|
| (config-router-af)#neighbor 1.1.1.1 activate               | Activate the peer into address family mode                                       |
| (config-router-af)#neighbor 1.1.1.1 route-reflector-client | Configure this node as the route reflector with the mentioned peer as its client |
| (config-router-af)#neighbor 5.5.5.5 activate               | Activate the peer into address family mode                                       |
| (config-router-af)#neighbor 5.5.5.5 route-reflector-client | Configure this node as the route reflector with the mentioned peer as its client |
| (config-router-af)#exit-address-family                     | Exit I2vpn address family mode   |
| (config-router)#commit                                     | Commit the candidate configuration to the running configuration.                 |

## CE-MH

|   |  |
|---|--|
| #con t  | Enter configure mode   |
| (config)#hostname CE3-MH                                | Configure host name  |
| (config)#hardware-profile statistics ingress-acl enable | Configure hardware profile statistics ingress-acl  |
| (config)#interface po10                                 | Enter interface mode   |
| (config-if)#switchport                                  | Configure the interface as switchport  |
| (config-if)#interface po10.100 switchport               | Enter interface mode   |
| (config-if)#encapsulation default                       | Configure the encapsulation as default   |
| (config-if)#interface ce0                               | Enter interface mode   |
| (config-if)#interface ce0.100 switchport                | Enter interface mode   |
| (config-if)#encapsulation default                       | Configure the encapsulation as default   |
| (config-if)#interface xe1                               | Enter interface mode   |
| (config-if)#channel-group 10 mode active                | Add this interface to channel group 10 and enable link aggregation so that it can be selected for aggregation by the local system. |
| (config-if)#interface xe9                               | Enter interface mode   |
| (config-if)#channel-group 10 mode active                | Add this interface to channel group 10 and enable link aggregation so that it can be selected for aggregation by the local system. |
| (config-if)#cross-connect MH-CE3                        | Create cross-connect with name MH-CE3  |
| (config-xc)#interface po10.100                          | Attach interface po10.100  |
| (config-xc)#interface ce0.100                           | Attach interface ce0.100   |
| (config-xc)#commit                                      | Commit the candidate configuration to the running configuration.   |

## Validation

```
VTEP1#show nvo vxlan xconnect
EVPN Xconnect Info
=====
AC-AC: Local-Cross-connect
AC-NW: Cross-connect to Network
AC-UP: Access-port is up
AC-DN: Access-port is down
```

## VxLAN Eline xConnect Configuration

---

NW-UP: Network is up  
NW-DN: Network is down  
NW-SET: Network and AC both are up

| Local   |          |       | Remote    |          | Connection-Details            |
|---------|----------|-------|-----------|----------|-------------------------------|
| VPN-ID  | EVI-Name | MTU   | VPN-ID    | Source   | Destination                   |
| PE-IP   | MTU      | Type  | NW-Status |          |                               |
| 2000    | ----     | 1500  | 3000      | xe4 2000 | 00:00:00:00:00:11:11:00:00:00 |
| 4.4.4.4 | 1500     | AC-NW | NW-SET    |          |                               |
| 3.3.3.3 | 1500     | ----  | ----      |          |                               |

Total number of entries are 1  
VTEP1-7012#  
VTEP1-7012#show nvo vxlan tunnel

VxLAN Network tunnel Entries

| Source  | Destination | Status    | Up/Down  | Update   |
|---------|-------------|-----------|----------|----------|
| 1.1.1.1 | 4.4.4.4     | Installed | 00:03:30 | 00:03:30 |
| 1.1.1.1 | 3.3.3.3     | Installed | 00:03:27 | 00:03:27 |

Total number of entries are 2  
VTEP1#

VTEP3#show nvo vxlan xconnect  
EVPN Xconnect Info  
=====  
AC-AC: Local-Cross-connect  
AC-NW: Cross-connect to Network  
AC-UP: Access-port is up  
AC-DN: Access-port is down  
NW-UP: Network is up  
NW-DN: Network is down  
NW-SET: Network and AC both are up

| Local   |          |       | Remote    |           | Connection-Details        |
|---------|----------|-------|-----------|-----------|---------------------------|
| VPN-ID  | EVI-Name | MTU   | VPN-ID    | Source    | Destination               |
| PE-IP   | MTU      | Type  | NW-Status |           |                           |
| 3000    | ----     | 1500  | 2000      | po10 2000 | --- Single Homed Port --- |
| 1.1.1.1 | 1500     | AC-NW | NW-SET    |           |                           |

Total number of entries are 1  
VTEP3#



```
VTEP2#show nvo vxlan xconnect
```

```
EVPN Xconnect Info
```

```
=====
```

```
AC-AC: Local-Cross-connect
```

```
AC-NW: Cross-connect to Network
```

```
AC-UP: Access-port is up
```

```
AC-DN: Access-port is down
```

```
NW-UP: Network is up
```

```
NW-DN: Network is down
```

```
NW-SET: Network and AC both are up
```

```
Local                               Remote                               Connection-Details
=====
=====
```

| VPN-ID  | EVI-Name | MTU   | VPN-ID    | Source    | Destination               |
|---------|----------|-------|-----------|-----------|---------------------------|
| PE-IP   | MTU      | Type  | NW-Status |           |                           |
| 3000    | ----     | 1500  | 2000      | po10 2000 | --- Single Homed Port --- |
| 1.1.1.1 | 1500     | AC-NW | NW-SET    |           |                           |

```
=====
```

```
Total number of entries are 1
```

```
VTEP2#
```



---

## CHAPTER 15 VxLAN-EVPN Symmetric IRB Support with Connected host

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---

### Overview

EVPN-IRB facilitates communication between two L2VNI's with the help of Routing using IP-VRF. This feature provides the Host (/32 or /128) based Symmetric IRB support which forwards the inter-subnet traffic directly towards the Host attached VTEP.

To achieve this Connected Host, we should configure "evpn irb-advertise-host-route" under VNID (BGP type 2) configurations or "redistribute connected-host-routes" under BGP (BGP type 5).

Note: On VxLAN-EVPN Interface less mode only "redistribute connected-host-routes" command is supported and in interface full both the commands are supported.

Note: It is recommended to have route map in esi configured MH nodes to block the Host from peer MH. Not required in non esi MH VTEP

---

### Topology

The procedures in this section use the topology in [Figure 15-1](#)

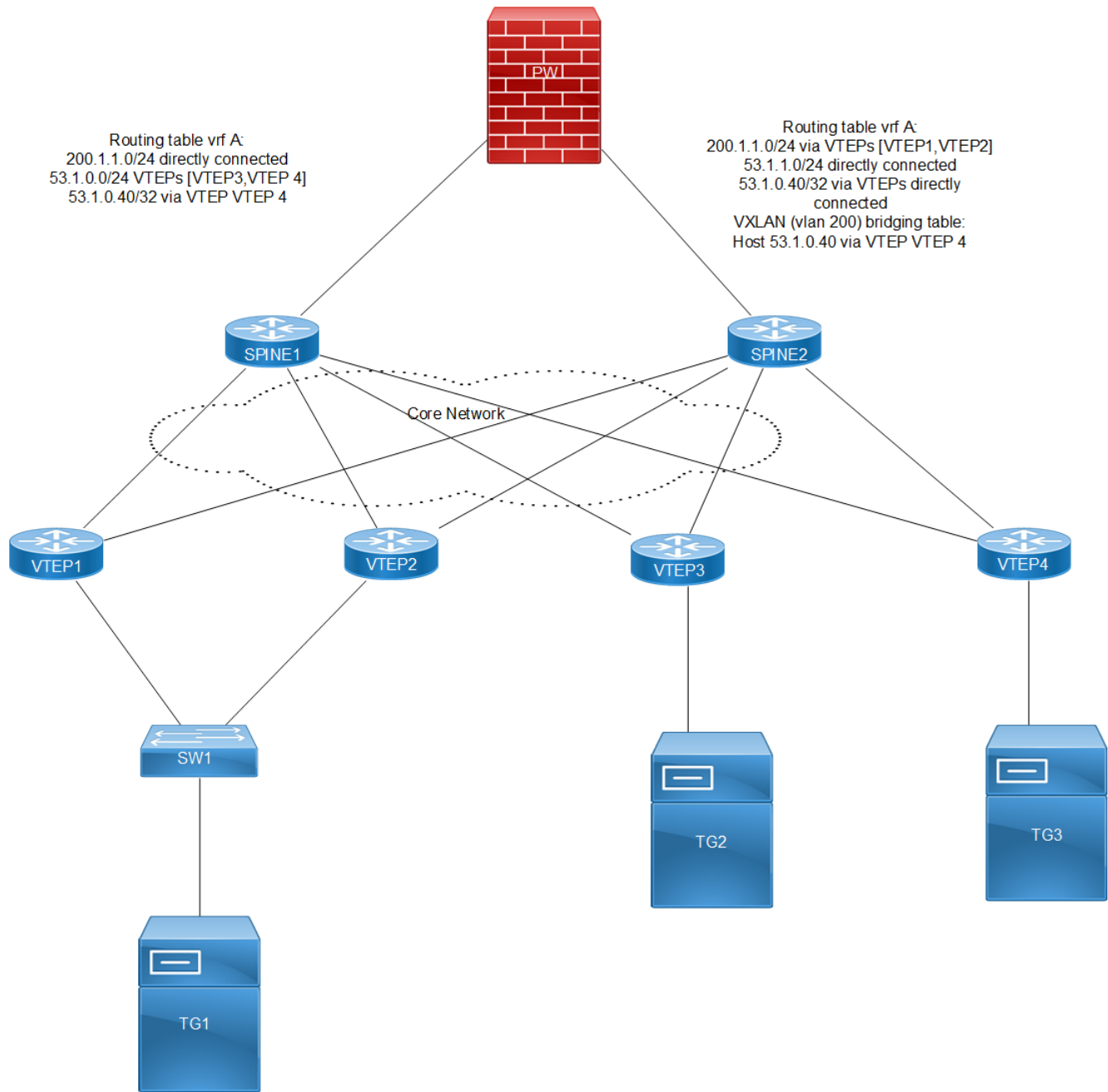


Figure 15-1: VxLAN\_EVPN\_IRB\_Connected\_host

Note: In the above topology TG1 is Multi homed Host and TG2 and TG3 are Single homed host with same subnet configured so there will be ECMP for 53 network in VTEP1 and VTEP2.

## Base Configurations

Have base configuration with Symmetric IRB configurations on VTEPs and start sending dynamic traffic from VTEP4 on same subnet (53.1.1.40/5301::40) of IRB interface.

## Validation

Verification before configuring `evpn irb-advertise-host-route` under VNID configurations or redistribute `connected-host-routes` under `bgp`.

### In VTEP1:

```
VTEP1#show ip route vrf vxlan_l3_elan_mhsh
Codes: K - kernel, C - connected, S - static, R - RIP, B - BGP
       O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2,
       ia - IS-IS inter area, E - EVPN,
       v - vrf leaked
       * - candidate default

IP Route Table for VRF "vxlan_l3_elan_mhsh"
B       2.2.2.2/32 [0/0] is directly connected, tunvxlan3, 00:21:33
B       5.5.5.5/32 [0/0] is directly connected, tunvxlan3, 00:21:33
B       6.6.6.6/32 [0/0] is directly connected, tunvxlan3, 00:21:33
B       53.1.1.0/24 [200/0] via 6.6.6.6 (recursive is directly connected,
tunvxlan3), 00:21:34
                               [200/0] via 5.5.5.5 (recursive is directly connected,
tunvxlan3)
C       127.0.0.0/8 is directly connected, lo.vxlan_l3_elan_mhsh, 07:17:43
C       200.1.1.0/24 is directly connected, irb1604, 07:17:41

Gateway of last resort is not set
VTEP1#
VTEP1#show ipv6 route vrf vxlan_l3_elan_mhsh
IPv6 Routing Table
IP Route Table for VRF "vxlan_l3_elan_mhsh"
C       ::1/128 via ::, lo.vxlan_l3_elan_mhsh, 07:18:01
B       ::ffff:202:202/128 [0/0] via ::, tunvxlan3, 00:21:51
B       ::ffff:505:505/128 [0/0] via ::, tunvxlan3, 00:21:51
B       ::ffff:606:606/128 [0/0] via ::, tunvxlan3, 00:21:51
C       2000::/48 via ::, irb1604, 07:17:59
B       5301::/48 [200/0] via ::ffff:606:606 (recursive via ::, tunvxlan3), 00:21:52
                               [200/0] via ::ffff:505:505 (recursive via ::, tunvxlan3)
C       fe80::/64 via ::, irb1604, 07:17:59
VTEP1#
```

### In VTEP2:

```
VTEP2#show ip route vrf vxlan_l3_elan_mhsh
IP Route Table for VRF "vxlan_l3_elan_mhsh"
B       1.1.1.1/32 [0/0] is directly connected, tunvxlan3, 00:22:50
B       5.5.5.5/32 [0/0] is directly connected, tunvxlan3, 00:22:50
```

## VxLAN-EVPN Symmetric IRB Support with Connected host

```
B          6.6.6.6/32 [0/0] is directly connected, tunvxlan3, 00:22:50
B          53.1.1.0/24 [200/0] via 6.6.6.6 (recursive is directly connected,
tunvxlan3), 00:22:51
                                     [200/0] via 5.5.5.5 (recursive is directly connected,
tunvxlan3)
C          127.0.0.0/8 is directly connected, lo.vxlan_l3_elan_mhsh, 07:19:21
C          200.1.1.0/24 is directly connected, irb1604, 07:19:19
```

Gateway of last resort is not set

VTEP2#

VTEP2#

VTEP2#show ipv6 route vrf vxlan\_l3\_elan\_mhsh

IPv6 Routing Table

IP Route Table for VRF "vxlan\_l3\_elan\_mhsh"

```
C          ::1/128 via ::, lo.vxlan_l3_elan_mhsh, 07:19:22
B          ::ffff:101:101/128 [0/0] via ::, tunvxlan3, 00:22:51
B          ::ffff:505:505/128 [0/0] via ::, tunvxlan3, 00:22:51
B          ::ffff:606:606/128 [0/0] via ::, tunvxlan3, 00:22:51
C          2000::/48 via ::, irb1604, 07:19:20
B          5301::/48 [200/0] via ::ffff:606:606 (recursive via ::, tunvxlan3), 00:22:51
                                     [200/0] via ::ffff:505:505 (recursive via ::, tunvxlan3)
C          fe80::/64 via ::, irb1604, 07:19:20
```

VTEP2#

VTEP2#show bgp l2vpn evpn mac-ip | grep 0000:0053:0040

```
0          605          0000:0053:0040 --
605        0          6.6.6.6          --          VxLAN
0          605          0000:0053:0040 53.1.1.40
605        0          6.6.6.6          --          VxLAN
0          605          0000:0053:0040 5301::40
605        0          6.6.6.6          --          VxLAN
```

VTEP2#

### In VTEP4:

VTEP4#show bgp l2vpn evpn mac-ip | grep 0000:0053:0040

```
0          605          0000:0053:0040 --
605        0          6.6.6.6          --          VxLAN
0          605          0000:0053:0040 53.1.1.40
605        0          6.6.6.6          --          VxLAN
0          605          0000:0053:0040 5301::40
605        0          6.6.6.6          --          VxLAN
```

VTEP4#

### Evpn irb-advertise-host-route configuration

|  |  |
|--|--|
| #configure terminal  | Enter Configure mode.                                      |
| (config)#nvo vxlan id 605 ingress-replication inner-vid-disabled         | Configure VxLAN Network identifier with inner-vid disabled |
| (config-nvo)#vxlan host-reachability-protocol evpn-bgp vxlan_l2_elan_sh2 | Assign VRF for EVPN-BGP to carry EVPN route                |

|  |   |
|--|---|
| (config-nvo)#evpn irb605                   | Configure IRB under VxLAN ID  |
| (config-nvo)#evpn irb-advertise-host-route | To Update the Route Target 2 along with IPvrf RT, router mac , l3vnid to advertise mac-p routes as /32 or /128. |

## Redistributed connected-host-routes

|   |   |
|---|---|
| #configure terminal   | Enter Configure mode.                                       |
| (config)#router bgp 1                                       | Configure bgp process                                       |
| (config-router)#address-family ipv4 vrf vxlan_l3_elan_sh    | Enter vrf address family belong to the irb interface subnet |
| VTEP4 (config-router-af)#redistribute connected-host-routes | To advertise the Connected Host Routes to VPN peers.        |

**Note:** With static mac ip configured on vxlan access interface and when redistribute connected-host-routes is configured under bgp. Then routes will not be advertised as /32 or /128 because for static mac-ip Arp entry will not be present so only for dynamic routes.

**Note:** With redistribute connected-host-routes, show bgp l2vpn evpn mac-ip will not show the l3vnid.

## Validation

### In VTEP1:

```
VTEP1#show ip route vrf vxlan_l3_elan_mhsh
IP Route Table for VRF "vxlan_l3_elan_mhsh"
B          2.2.2.2/32 [0/0] is directly connected, tunvxlan3, 00:37:03
B          5.5.5.5/32 [0/0] is directly connected, tunvxlan3, 00:37:03
B          6.6.6.6/32 [0/0] is directly connected, tunvxlan3, 00:37:03
B          53.1.1.0/24 [200/0] via 6.6.6.6 (recursive is directly connected,
tunvxlan3), 00:37:04
                                     [200/0] via 5.5.5.5 (recursive is directly connected,
tunvxlan3)
B          53.1.1.40/32 [200/0] via 6.6.6.6 (recursive is directly connected,
tunvxlan3), 00:05:49
C          127.0.0.0/8 is directly connected, lo.vxlan_l3_elan_mhsh, 07:33:13
C          200.1.1.0/24 is directly connected, irb1604, 07:33:11
Gateway of last resort is not set
VTEP1#
VTEP1#show ipv6 route vrf vxlan_l3_elan_mhsh
IPv6 Routing Table
IP Route Table for VRF "vxlan_l3_elan_mhsh"
C          ::1/128 via ::, lo.vxlan_l3_elan_mhsh, 07:33:21
B          ::ffff:202:202/128 [0/0] via ::, tunvxlan3, 00:37:11
B          ::ffff:505:505/128 [0/0] via ::, tunvxlan3, 00:37:11
B          ::ffff:606:606/128 [0/0] via ::, tunvxlan3, 00:37:11
C          2000::/48 via ::, irb1604, 07:33:19
B          5301::/48 [200/0] via ::ffff:606:606 (recursive via ::, tunvxlan3), 00:37:12
                                     [200/0] via ::ffff:505:505 (recursive via ::, tunvxlan3)
B          5301::40/128 [200/0] via ::ffff:606:606 (recursive via ::, tunvxlan3), 00:05:57
```

```
C      fe80::/64 via ::, irb1604, 07:33:19
VTEP1#
VTEP1#show bgp l2vpn evpn mac-ip | grep 0000:0053:0040
0          605          0000:0053:0040 --
605          0          6.6.6.6          --          VxLAN
0          605          0000:0053:0040 53.1.1.40
605          1604         6.6.6.6          --          VxLAN
0          605          0000:0053:0040 5301::40
605          1604         6.6.6.6          --          VxLAN
VTEP1#
```

### In VTEP2:

```
VTEP2#show ip route vrf vxlan_l3_elan_mhsh
IP Route Table for VRF "vxlan_l3_elan_mhsh"
B          1.1.1.1/32 [0/0] is directly connected, tunvxlan3, 00:31:16
B          5.5.5.5/32 [0/0] is directly connected, tunvxlan3, 00:31:16
B          6.6.6.6/32 [0/0] is directly connected, tunvxlan3, 00:31:16
B          53.1.1.0/24 [200/0] via 6.6.6.6 (recursive is directly connected,
tunvxlan3), 00:31:17
                                     [200/0] via 5.5.5.5 (recursive is directly connected,
tunvxlan3)
B          53.1.1.40/32 [200/0] via 6.6.6.6 (recursive is directly connected,
tunvxlan3), 00:00:03
C          127.0.0.0/8 is directly connected, lo.vxlan_l3_elan_mhsh, 07:27:47
C          200.1.1.0/24 is directly connected, irb1604, 07:27:45
Gateway of last resort is not set
VTEP2#
VTEP2#show ipv6 route vrf vxlan_l3_elan_mhsh
IPv6 Routing Table
IP Route Table for VRF "vxlan_l3_elan_mhsh"
C          ::1/128 via ::, lo.vxlan_l3_elan_mhsh, 07:27:54
B          ::ffff:101:101/128 [0/0] via ::, tunvxlan3, 00:31:23
B          ::ffff:505:505/128 [0/0] via ::, tunvxlan3, 00:31:23
B          ::ffff:606:606/128 [0/0] via ::, tunvxlan3, 00:31:23
C          2000::/48 via ::, irb1604, 07:27:52
B          5301::/48 [200/0] via ::ffff:606:606 (recursive via ::, tunvxlan3), 00:31:23
                                     [200/0] via ::ffff:505:505 (recursive via ::, tunvxlan3)
B          5301::40/128 [200/0] via ::ffff:606:606 (recursive via ::, tunvxlan3), 00:00:10
C          fe80::/64 via ::, irb1604, 07:27:52
VTEP2#
VTEP2#show bgp l2vpn evpn mac-ip | grep 0000:0053:0040
0          605          0000:0053:0040 --
605          0          6.6.6.6          --          VxLAN
0          605          0000:0053:0040 53.1.1.40
605          1604         6.6.6.6          --          VxLAN
0          605          0000:0053:0040 5301::40
605          1604         6.6.6.6          --          VxLAN
VTEP2#
```

### In VTEP4:

```
VTEP4#show arp vrf vxlan_l3_elan_mhsh
```

---



---

Flags: D - Static Adjacencies attached to down interface

IP ARP Table for context vxlan\_l3\_elan\_mhsh

Total number of entries: 1

| Address   | Age      | MAC Address    | Interface | State     |
|-----------|----------|----------------|-----------|-----------|
| 1.1.1.1   | -        | e8c5.7aa3.2cb0 | tunvxlan3 | PERMANENT |
| 2.2.2.2   | -        | e001.a657.ef01 | tunvxlan3 | PERMANENT |
| 5.5.5.5   | -        | 6cb9.c5b1.ab9c | tunvxlan3 | PERMANENT |
| 53.1.1.40 | 00:02:57 | 0000.0053.0040 | irb604    | STALE     |

VTEP4#

VTEP4#show bgp l2vpn evpn mac-ip | grep 0000:0053:0040

|     |      |         |                |           |       |
|-----|------|---------|----------------|-----------|-------|
| 0   |      | 605     | 0000:0053:0040 | --        |       |
| 605 | 0    | 6.6.6.6 | --             |           | VxLAN |
| 0   |      | 605     | 0000:0053:0040 | 53.1.1.40 |       |
| 605 | 1604 | 6.6.6.6 | --             |           | VxLAN |
| 0   |      | 605     | 0000:0053:0040 | 5301::40  |       |
| 605 | 1604 | 6.6.6.6 | --             |           | VxLAN |

VTEP4#



## CHAPTER 16 Single-Home for VxLAN IRB with OSPF or ISIS

---

### Overview

Ethernet VPN with Integrated Routing and Bridging (EVPN-IRB) with OSPF or ISIS for single-homing is a feature designed to enhance the efficiency and simplicity of network connectivity in single-homing scenarios. This solution brings together the power of EVPN-IRB and the routing capabilities of OSPF or ISIS, making it an ideal choice for various network environments. This feature streamlines the network infrastructure, making it easier to manage the network's Layer 3 routing while seamlessly integrating with EVPN-MPLS.

For more information, see the Single-Home for VxLAN IRB with OSPF or ISIS section in the *OcNOS Key Feature document*, Release 6.4.1.



# CHAPTER 17 Single-Home for VxLAN EVPN IRB with OSPF or ISIS

---

## Overview

Ethernet VPN with Integrated Routing and Bridging (EVPN-IRB) with OSPF or ISIS for single-homing is a feature designed to enhance the efficiency and simplicity of network connectivity in single-homing scenarios. This solution brings together the power of EVPN-IRB and the routing capabilities of OSPF or ISIS, making it an ideal choice for various network environments. This feature streamlines the network infrastructure, making it easier to manage the network's Layer 3 routing while seamlessly integrating with EVPN-MPLS.

For more information, see the Single-Home for VxLAN EVPN IRB with OSPF or ISIS section in the *OcNOS Key Feature document*, Release 6.4.1.



# Virtual Extensible LAN Command Reference





---

## CHAPTER 1 VxLAN Commands

---

This chapter describes the VxLAN commands:

- `access-if-evpn`
- `arp-cache disable`
- `arp-nd flood-suppress`
- `arp-nd refresh timer`
- `clear mac address-table dynamic vxlan`
- `clear nvo vxlan counters`
- `clear nvo vxlan mac-stale-entries`
- `description`
- `dynamic-learning disable`
- `encapsulation`
- `evpn esi hold-time`
- `evpn`
- `evpn irb-forwarding anycast-gateway-mac`
- `evpn irb-if-forwarding anycast-gateway-mac`
- `evpn multi-homed`
- `evpn vxlan multihoming enable`
- `evpn-vlan-service`
- `hardware-profile filter vxlan`
- `hardware-profile filter vxlan-mh`
- `hardware-profile filter vxlan-short-pkt`
- `interface irb`
- `ip address`
- `ipv6 address`
- `ip dhcp relay uplink`
- `l3vni`
- `mac`
- `mac vrf`
- `mac-holdtime`
- `map vpn-id`
- `nd-cache disable`
- `nvo vxlan`
- `nvo vxlan access-if`
- `nvo vxlan id`

- `nvo vxlan irb`
- `nvo vxlan mac-ageing-time`
- `nvo vxlan vtep-ip-global`
- `show bgp l2vpn evpn`
- `show bgp l2vpn evpn prefix-route`
- `show bgp l2vpn evpn summary`
- `show evpn multi-homing all`
- `show evpn multihoming-status`
- `show interface irb`
- `show nvo vxlan`
- `show nvo vxlan access-if-config`
- `show nvo vxlan arp-cache`
- `show nvo vxlan counters access-port`
- `show nvo vxlan counters network-port`
- `show nvo vxlan l3vni`
- `show nvo vxlan mac-table`
- `show nvo vxlan static host state`
- `show nvo vxlan tunnel`
- `show nvo vxlan route-count`
- `show nvo vxlan vni-name`
- `show nvo vxlan xconnect`
- `show running-config interface irb`
- `show running-config nvo vxlan`
- `shutdown`
- `vxlan host-reachability-protocol evpn-bgp`

## access-if-evpn

Use this command to create the evpn access-port.

Use the no form of this command to delete the evpn access-port.

### Command Syntax

```
access-if-evpn
no access-if-evpn
```

### Parameters

None

### Command Mode

L2 Sub-interface mode

### Applicability

This command was introduced in OcNOS version 6.0.0.

### Examples

```
#configure terminal
(config)#interface xe1.1 switchport
(config-if)#access-if-evpn
(config-access-if)#end
```

---

## arp-cache disable

Use this command to disable the ARP cache for MAC/IP.

When the ARP cache is disabled on a VxLAN access port, OcnOS does not reply to any ARP arriving on this port from the cache. OcnOS withdraws all MAC/IPs configured/learned on this access port and removes the MAC/IP entry for this access port from the local ARP cache.

OcnOS also makes sure that on withdrawing the MAC/IP route, the MAC does not become unknown. If all routes for this MAC are being withdrawn because of this command, then OcnOS advertises a MAC-only route. This is done so that the MAC does not become unknown and only the cache functionality becomes disabled.

Use the `no` form of this command to enable ARP cache for MAC/IP.

Note: On enabling the cache, an IP will be in conflict, then the cache enable will fail. The conflict has to be manually removed and then the cache enabled.

### Command Syntax

```
arp-cache disable
no arp-cache disable
```

### Parameters

None

### Default

By default, the arp-cache option is enabled.

### Command Mode

NVO access interface mode

Access interface EVPN mode

### Applicability

This command was introduced before OcnOS version 1.3.

The Access interface EVPN mode is supported only from OcnOS version 6.0.

### Example

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xe1 2
(config-nvo-acc-if)#arp-cache disable
(config-nvo-acc-if)#exit

(config)#interface xe7.100 switchport
(config-if)#access-if-evpn
(config-acc-if-evpn)#arp-cache disable
```

---

## arp-nd flood-suppress

Use this command to *completely* restrict the flood of ARP/ND packets towards remote VTEPs or other access ports.

This command applies only when the ARP cache and ND cache are enabled. When the ARP cache is disabled, ARP flooding is not suppressed even if this command is given. When the ND cache is disabled, ND flooding is not disabled, even if this command is given.

Use the `no` form of this command to not restrict the flood of ARP/ND packets.

### Command Syntax

```
arp-nd flood-suppress
no arp-nd flood-suppress
```

### Parameters

None

### Default

By default, the `arp-nd flood-suppress` option is disabled.

### Command Mode

NVO access interface mode

Access interface EVPN mode

### Applicability

This command was introduced before OcNOS version 1.3.

The Access interface EVPN mode is supported only from OcNOS version 6.0.

### Example

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xel 2
(config-nvo-acc-if)#arp-nd flood-suppress
(config-nvo-acc-if)#exit

(config)#interface xe7.100 switchport
(config-if)#access-if-evpn
(config-acc-if-evpn)#arp-nd flood-suppress disable
```

---

## arp-nd refresh timer

Use this command to configure aging out the arp-cache and nd-cache entries for given time multiplied by 3 in seconds. Use the `no` form of this command to remove the configuration.

Note: After this timer interval, it sends out ARP to revalidate and 3 times of this would lead to removal of the dynamic entry.

### Command Syntax

```
nvo vxlan arp-nd refresh-timer <3-190>
no nvo vxlan arp-nd refresh-timer
```

### Parameters

<3-190> Refresh timer value in seconds (age-out is refresh time \* 3)

### Command Mode

Configuration mode

### Applicability

This command was introduced in OcNOS version 4.0.

### Example

```
#config mode
(config)#nvo vxlan arp-nd refresh-timer 100
(config)#no nvo vxlan arp-nd refresh-timer
```

---

## clear mac address-table dynamic vxlan

Use this command to clear dynamically learned MACs.

### Command Syntax

```
clear mac address-table dynamic vxlan
clear mac address-table dynamic vxlan vnid <1-16777215>
clear mac address-table dynamic vxlan vnid <1-16777215> (address MACADDR|)
```

### Parameters

|              |                                 |
|--------------|---------------------------------|
| address      | Clear the specified MAC Address |
| VNID         | VxLAN network identifier        |
| <1-16777215> | Range supported for VNID        |

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 1.3.

### Example

```
#clear mac address table dynamic vxlan
#clear mac address-table dynamic vxlan vnid 100
#clear mac address-table dynamic vxlan vnid 100 address 0000.0005.0505
```

## clear nvo vxlan counters

Use this command to clear the counters of access ports or network ports.

### Command Syntax

```
clear nvo vxlan counters((access-port (port IFNAME | port-vlan IFNAME (VLAN_ID |
outer-vlan) | all)) | (network-port (dst A.B.C.D | all)))
```

### Parameters

|            |                                 |
|------------|---------------------------------|
| port       | Port                            |
| IFNAME     | Interface name                  |
| port-vlan  | VLAN port                       |
| IFNAME     | Interface name                  |
| VLAN_ID    | VLAN identifier                 |
| Outer-vlan | Outer VLAN                      |
| A.B.C.D    | Tunnel destination IPv4 address |
| all        | All access or network ports     |

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 1.3.

### Example

Example for clearing a VLAN port counter:

```
#clear nvo vxlan counters access-port port-vlan xe1 2
```

Example for clearing all access port counters:

```
#clear nvo vxlan counters access-port all
```

Example for clearing network port counters:

```
#clear nvo vxlan counters network-port dst 1.1.1.1
```

Example for clearing all network port counters:

```
#clear nvo vxlan counters network-port all
```



---

## clear nvo vxlan mac-stale-entries

Use this command to clear MAC entries that are in discard state in the forwarding database.

### Command Syntax

```
clear nvo vxlan mac-stale-entries (vnid <1-16777215> |)
```

### Parameters

<1-16777215> VxLAN network identifier

### Command Mode

Exec mode

### Applicability

This command was introduced before OcnOS version 1.3.

### Example

```
#clear nvo vxlan mac-stale-entries vnid 100
```

## description

Use this command to set a description for a port.

Use the `no` form of this command to remove the description for a port.

### Command Syntax

```
description LINE
no description
```

### Parameters

`LINE` Maximum 32 characters describing this port.

### Default

No default value is specified for description `LINE` commands.

### Command Mode

NVO access interface mode

### Applicability

This command was introduced before OcNOS version 1.3.

### Example

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xel 2
(config-nvo-acc-if)#description member-port xel with vlan 2
(config-nvo-acc-if)#exit

#show running-config nvo vxlan
!
nvo vxlan enable
!
nvo vxlan access-if port-vlan xel 2
description member-port xel with vlan 2
no shutdown
```

---

## dynamic-learning disable

Use this command to disable dynamic learning of MACs at the access port. This command also disables dynamic learning of MAC/IP from ARP/ND messages received on this access port.

Use the `no` form of this command to enable dynamic learning of MACs at the access port.

### Command Syntax

```
dynamic-learning disable
no dynamic-learning disable
```

### Parameters

None

### Default

By default, the dynamic-learning option is enabled.

### Command Mode

NVO access interface mode

Access interface EVPN mode

### Applicability

This command was introduced before OcNOS version 1.3.

The Access interface EVPN mode is supported only from OcNOS version 6.0.

### Example

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xe1 2
(config-nvo-acc-if)#dynamic-learning disable
(config-nvo-acc-if)#exit

(config)#interface xe7.100 switchport
(config-if)#access-if-evpn
(config-acc-if-evpn)#dynamic-learning disable
```

## encapsulation

Use this command to assign a Tag Protocol Identifier (TPID) to an access port.

Use the `no` form of this command to set the default TPID (0x8100: IEEE 802.1Q VLAN-tagged frame) to an access port.

Note: Before configuring the TPID in the NVO access interface mode, first configure it at port level.

### Command Syntax

```
encapsulation TPID
no encapsulation
```

### Parameters

|      |   |
|------|---|
| TPID | Tag Protocol Identifier:                                  |
|      | Ox88A8: IEEE 802.1ad Provider Bridging                    |
|      | Ox9100: IEEE 802.1Q VLAN-tagged frame with double tagging |

### Default

The encapsulation TPID default is 0X8100.

### Command Mode

NVO access interface mode

### Applicability

This command was introduced before OcnOS version 1.3.

### Example

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xel 2
(config-nvo-acc-if)#encapsulation 0x9100
(config-nvo-acc-if)#no encapsulation
(config-nvo-acc-if)#exit
```

## evpn esi hold-time

Use this command to allow some time for the tunnels to come at the time of VxLAN initialization before making the ESI up. This avoids traffic to be black-holed when a new PE is added and connected to an already running CE for multihoming.

Use the `no` form of this command to make the ESI up immediately when configuring the access-if cli.

### Command Syntax

```
evpn esi hold-time <10-300>
no evpn esi hold-time <10-300>
```

### Parameters

|          |                      |
|----------|----------------------|
| <10-300> | Hold time in seconds |
|----------|----------------------|

### Default

The default value is 0.

### Command Mode

Configuration Mode

### Applicability

This command was introduced before OcnOS version 1.3.

### Example

```
#configure terminal
(config)# evpn esi hold-time 100
(config)# exit
```

---

## evpn

Use this command to configure default gateway behavior on a VTEP for particular VNID.

Use the no form this command to disable default gateway behavior on a VTEP for the particular VNID.

Note: Map an IRB interface to an L2 VNID. This IRB interface can have multiple IP address as configured in IRB IP address CLI and can serve all subnets attached to the L2 VNID.

### Command Syntax

```
evpn <NAME>
no evpn <NAME>
```

### Parameters

|      |                    |
|------|--------------------|
| NAME | IRB interface name |
|------|--------------------|

### Command Mode

NVO Mode

### Applicability

This command was introduced before OcNOS version 4.1.

### Example

```
#config mode
(config)# nvo vxlan id 2000 ingress-replication inner-vid-disabled
(config-nvo)# evpn irb1
(config-nvo)# no evpn irb1
```

---

## evpn irb-forwarding anycast-gateway-mac

Use this command to configure common anycast mac-address for all the IRB interfaces

Use the `no` form of this command to remove the global MAC address on all the IRB interfaces.

### Command Syntax

```
evpn irb-forwarding anycast-gateway-mac XXXX.XXXX.XXXX
no evpn irb-forwarding anycast-gateway-mac
```

### Parameters

|                   |                               |
|-------------------|-------------------------------|
| XX-XX-XX-XX-XX-XX | Source MAC address (Option 1) |
| XX:XX:XX:XX:XX:XX | Source MAC address (Option 2) |
| XXXX.XXXX.XXXX    | Source MAC address (Option 3) |

### Command Mode

Configuration Mode

### Applicability

This command was introduced before OcNOS version 4.1.

### Example

```
#configure terminal
(config)#evpn irb-forwarding anycast-gateway-mac 0000.0000.1313
Or
(config)#evpn irb-forwarding anycast-gateway-mac 00:00:00:00:13:13
Or
(config)#evpn irb-forwarding anycast-gateway-mac 00-00-00-00-13-13
(config)# no evpn irb-forwarding anycast-gateway-mac
```

---

## evpn irb-if-forwarding anycast-gateway-mac

Use this command to enable an IRB interface to use the global anycast IRB mac-address.

Use the `no` form of this command to un-configure anycast MAC at IRB interface.

### Command Syntax

```
evpn irb-if-forwarding anycast-gateway-mac
no evpn irb-if-forwarding anycast-gateway-mac
```

### Parameters

None

### Command Mode

IRB\_IF\_Mode

### Applicability

This command was introduced before OcnOS version 4.1.

### Example

```
#configure terminal
(config)# interface irb 1
(config-irb-if)# ip vrf forwarding vrfip
(config-irb-if)#evpn irb-if-forwarding anycast-gateway-mac
(config-irb-if)#no evpn irb-if-forwarding anycast-gateway-mac
```



---

## evpn multi-homed

Use this command to configure single-active or port-active load-balancing Ethernet Segment Identifier (ESI) configuration on a link with multihomed Customer Edge (CE).

Use the no parameter of this command to unconfigure Ethernet Segment Identifier (ESI) configuration on a link with multihomed Customer Edge (CE).

### Command Syntax

```
evpn multi-homed (esi XX:XX:XX:XX:XX:XX:XX:XX:XX | system-mac (XX-XX-XX-XX-XX-XX|XX:XX:XX:XX:XX:XX|XXXX.XXXX.XXXX)) load-balancing single-active
evpn multi-homed system-mac (XX-XX-XX-XX-XX-XX|XX:XX:XX:XX:XX:XX|XXXX.XXXX.XXXX) load-balancing port-active
no evpn multi-homed (esi | system-mac)
```

### Parameters

|                            |  |
|----------------------------|--|
| XX:XX:XX:XX:XX:XX:XX:XX:XX | ESI value in HH:HH:HH:HH:HH:HH:HH:HH:HH - 9 octet format |
| XX-XX-XX-XX-XX-XX          | Host MAC address (Option 1)                              |
| XX:XX:XX:XX:XX:XX          | Host MAC address (Option 2)                              |
| XXXX.XXXX.XXXX             | Host MAC address (Option 3)                              |

### Default

The default value is 0.

### Command Mode

Interface mode

### Applicability

This command was introduced before OcNOS version 1.3 and underwent modifications in the OcNOS version 6.4.1.

### Example

```
#configure terminal
(config)#interface xe1
(config-if)#evpn multi-homed esi 00:11:22:33:44:55:66:77:88 load-balancing
single-active
(config)#exit

#configure terminal
(config)#interface po1
(config-if)#evpn multi-homed system-mac 0000.0000.1111 load-balancing port-
active
(config)#exit
```

---

## evpn vxlan multihoming enable

Use this command to enable evpn vxlan multi-homing

Use the no form of this command to disable evpn vxlan multi-homing.

Note: You must restart the device after giving this command. If there are devices in the topology which have multi-homed CEs, then devices which do not have multi-homed CEs should also enable multihoming so that they can load share traffic to the multi-homed CEs.

Note: Before enabling multi-homing, configure the hardware-profiles:

- [hardware-profile filter vxlan-mh](#)
- [hardware-profile filter for Qumran-1](#) with the `egress-ipv4` parameter

### Command Syntax

```
evpn vxlan multihoming enable
no evpn vxlan multihoming enable
```

### Parameters

None

### Default

By default, multi-homing is disabled.

### Command Mode

Configure mode

### Applicability

This command was introduced before OcNOS version 1.3 and changed in OcNOS version 4.0.

### Example

```
#configure terminal
#(config)#evpn vxlan multihoming enable
#(config)#exit
```

## evpn-vlan-service

Use this command to configure VLAN-based EVPN-Service type.

Use the `no` form of this command to delete the evpn vlan service.

**Note:** If access port mappings to vnid exists already and VLAN service is configured later and mapped to tenant then we should not allow the mapping, user should either remove and reconfigure the access port mappings.

### Command Syntax

```
evpn-vlan-service vlan-based
no evpn-vlan-service
```

### Parameters

`vlan-based`      VLAN-based EVPN-Service type

### Command Mode

MAC vrf mode

### Applicability

This command was introduced before OcnOS version 1.3.

### Example

```
#configure terminal
(config)#mac vrf vrf1
(config-vrf)# evpn-vlan-service vlan-based
(config-vrf)# no evpn-vlan-service vlan-based
```

---

## hardware-profile filter vxlan

Use this command to configure hardware profile for nvo vxlan. This profile should be enabled before enabling VxLAN.

Note: You need to save the configuration and do a reboot after giving this command.

### Command Syntax

```
hardware-profile filter vxlan enable
hardware-profile filter vxlan disable
```

### Parameters

None

### Command Mode

Configure mode

### Applicability

This command was introduced in OcNOS version 3.0.

### Example

```
#config mode
(config)# hardware-profile filter vxlan enable
(config)# hardware-profile filter vxlan disable
```

---

## hardware-profile filter vxlan-mh

Use this command to enable the hardware-profile for VxLAN multi-homing to successfully activate multi-homing in the hardware.

Before enabling EVPN multi-homing ([evpn multi-homed](#) command), give this command.

Before disabling the hardware-profile, disable EVPN multi-homing.

Note: You need to save the configuration and do a reboot after giving this command.

Use the `disable` form of this command to disable the configured hardware-profile.

### Command Syntax

```
hardware-profile filter vxlan-mh enable
hardware-profile filter vxlan-mh disable
```

### Parameters

None

### Default

By default, the VxLAN multi-homing hardware-profile is disabled.

### Command Mode

Configure mode

### Applicability

This command was introduced in OcNOS version 3.0.

### Example

```
#configure terminal
#(config)#hardware-profile filter vxlan-mh enable
#(config)#hardware-profile filter vxlan-mh disable
#(config)#exit
```

---

## hardware-profile filter vxlan-short-pkt

Use this command to enable/disable the VxLAN short packet forwarding filter group.

When this filter group is enabled, any short packet received less than 36B is sent to the CPU to add extra bytes to make the packet size up to 64B and sent back to access-port.

Use the `disable` form of this command to disable the configured hardware-profile.

### Command Syntax

```
hardware-profile filter vxlan-short-pkt enable
hardware-profile filter vxlan-short-pkt disable
```

### Parameters

None

### Default

By default, the VxLAN short packet hardware-profile is disabled.

### Command Mode

Configure mode

### Applicability

This command was introduced in OcNOS version 6.3.1.

### Example

```
#configure terminal
#(config)#hardware-profile filter vxlan-short-pkt enable
#(config)#exit
```

## interface irb

Use this command to configure logical IRB interface.

Use the `no` form of this command to un-configure logical IRB interface.

### Command Syntax

```
interface irb<1-4094>  
no interface irb<1-4094>
```

### Parameters

<1-4094>            IRB interface number

### Command Mode

Configure mode

### Applicability

This command was introduced in OcNOS version 4.1.

### Example

```
#configure terminal  
(config)#interface irb1  
(config)#no interface irb1
```

## ip address

Use this command to set anycast flag for primary and secondary subnets under IRB interface.

With this anycast gateway can be supported for multiple subnets.

### Command Syntax

```
ip address [ <A.B.C.D/M> | anycast]
ip address [ <A.B.C.D> | <A.B.C.D> | anycast]
ip address [ <A.B.C.D/M> | secondary | anycast]
ip address [ <A.B.C.D> | <A.B.C.D> | secondary | anycast]
```

### Default

The default value is router mac

### Parameters

|           |                                   |
|-----------|-----------------------------------|
| anycast   | Anycast flag                      |
| secondary | Used for secondary address option |

### Command Mode

IRB\_IF Mode

### Applicability

The anycast flag was introduced in OcNOS version 6.3.0.

### Example

```
(config)#interface irb2
(config-irb-if)#ip address 40.1.1.1/24 anycast
(config-irb-if)#ip address 41.1.1.1/24 secondary anycast
(config-irb-if)#
(config)#interface irb1
(config-irb-if)#ip address 42.1.1.1 255.255.255.0 anycast
(config-irb-if)#ip address 43.1.1.1 255.255.255.0 secondary anycast
(config-irb-if)#
```



## ipv6 address

Use this command to set anycast flag for any configured subnets under IRB interface.

With this anycast gateway can be supported for multiple subnets.

### Command Syntax

```
ipv6 address [ < X:X::X:X/M > | anycast]
```

### Default

The default value is router mac

### Parameters

|                      |              |
|----------------------|--------------|
| <code>anycast</code> | Anycast flag |
|----------------------|--------------|

### Command Mode

IRB\_IF Mode

### Applicability

The anycast flag was introduced in OcNOS version 6.3.0.

### Example

```
(config)#interface irb1  
(config-irb-if)# ipv6 address 1100::1/64 anycast
```

---

## ip dhcp relay uplink

Use this command to configure uplink interface towards server per vrf.

Use the `no` form of this command to un-configure uplink interface.

### Command Syntax

```
ip dhcp relay uplink evpn
no ip dhcp relay uplink evpn
```

### Parameters

evpn                      IP VRF IRB interface

### Command Mode

Configure mode

### Applicability

This command was introduced in OcNOS version 5.0.

### Example

```
#configure terminal
(config)#ip vrf vrf1
(config-vrf)#ip dhcp relay uplink evpn
(config-vrf)#no ip dhcp relay uplink evpn
```

## **l3vni**

Use this command to configure L3 Virtual Network Identifier for an ip vrf

Use the no form of this command to remove L3 Virtual Network Identifier

This identifies a tenant, with this one tenant can have L3VNI as its identifier and he can have multiple L2 networks identified with L2VNI's.

Note: L3 VNID cannot be same as L2 VNID.

### **Command Syntax**

```
l3vni <L3 VNID>  
no l3vni <L3 VNID>
```

### **Parameters**

<1-16777215> L3 VNID. Cannot be same as L2 VNID

### **Command Mode**

Configure VRF mode

### **Applicability**

This command was introduced in OcNOS version 4.1.

### **Example**

```
#configure terminal  
(config)#ip vrf vrfip  
(config-vrf)#l3vni 10002  
(config-vrf)#no l3vni 10002
```

## mac

Use this command to associate a static MAC address and a static IPv4 or IPv6 address on an access interface.

Use the `no` form of this command to disassociate a static MAC address and an IPv4 or IPv6 address for an access interface.

Note: When a static host is configured on an access port which is in the down state, its state is Inactive.

Note: The same static mac configuration is not allowed on a different access port as then there will be a chance of conflict. However, if a dynamic packet is sent at another access port which is up and running with the same MAC, it learns as usual. As soon as the port on which the static MAC is configured comes up, static learning is given precedence and the dynamically learned MAC is moved to the port where it is configured statically.

### Command Syntax

```
mac XXXX.XXXX.XXXX
mac XXXX.XXXX.XXXX (ip A.B.C.D | ipv6 X:X::X:X)
no mac XXXX.XXXX.XXXX (ip A.B.C.D | ipv6 X:X::X:X)
```

### Parameters

XXXX.XXXX.XXXX Static MAC address. The following formats are supported:

- XX-XX-XX-XX-XX-XX Source MAC address (Option 1)
- XX:XX:XX:XX:XX:XX Source MAC address (Option 2)
- XXXX.XXXX.XXXX Source MAC address (Option 3)

A.B.C.D Static IPv4 address.

X:X::X:X Static IPv6 address.

### Default

No default value is specified for mac command.

### Command Mode

NVO access interface mode

Access interface EVPN mode

### Applicability

This command was introduced before OcNOS version 1.3.

The Access interface EVPN mode is supported only from OcNOS version 6.0.

### Example

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xe1 2
(config-nvo-acc-if)#mac 0000.0000.aaaa ip 10.10.10.1
(config-nvo-acc-if)#mac 0000.0000.aaaa ipv6 1201::1
(config-nvo-acc-if)#exit
(config)#interface xe7.100 switchport
(config-if)#access-if-evpn
(config-acc-if-evpn)#arp-nd flood-supress disable
```

## mac vrf

Use this command to create a MAC VRF to use in EVPN routes.

See also [vxlan host-reachability-protocol evpn-bgp](#).

Use the `no` form of this command to delete the MAC VRF.

### Command Syntax

```
mac vrf WORD
no mac vrf WORD
```

### Parameter

WORD                      MAC routing or forwarding instance name.

### Command Mode

Configure mode

### Applicability

This command was introduced before OcnOS version 1.3.

### Example

```
#configure terminal
(config)#mac vrf vrf1

(config)#no mac vrf vrf1
```

## mac-holdtime

Use this command to set the MAC hold time for a MAC/IP or MAC.

The feature holds the MAC in hardware until BGP has withdrawn from the neighbors. This helps to reduce flooding to other access ports.

This setting applies when the access port is shut down, the physical port on which the access port is down, or the access port is removed from the VNID using the `no` form of the `map vpn-id` command.

When the MAC hold time is configured as `-1`, then the MAC is not removed from the hardware and is also not withdrawn from EVPN BGP.

Use the `no` form of this command to remove the MAC hold time for the MAC/IP or MAC.

Note: When a MAC is moved to discard state, traffic to and from this MAC is discarded. This is applicable only on statically configured MAC/MAC-IPs.

### Command Syntax

```
mac-holdtime <-1-300>
no mac-holdtime
```

### Parameters

<-1-300>            MAC hold time in seconds. Specify `-1` to “never expire”.

### Default

The default holdtime for mac is 3 seconds.

### Command Mode

NVO access interface mode

Access interface EVPN mode

Note: When configured in both modes, then the `NVO_ACC_IF_MODE` or `ACC-IF-EVPN` value takes preference for that access port.

### Applicability

This command was introduced before OcNOS version 1.3.

This command in `NVO_ACC_IF_MODE` mode is introduced in OcNOS version 1.3.4.

The Access interface EVPN mode is supported only from OcNOS version 6.0.

### Example

```
#configure terminal
(config)#nvo vxlan id 3 ingress-replication inner-vid-disabled
(config-nvo)#mac-holdtime -1
(config-nvo)#exit

(config)#interface xe7.100 switchport
(config-if)#access-if-evpn
(config-acc-if-evpn)#mac-holdtime -1
```

---

## map vpn-id

Use this command to map a tenant to an access-port.

Use the `no` form of this command to remove the tenant from an access-port

### Command Syntax

```
map vpn-id <1-16777215>
no map vpn-id <1-16777215>
```

### Parameters

<1-16777215> VxLAN network identifier.

### Default

No default value is specified for map vnid command.

### Command Mode

NVO access interface mode

Access interface EVPN mode

### Applicability

This command was introduced before OcNOS version 1.3.

The Access interface EVPN mode is supported only from OcNOS version 6.0.

### Example

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xe1 2
(config-nvo-acc-if)#map vpn-id 100
(config-nvo-acc-if)#exit

(config)#interface xe7.100 switchport
(config-if)#access-if-evpn
(config-acc-if-evpn)#map vpn-id 100
```

## nd-cache disable

Use this command to disable ND cache for MAC/IPv6.

When the ND cache is disabled on a VxLAN access port, OcNOS does not reply to any ND arriving on this port from the cache. OcNOS withdraws all MAC/IPs configured/learned on this access port and removes the MAC/IP entry for this access port from the local ND cache.

OcNOS also makes sure that on withdrawing the MAC/IP route, the MAC does not become unknown. If all routes for this MAC are being withdrawn because of this command, then OcNOS advertises a MAC-only route. This is done so that the MAC does not become unknown and only the cache functionality becomes disabled.

See also [arp-cache disable](#).

Use the `no` form of this command to enable ND cache for MAC/IPv6.

Note: On enabling the cache, an IP will be in conflict, then the cache enable will fail. The conflict has to be manually removed and then the cache enabled.

### Command Syntax

```
nd-cache disable
no nd-cache disable
```

### Parameters

None

### Default

By default, the `nd-cache` option is enabled.

### Command Mode

NVO access interface mode  
Access interface EVPN mode

### Applicability

This command was introduced before OcNOS version 1.3.

The Access interface EVPN mode is supported only from OcNOS version 6.0

### Example

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xe1 2
(config-nvo-acc-if)#nd-cache disable
(config-nvo-acc-if)#exit

(config)#interface xe7.100 switchport
(config-if)#access-if-evpn
(config-acc-if-evpn)#nd-cache disable
```



## nvo vxlan

Use this command to enable or disable VxLAN.

You must enable the VxLAN hardware profile with the [hardware-profile filter vxlan](#) command before enabling VxLAN.

Note: To make nvo vxlan disable and enable effective, system reboot is required.

### Command Syntax

```
nvo vxlan (enable | disable)
```

### Parameters

None

### Default

By default, the VxLAN is disabled.

### Command Mode

Configure mode

### Applicability

This command was introduced before OcNOS version 1.3.

### Example

```
#configure terminal
(config)#nvo vxlan enable

(config)#nvo vxlan disable
```

## nvo vxlan access-if

Use this command to map a complete interface or a VLAN or VLAN range on an interface to identify the tenant traffic and to enter NVO access interface mode.

The command `nvo vxlan access-if port <if_name> default` accepts all tagged, double tagged and untagged traffic received on the mapped physical port.

Use the `no` form of this command to unmap an interface or a VLAN.

Note: When a VxLAN access interface configured as a port VLAN as VLAN-range or port as default, then arp-cache and nd-cache should be disabled and only VNID with inner-vid-enable is mapped.

Note: Inner-vid-enable is one-to-one mapping. VNID is mapped to only on one access-port.

Note: VLAN Range not allowed to be configured for VxLAN stacked access-port.

### Command Syntax

```
nvo vxlan access-if (port IFNAME (| default) | port-vlan IFNAME VLAN_RANGE (|
inner-vlan <2-4094>))
no nvo vxlan access-if (port IFNAME | port-vlan IFNAME VLAN_RANGE(| inner-vlan <2-
4094>))
```

### Parameters

|                             |  |
|-----------------------------|--|
| <code>port</code>           | A physical port.                                 |
| <code>IFNAME</code>         | Interface name (Physical/Static lag/Dynamic lag) |
| <code>default</code>        | Default access interface                         |
| <code>port-vlan</code>      | The physical port on which VLANs are configured  |
| <code>IFNAME</code>         | Interface name (Physical/Static lag/Dynamic lag) |
| <code>VLAN_RANGE</code>     | Configure VLANId or VLAN-Range for outer VLAN    |
| <code>Inner-vlan</code>     | Inner-VLAN id                                    |
| <code>&lt;2-4094&gt;</code> | VLAN id  |

### Default

By default, the `nvo vxlan access-if` option is port VLAN ID.

### Command Mode

Configure mode

### Applicability

This command was introduced before OcNOS version 1.3 and `VLAN_RANGE` option is introduced in OcNOS version 5.0. This command is not available on Qumran2 devices.

### Example

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xe1 2-10
(config-nvo-acc-if)#exit

#configure terminal
```

```
(config)#nvo vxlan access-if port xe1
(config-nvo-acc-if)#exit

#configure terminal
(config)#nvo vxlan access-if port xe1 default
(config-nvo-acc-if)#exit

#configure terminal
(config)#nvo vxlan access-if port-vlan xe1 2 inner-vlan 10
(config-nvo-acc-if)#exit
```

---

## nvo vxlan id

Use this command to add a tenant and the type of VPN. This command changes the mode to NVO mode.

Use `nvo vxlan id` for creating ELAN and use `nvo vxlan id xconnect` with source and target identifier for ELINE/XConnect.

Use `no` form of this command to unconfigure the VxLAN ID.

You must enable VxLAN with the `nvo vxlan` command before you give this command.

### Command Syntax

```
nvo vxlan id <1-16777215> (multicast |) | ((ingress-replication | xconnect target-  
vxlan-id <1-16777215>) (| inner-vid-disabled))  
no nvo vxlan id <1-16777215>
```

### Parameters

|                                       |   |
|---------------------------------------|---|
| <code>&lt;1-16777215&gt;</code>       | VxLAN Network Identifier (VNID)   |
| <code>multicast</code>                | Point to multipoint.  |
| <code>ingress-replication</code>      | Use head end replication for forwarding BUM (Broadcast, Unknown Unicast, Multicast) traffic |
| <code>xconnect target-vxlan-id</code> | Cross-connect   |
| <code>&lt;1-16777215&gt;</code>       | Target cross-connect identifier   |
| <code>inner-vid-disabled</code>       | Do not carry VID out of network port  |

### Command Mode

Configure mode

### Applicability

This command was introduced before OcNOS version 1.3; `nvo vxlan id xconnect` was introduced in OcNOS version 5.1.

### Example

```
#configure terminal  
(config)#nvo vxlan id 300 ingress-replication  
(config-nvo)#exit  
  
(config)#nvo vxlan id 200 ingress-replication inner-vid-disabled  
(config-nvo)#exit  
  
(config)#nvo vxlan id 30 xconnect target-vxlan-id 20  
(config-nvo)#exit  
  
(config)#nvo vxlan id 40 xconnect target-vxlan-id 50 ingress-replication
```

```
(config-nvo) #exit
```

---

## **nvo vxlan irb**

Use this command to enable IRB functionality.

Use the `no` form of this command to disable IRB functionality.

Note: Remove the existing L2 VNID configuration to enable IRB.

### **Command Syntax**

```
nvo vxlan irb
no nvo vxlan irb
```

### **Parameters**

None

### **Command Mode**

Configure mode

### **Applicability**

This command was introduced before OcNOS version 4.1.

### **Example**

```
#configure terminal
(config)#nvo vxlan irb
(config)#no nvo vxlan irb
```

---

## nvo vxlan mac-ageing-time

Use this command to set the dynamically learned MAC aging time.

Use the `no` form of this command to set the age out the MACs in hardware to its default (300 seconds).

### Command Syntax

```
nvo vxlan mac-ageing-time <10-572>
no nvo vxlan mac-ageing-time
```

### Parameters

<10-572>            Aging time in seconds

### Default

The default age out time is 300 seconds.

### Command Mode

Configure mode

### Applicability

This command was introduced before OcNOS version 1.3.

### Example

```
#configure terminal
(config)#nvo vxlan mac-ageing-time 10
(config)#no nvo vxlan mac-ageing-time 10
```

---

## nvo vxlan vtep-ip-global

Use this command to set the source IP address of the VxLAN tunnels.

Use the `no` form of this command to remove the source IP address of the VxLAN tunnels.

You must enable VxLAN with the [nvo vxlan](#) command before you give this command.

### Command Syntax

```
nvo vxlan vtep-ip-global A.B.C.D
no nvo vxlan vtep-ip-global A.B.C.D
```

### Parameters

A.B.C.D                      Source VTEP IP address of the global configuration

### Default

No default value is specified for `nvo vxlan vtep-ip-global` command.

### Command Mode

NVO mode

### Applicability

This command was introduced before OcnOS version 1.3.

### Example

```
(config-nvo)#nvo vxlan vtep-ip-global 10.10.11.1
```



---

## show bgp l2vpn evpn

Use this command to display details about Layer 2 Virtual Private Network (L2VPN) Ethernet Virtual Private Network (EVPN) routes.

Note: A BGP EVPN route update received for an unreachable IP address is also listed by this command and as a best route. This is because the next hop tracking feature is not supported for the EVPN address family. However, the tunnel to this IP address is shown in unresolved state by the [show nvo vxlan tunnel](#) output.

### Command Syntax

```
show bgp l2vpn evpn (((vrf WORD)|(rd WORD))((prefix-route)|(detail| time)))
show bgp l2vpn evpn mac-ip ((vrf WORD)|(rd WORD)|)
show bgp l2vpn evpn mcast
show bgp l2vpn evpn multihoming es-route <(rd WORD)|(vrf WORD)>
show bgp l2vpn evpn multihoming ethernet-ad-per-evi <(rd WORD)|(vrf WORD)>
show bgp l2vpn evpn multihoming ethernet-ad-per-es <(rd WORD)|(vrf WORD)>
```

### Parameters

|              |   |
|--------------|---|
| vrf          | Virtual Routing and Forwarding instance               |
| WORD         | VRF name  |
| rd           | Route distinguisher                                   |
| WORD         | Route distinguisher: ASN:nn or IP:nn                  |
| prefix-route | Shows detail of the Prefix-Route (Type:5))            |
| detail       | Detailed output of the route-path                     |
| time         | Display learnt time for details for evpn routes.      |
| mac-ip       | Show detail of the MAC-IP route (Type:2)              |
| mcast        | Show detail of the Inclusive MULTICAST route (Type:3) |
| multihoming  | Show multihoming information                          |
| peer-group   | Dynamic peer-group                                    |

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 1.3.

### Example

```
show bgp l2vpn evpn detail
BGP route entry for prefix : [1]:[00:00:00:00:11:12:12:22:11:11]:[100]:[100]
Route-Distinguisher: 1.1.1.1:1
Flags : Valid, Selected, IBGP, Labelled
Nexthop : 1.1.1.1 MED value : 0
Community:
Extended Community: RT:100:1 Encapsulation:VxLAN ESI-Label:0
Weight :0, Local Preference :100
AS Path : Local
```

```
Origin : IGP
Last Update : Thu Apr 13 12:05:23 2023
Peer : 1.1.1.1
```

```
BGP route entry for prefix : [2]:[0]:[100]:[48,0000:1111:0000]:[32,10.12.11.12]:[100]
Route-Distinguisher: 1.1.1.1:1
Flags : Valid, Selected, IBGP, Labelled
Nexthop : 1.1.1.1 MED value : 0
Community:
Extended Community: RT:100:1 Encapsulation:VxLAN MAC_mob_seq:Static
Weight :0, Local Preference :100
AS Path : Local
Origin : IGP
Last Update : Thu Apr 13 12:05:23 2023
Peer : 1.1.1.1
Total number of prefixes 2
```

Table 1-1 shows the status codes displayed at the start of a route entry.

**Table 1-1: status codes**

| Status code | Description | Comments   |
|-------------|-------------|--|
| s           | suppressed  | Whether the route is suppressed and is not advertised to neighbors.  |
| d           | damped      | When the penalty of a flapping route exceeds the suppress limit, the route is damped and remains in a withdrawn state until its penalty decreases below the reuse limit. |
| h           | history     | When the penalty of a flapping route does not exceed the suppress limit, the route is not damped and BGP maintains a history of the flapping route.                      |
| *           | valid       | Whether the route is valid. When a route is not suppressed, damped, or present in the history, it is valid.  |
| >           | best        | The selected route to be installed in the kernel routing table.  |
| i           | internal    | The prefix was learned from an iBGP peer.  |
| l           | labeled     | BGP Labeled Unicast advertises route information between inter region routers.   |

Table 1-2 shows the codes at the end of each route entry that indicate where the route originated.

**Table 1-2: origin codes**

| Origin Code | Description | Comments   |
|-------------|-------------|--|
| i           | IGP         | The route is from an Interior Gateway Protocol.                          |
| e           | EGP         | The route is from an Exterior Gateway Protocol.                          |
| ?           | incomplete  | Origin not known. Typically, these are routes redistributed from an IGP. |

Table 1-3 explains the fields for each route.

**Table 1-3: route entry fields**

| Field                    | Description  |
|--------------------------|--|
| RD                       | Route distinguisher: AS number or IP address.  |
| VRF                      | Name of the VRF.   |
| Network                  | <p>EVPN route information.</p> <p>The route type indicates the type of routing information advertised by the EVPN control plane:</p> <p>2 MAC/IP Route: Endpoint reachability information, including MAC and IP addresses of the endpoints.<br/>           3 Inclusive Multicast Route: Information about how to forward Broadcast, Unknown Unicast and Multicast (BUM) traffic.</p> <p>The other fields included depend on the route type:<br/>           Type 2: [ESI]:[E-Tag]:[Length, Host MAC address]:[Length, Host IP address]:[Label/VNID]<br/>           Type 3: [E-Tag]:[Length, PE IP address]</p> <p>ESI (Ethernet Segment Identifier): a unique non-zero identifier that identifies an Ethernet segment, which is a set of links that connects a network or device to one or more PEs. ESI 0 denotes a single-homed site.</p> <p>E-Tag (Ethernet tag): identifies a particular broadcast domain such as a VLAN or VNID in the VxLAN case. An EVPN instance consists of one or more broadcast domains.</p> <p>VNID (VxLAN network identifier): identifies Layer 2 segments and maintains Layer 2 isolation between the segments, allowing the addressing of up to 16 million logical networks in the same administrative domain.</p> <p>The status codes are explained in <a href="#">Table 1-1</a>.</p> |
| Next Hop                 | IP address of the nexthop for this route.  |
| Metric                   | Multiple-Exit Discriminator (MED). If there are multiple paths to the same destination from a single routing protocol, then the multiple paths have the same administrative distance and the best path is selected based on this metric. The path with the lowest metric is selected as the optimal path and installed in the routing table.   |
| LocPrf                   | This value is used only with iBGP sessions within the local autonomous system to determine if a route towards a destination is the “best” one. The path with the highest local preference is preferred.  |
| Weight                   | This field applies only to routes within an individual router. If a route was learned from a peer, it has a default weight of 0. All routes generated by the local router have a weight of 32,768.   |
| Path                     | The autonomous systems through which the prefix advertisement passed.<br>The origin codes are explained in <a href="#">Table 1-2</a> .   |
| Peer                     | Neighbor address.  |
| Total number of prefixes | The total number of prefixes listed.   |

---

## show bgp l2vpn evpn prefix-route

Use this command to display the Type-5 prefix remote routes.

### Command Syntax

```
show bgp l2vpn evpn prefix-route <vrf WORD | rd Word>
```

### Parameters

None

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 4.1.

### Example

```
rtr1#show bgp l2vpn evpn prefix-route
```

```
RD[300:1]
ESI
GW-IP Address      Eth-Tag Prefix-Length  IP-Address      L3VNID  Nexthop      Encap
0                  45001   24              80.80.80.0     45001    2.2.2.2      VxLAN
0.0.0.0           45001   24              90.90.90.0     45001    2.2.2.2      VxLAN
0                  45001   24              45001          2.2.2.2      VxLAN
0.0.0.0           45001   64              8001::         45001    2.2.2.2      VxLAN
::                45001   64              9001::         45001    2.2.2.2      VxLAN
0                  45001   64              45001          2.2.2.2      VxLAN
::
rtr1#
```

## show bgp l2vpn evpn summary

Use this command to display a summary of BGP EVPN neighbor status.

### Command Syntax

```
show bgp l2vpn evpn summary
```

### Parameters

None

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 1.3.

### Example

```
#show bgp l2vpn evpn summary
BGP router identifier 1.1.1.1, local AS number 100
BGP table version is 17
1 BGP AS-PATH entries
0 BGP community entries
```

| Neighbor    | V | AS  | MsgRcv | MsgSen | TblVer | InQ | OutQ | Up/Down  | State/PfxRcd | AD | MACIP | MCAST | ESI |
|-------------|---|-----|--------|--------|--------|-----|------|----------|--------------|----|-------|-------|-----|
| 8.8.8.8     | 4 | 100 | 111    | 112    | 17     | 0   | 0    | 00:53:03 | 3            | 0  | 0     | 3     | 0   |
| 9.9.9.9     | 4 | 100 | 110    | 110    | 17     | 0   | 0    | 00:52:10 | 15           | 0  | 13    | 2     | 0   |
| 13.13.13.13 | 4 | 100 | 132    | 109    | 17     | 0   | 0    | 00:51:57 | 4            | 0  | 2     | 2     | 0   |

Total number of neighbors 3

Total number of Established sessions 3

The start of the output shows:

- The BGP router identifier and the local router AS number.
- The BGP table version tracks the local BGP table version. Any time the BGP best path algorithm executes, the table version increments.
- BGP AS-PATH entry and community entries.

[Table 1-4](#) explains the fields for each neighbor entry.

**Table 1-4: neighbor fields**

| Field    | Description   |
|----------|---|
| Neighbor | IP address of peer.   |
| V        | BGP version of peer.  |
| AS       | Autonomous system number of peer.                           |
| MsgRcvd  | Messages received since the BGP connection was established. |
| MsgSent  | Messages sent since the BGP connection was established.     |

**Table 1-4: neighbor fields (Continued)**

| Field        | Description  |
|--------------|--|
| TblVer       | Last version of the local router's BGP database advertised to the peer.  |
| InQ          | Received messages waiting in the input queue for further processing.   |
| OutQ         | Messages waiting in the output queue to be sent.   |
| Up/Down      | Connection up time in the interface.   |
| State/PfxRcd | <p>If the TCP session is up and the BGP peers have formed an adjacency, this field shows how many prefixes have been received from the remote neighbor.</p> <p>Other states:</p> <p>Idle: The local router has not allocated resources for the peer connection, so incoming connection requests are refused</p> <p>Idle (Admin): The peer has shut down</p> <p>Idle (PfxCt): Prefix overflow</p> <p>Idle (G-shut): Graceful shutdown</p> <p>Connect: BGP is waiting for the TCP connection to complete</p> <p>Active: the local router is trying to establish a TCP connection to the remote peer. You might see this if the local peer has been configured, but the remote peer is unreachable or has not been configured.</p> <p>OpenSent: BGP is waiting for an open message from its peer</p> <p>OpenConfirm: BGP received an open message from the peer and is now waiting for a keepalive or notification message. If BGP receives a keep alive message from the peer, the state changes to established. If the message is a notification, the state changes to idle.</p> <p>Established: BGP is ready to exchange update, notification, and keep alive messages with its peer</p> <p>Invalid: The session state is invalid.</p> |
| AD           | Number of EVPN type 1 Ethernet Auto-discovery routes: Only originated for multi-homed sites. Type 1 routes allow fast convergence where PE devices can change the next-hop adjacencies for all MAC addresses associated with a particular Ethernet Segment and aliasing where traffic can be balanced across multiple egress points  |
| MACIP        | Number of EVPN type 2 MAC/IP routes: Endpoint reachability information, including MAC and IP addresses of the endpoints.   |
| MCAST        | Number of EVPN type 3 Inclusive Multicast routes: Broadcast, Unknown Unicast and Multicast (BUM) traffic.  |
| ESI          | Number of EVPN type 4 Ethernet Segment Routes: Used in multi-homing for Designated Forwarder Election. The Designated Forwarder sends BUM traffic to the CE on a particular Ethernet Segment.  |

---

## show evpn multi-homing all

Use this command to display the multi-homed VTEP details.

### Command Syntax

```
show evpn multi-homing all
```

### Parameters

None

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 1.3.

### Example

```
#show evpn multi-homing all
ESI                               Access-IF      PE-IP-ADDRESS
=====
00:00:11:22:33:44:55:66:77:88    ce21/1        1.1.1.1
00:00:11:22:33:44:55:66:77:88    ----         2.2.2.2
Total number of entries are 2
```

[Table 1-5](#) explains the output fields.

**Table 1-5: show evpn multi-homing all output details**

| Field         | Description   |
|---------------|---|
| ESI           | An Ethernet segment has a unique nonzero identifier, called the Ethernet segment identifier (ESI). The ESI is encoded as a 10-octet integer that identifies this segment. When manually configuring an ESI value, the most significant octet, known as the type byte, must be 00. When a single-homed CE device is attached to an Ethernet segment, the entire ESI value is zero. |
| Access-IF     | Map the access port ce21/1 for evpn.  |
| PE-IP-ADDRESS | Address of the provider edge router in the interface.   |

---

## show evpn multihoming-status

Use this command to display the status of multihoming on a VTEP.

### Command Syntax

```
show evpn multihoming-status
```

### Parameters

None

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 1.3.

### Example

```
#show evpn multihoming-status  
Multihoming is ACTIVE in Hardware
```



---

## show interface irb

Use this command to display the current running configuration of IRB interface.

### Command Syntax

```
show interface irb<1-4094>
```

### Parameters

None

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 4.1.

### Example

```
rtr1#show interface irb1
Interface irb1
  Hardware is IRB   Current HW addr: 0000.0000.ff10
  Physical:(Not Applicable)   Logical:0000.0000.ff10
  Port Mode is Router
  Interface index: 700001
  Metric 0 mtu 1500
  Debounce timer: disable
  ARP ageing timeout 1500
  <UP,BROADCAST,RUNNING,MULTICAST>
  VRF Binding: Associated with vrf1
  Label switching is disabled
  Administrative Group(s): None
  DHCP client is disabled.
  Last Flapped: Never
  Statistics last cleared: 2019 Mar 14 17:57:06 (00:21:31 ago)
  inet 80.80.80.1/24 broadcast 80.80.80.255
  inet6 8001::1/64
  inet6 fe80::200:ff:fe00:ff10/64
  RX
    unicast packets 0 multicast packets 0 broadcast packets 0
    input packets 0 bytes 0
    jumbo packets 0
    undersize 0 oversize 0 CRC 0 fragments 0 jabbers 0
    input error 0
    input with dribble 0 input discard 0
    Rx pause 0
  TX
    unicast packets 0 multicast packets 0 broadcast packets 0
    output packets 0 bytes 0
    jumbo packets 0
    output errors 0 collision 0 deferred 0 late collision 0
    output discard 0
    Tx pause 0
rtr1#
```

## show nvo vxlan

Use this command to display VxLAN information.

### Command Syntax

```
show nvo vxlan (vnid <1-16777215>|)
```

### Parameters

<1-16777215> VxLAN network identifier

### Command Mode

Exec mode

### Applicability

This command was introduced before OcnOS version 1.3.

### Example

```
#sh nvo vxlan
VxLAN Information
=====
```

```
Codes: NW - Network Port
       AC - Access Port
       (u) - Untagged
```

| VNID  | Vni-name | Type | Interface | ESI                           | Vlan | DF-Status | Src-addr | Dst-addr |
|-------|----------|------|-----------|-------------------------------|------|-----------|----------|----------|
| 10    | ----     | NW   | ----      | ----                          | ---- | ----      | 1.1.1.1  | 3.3.3.3  |
| 10    | ----     | NW   | ----      | ----                          | ---- | ----      | 1.1.1.1  | 2.2.2.2  |
| 10    | ----     | AC   | ce21/1    | 00:00:11:22:33:44:55:66:77:88 | 2    | DF        | ----     | ----     |
| 20    | ----     | NW   | ----      | ----                          | ---- | ----      | 1.1.1.1  | 3.3.3.3  |
| 20    | ----     | NW   | ----      | ----                          | ---- | ----      | 1.1.1.1  | 2.2.2.2  |
| 20    | ----     | AC   | ce21/1    | 00:00:11:22:33:44:55:66:77:88 | 3    | NON-DF    | ----     | ----     |
| 45001 | ----     | L3   | NW        | ----                          | ---- | ----      | 1.1.1.1  | 3.3.3.3  |

Total number of entries are 7

[Table 1-6](#) explains the fields in the output.

**Table 1-6: VxLAN fields**

| Field                   | Description  |
|-------------------------|--|
| VNID                    | VxLAN network identifier.  |
| Type                    | NW - Network Port: VxLAN tunnel<br>AC - Access Port: Host connection |
| Interface               | Name of the Interface.   |
| Vlan                    | VLAN identifier  |
| Src-addr                | Source address in the interface.                                     |
| Dst-addr                | Destination address in the interface.                                |
| Total number of entries | The total number of entries listed.                                  |

---

## show nvo vxlan access-if-config

Use this command to display the current running configuration of the access interface.

### Command Syntax

```
show nvo vxlan access-if-config (LINE|)
```

### Parameters

|      |                         |
|------|-------------------------|
| LINE | Access port description |
|------|-------------------------|

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 1.3.

### Example

```
#show nvo vxlan access-if-config
  nvo vxlan access-if port-vlan xe1 2
    map vnid 100
  access-if-description member-port with xe1 as vlan 2
  shutdown
  mac 0000.0000.1111
  mac 0000.0000.aaaa ip 12.12.12.1
  map qos-profile cos-to-queue ac_port_ingress
  map qos-profile queue-color-to-cos ac_port_egress
  !
  nvo vxlan access-if port-vlan po1 6
    no shutdown
    map vnid 100
  !
```

## show nvo vxlan arp-cache

Use this command to display the ARP cache information.

### Command Syntax

```
show nvo vxlan arp-cache (vnid <1-16777215>|)
```

### Parameters

<1-16777215> VxLAN network identifier

### Command Mode

Exec mode

### Applicability

This command was introduced before OcnOS version 1.3.

### Example

```
#show nvo vxlan arp-cache
VxLAN ARP-CACHE Information
=====
VNID      Ip-Addr      Mac-Addr      Type      Age-Out      Retries-Left
-----
10        12.12.12.2   0000.0000.2222 Static Local   ----
Total number of entries are 1
```

[Table 1-7](#) explains the fields in the output.

**Table 1-7: arp cache fields**

| Field                   | Description  |
|-------------------------|--|
| VNID                    | VxLAN network identifier.  |
| Ip-Addr                 | IP address of the vxlan.   |
| Mac-Addr                | Device MAC address.  |
| Type                    | How a host learns a MAC/IP pair:<br>Dynamic Local: Learned by data plane source learning<br>Dynamic Remote: Learned by EVPN Type 2 (MAC/IP) routes<br>Static Remote: Statically configured for remote; used only for static VxLAN, not with EVPN<br>Static Local: Configured on local VTEP |
| Total number of entries | The total number of entries listed.  |

---

## show nvo vxlan counters access-port

Use this command to display the receive and transmit counters of an access port.

Note: Due to a limitation in the hardware, the transmit packet counters includes the BUM traffic received on that port.

Note: To see the statistics, you must enable the hardware profile for the access-port with the [hardware-profile filter for Qumran-1](#) command with the `ac-lif` parameter.

Note: All the expected packets might not be seen in the output of this command.

### Command Syntax

```
show nvo vxlan counters access-port (port IFNAME | port-vlan IFNAME VLAN_ID_RANGE
  (| inner-vlan INNER_VLAN_ID) | all)
```

### Parameters

|               |                                |
|---------------|--------------------------------|
| port          | Port Mapping                   |
| IFNAME        | Access port name               |
| port-vlan     | Port-VLAN Mapping              |
| IFNAME        | Access port name               |
| VLAN_ID_RANGE | VLAN Id or VLAN Range <2-4094> |
| INNER_VLAN_ID | Inner-VLAN Id                  |
| all           | All ports and VLANs            |

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 1.3 and VLAN\_RANGE option is introduced in OcNOS version 5.0.

### Example

```
#show nvo vxlan counters access-port port-vlan xe13 10
```

Data packets:

\*If ARP/ND cache is enabled, TX doesn't count ARP/ND replies from ARP/ND cache and ARP/ND forwarded after uplifting to the control plane.

```
RX: packets   : 2774939
    bytes     : 210553516
TX: packets   : 4322274
    bytes     : 326026474
```

Control Packets:

\*ARP/ND uplifted and sent/replied from control plane:

```
Rx Vxlan Arp discard count      : 0
Rx Vxlan Nd discard count       : 0
Tx Vxlan Arp discard count      : 0
Tx Vxlan Nd discard count       : 0
Rx Vxlan Arp Request count      : 0
```

```

Tx Vxlan Arp Request count      : 0
Rx Vxlan Arp Reply count       : 5
Tx Vxlan Arp Reply count       : 1
Rx Vxlan Neighbor Solicitation count : 0
Tx Vxlan Neighbor Solicitation count : 0
Rx Vxlan Neighbor Advertisement count: 3
Tx Vxlan Neighbor Advertisement count: 0

```

Table 1-8 explains the fields in the output.

**Table 1-8: access port counters**

| Field                                 | Description  |
|---------------------------------------|--|
| RX: packets                           | Number of packets received on an access-interface.               |
| RX: bytes                             | Number of bytes received.  |
| TX: packets                           | Number of packets transmitted.                                   |
| TX: bytes                             | Number of bytes transmitted.                                     |
| Rx Vxlan Nd discard count             | Number of discarded ND that is received from neighbor.           |
| Tx Vxlan Arp discard count            | Number of discarded Arp that is transmitted to peer.             |
| Tx Vxlan Nd discard count             | Number of discarded ND that is transmitted to peer.              |
| Rx Vxlan Arp Request count            | Number of request ARP that is received from neighbor.            |
| Tx Vxlan Arp Request count            | Number of request ARP that is transmitted to peer.               |
| Rx Vxlan Arp Reply count              | Number of replied ARP that is received from neighbor.            |
| Tx Vxlan Arp Reply count              | Number of replied ARP which is transmitted to peer.              |
| Rx Vxlan Neighbor Solicitation count  | Number of request ND that is received from neighbor.             |
| Tx Vxlan Neighbor Solicitation count  | Number of replied ND that is received from neighbor.             |
| Rx Vxlan Neighbor Advertisement count | Number of Neighbor Advertisement that is received from neighbor. |
| Tx Vxlan Neighbor Advertisement count | Number of Neighbor Advertisement which is transmitted to peer.   |

## show nvo vxlan counters network-port

Use this command to display the receive and transmit counters of a network port including ARP, ND and GARP counters.

### Command Syntax

```
show nvo vxlan counters network-port (dst A.B.C.D | ALL)
```

### Parameters

|         |                     |
|---------|---------------------|
| A.B.C.D | Tunnel IPv4 address |
| ALL     | All addresses       |

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 1.3.

### Example

```
#show nvo vxlan counters network-port dst 2.2.2.2
```

Data packets:

\*If ARP/ND cache is enabled, TX doesn't count ARP/ND replies from ARP/ND cache and ARP/ND forwarded after uplifting to the control plane.

```
RX: packets : 0
    bytes    : 0
TX: packets : 3570006
    bytes    : 406980684
```

Control Packets:

\*ARP/ND uplifted and sent/replied from control plane:

```
TX VxLAN ARP discard count      : 0
TX VxLAN ND discard count       : 0
Tx Vxlan ARP Request count      : 0
Tx Vxlan ARP Reply count        : 0
Tx Vxlan Neighbor Solicitation count : 0
Tx Vxlan Neighbor Advertisement count: 0
```

[Table 1-9](#) explains the each network entry fields.

**Table 1-9: show nvo vxlan counters network-port output fields**

| Field       | Description   |
|-------------|---|
| RX: packets | Number of hello packets received from neighbor.                   |
| RX: bytes   | Number of hello packets received from neighbor in bytes received. |

**Table 1-9: show nvo vxlan counters network-port output fields (Continued)**

| <b>Field</b>                          | <b>Description</b>  |
|---------------------------------------|---|
| TX: packets                           | Number of hello packets transmitted to neighbor.                      |
| TX: bytes                             | Number of hello packets transmitted to neighbor in bytes transmitted. |
| Tx VxLAN Arp discard count            | Number of discarded Arp that is transmitted to peer.                  |
| Tx VxLAN Nd discard count             | Number of discarded ND that is transmitted to peer.                   |
| Tx Vxlan Arp Request count            | Number of request ARP that is transmitted to peer.                    |
| Tx Vxlan Arp Reply count              | Number of replied ARP which is transmitted to peer.                   |
| Tx Vxlan Neighbor Solicitation count  | Number of replied ND that is received from neighbor.                  |
| Tx Vxlan Neighbor Advertisement count | Number of Neighbor Advertisement which is transmitted to peer.        |



---

## show nvo vxlan l3vni

Use this command to display the L3 VNI, L2 VNI and IRB interface mapping.

### Command Syntax

```
show nvo vxlan l3vni-map
```

### Parameters

None

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 4.1.

### Example

```
rtr3#show nvo vxlan l3vni-map
L3VNI      L2VNI      IRB-interface
=====
45001      10         irb1
45001      20         irb2

rtr3#
```

## show nvo vxlan mac-table

Use this command to display the host MAC address table. Use the hardware option to see the ageout time for the dynamically learn macs.

### Command Syntax

```
show nvo vxlan mac-table (vnid <1-16777215>|) (summary | hardware |)
```

### Parameters

|              |                                  |
|--------------|----------------------------------|
| <1-16777215> | VxLAN network identifier         |
| summary      | Display a count of MAC addresses |
| hardware     | Display hardware information     |

### Command Mode

Exec mode

### Applicability

This command was introduced before OcnOS version 1.3.

### Example

```
#show nvo vxlan mac-table
```

```
=====
VxLAN MAC Entries
=====
VNID      Interface  VlanId  Inner-VlanId  Mac-Addr      VTEP-Ip/ESI
Type                               Status        AccessPortDesc
-----
10        ce21/1     2        ----         0000.0000.1111 1.1.1.1
Static Local                    -----         partner-port
10        ----      ----     ----         0000.0000.2222 3.3.3.3
Static Remote                    -----
20        ce21/1     3        ----         0000.0000.cccc 1.1.1.1
Static Local                    Discard
20        ----      ----     ----         0000.0000.dddd 3.3.3.3
Static Remote                    -----
```

Total number of entries are : 4

```
#show nvo vxlan mac-table hardware
```

```
=====
VxLAN MAC Entries
=====
VNID      Interface  VlanId  Inner-VlanId  Mac-Addr      VTEP-Ip/ESI
Type                               Status        Time-out AccessPortDesc
-----
```

```

10          ce21/1      2      ---      0000.0000.1111 1.1.1.1
Static Local      -----      ---      partner-port
10          ---        ---      ---      0000.0000.2222 3.3.3.3
Dyanamic Remote  -----      ---      ---
10          ---        ---      ---      0000.0000.aa11 3.3.3.3
Dyanamic Remote  -----      ---      ---
10          ce21/1      2      ---      0000.0000.bb11 1.1.1.1
Dynamic Local      -----      300      partner-port
10          ce21/1      2      ---      0000.0000.bb12 1.1.1.1
Dynamic Local      -----      277      partner-port
20          ce21/1      ---      ---      0000.0000.cccc 1.1.1.1
Static Local      Discard      ---      ---
20          ---        ---      ---      0000.0000.dddd 3.3.3.3
Dyanamic Remote  -----      ---      ---

```

Total number of entries are 7

[Table 1-10](#) explains the fields in the output.

**Table 1-10: MAC table fields**

| Field                   | Description  |
|-------------------------|--|
| VNID                    | VxLAN network identifier   |
| Interface               | Interface name   |
| VlanId                  | VLAN identifier  |
| Mac-Addr                | MAC address  |
| VTEP-Ip                 | VTEP identifier  |
| Type                    | How a host learns a MAC/IP pair:<br><br>Dynamic Remote: Learned by EVPN Type 2 (MAC/IP) routes<br>Static Remote: Statically configured for remote; used only for static VxLAN, not with EVPN<br>Static Local: Configured on local VTEP<br>Dynamic Local: Learned by data plane source learning   |
| Status                  | Max Move conflict: When a MAC has moved too many times (5 or more times in 180 seconds). This is according to the procedures defined in RFC 7432, Section 15.1.<br><br>Discard: If a MAC hold time is configured, then if the VxLAN access port goes down (admin or operational), the MAC is moved to the discard state for the period of the hold time. The MAC is also moved to the discard state if the VNID is unmapped from the port. In dynamically learned cases, the MAC is also moved to discard when learning is disabled. |
| Time-out                | Age timeout for dynamically learned MACs.  |
| AccessPortDesc          | Access port description.   |
| Total number of entries | The total number of entries listed.  |

---

## show nvo vxlan static host state

Use this command to display the state of the host which is configured statically.

### Command Syntax

```
show nvo vxlan static host state
```

### Parameters

None

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 1.3.

### Example

```
#show nvo vxlan static host state
```

```
VxLAN Static Host Information
```

```
=====
```

```
Codes: NW - Network Port
```

```
AC - Access Port
```

```
(u) - Untagged
```

| VNID<br>Addr         | Ifname<br>Status | Outer-Vlan | Inner-vlan | Ip-Addr    | Mac- |
|----------------------|------------------|------------|------------|------------|------|
| 10<br>0000.0000.2222 | xe13<br>Active   | 10         | ---        | 12.12.12.2 |      |
| 10<br>0000.0000.bbbb | xe17<br>Inactive | 10         | ---        | 11.11.11.1 |      |
| 10<br>0000.1111.2222 | xe17<br>Inactive | 30         | 40         | 0.0.0.0    |      |

Total number of entries are 5

[Table 1-11](#) explains the output fields.

**Table 1-11: Static host fields**

| Field   | Description              |
|---------|--------------------------|
| VNID    | VxLAN network identifier |
| Ifname  | Interface name           |
| Vlan    | VLAN name                |
| Ip-Addr | IP address               |

Table 1-11: Static host fields

| Field    | Description   |
|----------|---|
| Mac-Addr | MAC address   |
| Status   | <p>Status of the MAC/IP on the host:</p> <p><b>Conflict:</b> When a MAC/IP was configured, the conflict was not known as the VNID was not mapped to the access port. After the VNID is mapped, if the same MAC/IP is present statically on some other port on the same VNID, then it is in conflict state.</p> <p><b>Learnt Conflict:</b> When a MAC/IP was configured, the conflict was not known. However, it is now in conflict because the same MAC/IP is configured on an access port on VTEP1 and on an access port on VTEP2. Because the BGP session/tunnel was not up, the MAC/IP was not known to the other VTEP and the configuration was allowed. When the BGP session/tunnel comes up and it finds such a conflicted route, it marks the state as Learnt Conflict.</p> <p><b>Inactive:</b> Configured but not operating, such as when the port is not mapped to any VNID. The port is down and the ARP/ND cache is disabled.</p> <p><b>Active:</b> Operating host MAC/IP.</p> |

## show nvo vxlan tunnel

Use this command to view the source, destination, and status of the VxLAN tunnel entries.

### Command Syntax

```
show nvo vxlan tunnel
```

### Parameters

None

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 1.3.

### Example

The following is a sample output of the `show nvo vxlan tunnel` command.

```
#show nvo vxlan tunnel
VxLAN Network tunnel Entries
 Source Destination      Status Up/Down Update
=====
1.1.1.1 2.2.2.2                Installed 00:00:20 00:00:20
Total number of entries are 1
```

[Table 1-12](#) explains the output fields.

**Table 1-12: VxLAN tunnel fields**

| Field                   | Description  |
|-------------------------|--|
| Source                  | Tunnel source IP address.  |
| Destination             | Tunnel destination IP address.   |
| Status                  | Installed: Tunnel Installed in the hardware and operating.<br><br>Resolved: Tunnel destination IP is reachable, but VxLAN tunnel not installed in hardware. Therefore, not operating.<br><br>Unresolved: Tunnel destination IP not reachable because L3 route is down. |
| Up/Down                 | When the tunnel came up or went down   |
| Update                  | When the tunnel was last updated   |
| Total number of entries | The total number of entries listed.  |

## show nvo vxlan route-count

Use this command to display the VxLAN active route (MAC-IP and MAC-only) count information.

### Command Syntax

```
show nvo vxlan route-count (|vnid <1-16777215>)
```

### Parameters

<1-16777215> Range supported for VNID

### Command Mode

Exec mode

### Applicability

This command was introduced before OcNOS version 1.3 and modified to include the GW-IPv4, and Prefix IPv4 in OcNOS version 1.3.5.

### Example

```
#show nvo vxlan route-count
VxLAN Active route count information
=====
Max route count      : 32768
Active route count: 0
```

```
-----
VNID      Total      MACONLY  MACIPv4  MACIPv6
-----
100       0           0        0        0
10        0           0        1        0
```

Total number of entries are 2

Table 1-13 explains the output fields.

**Table 1-13: show nvo vxlan route-count output details**

| Field              | Description   |
|--------------------|---|
| Max route count    | Maximum number of route count in vxlan.   |
| Active route count | Number of active route count in the interface.  |
| VNID               | VNID is used to identify Layer 2 segments and to maintain Layer 2 isolation between the segments. |
| Total              | Total number of entries for the interface.  |
| MACONLY            | The MAC-only route for the local interface appears in the VxLAN instance route table.             |
| MACIPv4            | IPv4 media access control (MAC) address for a default virtual gateway.                            |
| MACIPv6            | IPv6 media access control (MAC) address for a default virtual gateway.                            |

---

## show nvo vxlan vni-name

Use this command to display the vxlan results based on vni-name.

### Command Syntax

```
show nvo vxlan vni-name (WORD)
```

### Parameters

WORD                      VxLAN id name

### Command Mode

Exec mode

### Applicability

This command was introduced before OcnOS version 1.3.

### Example

```
#show nvo vxlan vni-name SITEA-PRO
VxLAN Information
=====
Codes: NW - Network Port
AC - Access Port
(u) - Untagged
VNID Vni-name Type Interface ESI Vlan DF-Status Src-addr Dst-addr
-----
1 ---- NW ---- ----- ---- ----- 10.0.1.1 10.0.6.8
1 ---- NW ---- ----- ---- ----- 10.0.1.1 10.0.6.9
1 ---- NW ---- ----- ---- ----- 10.0.1.1 10.0.3.1
1 ---- NW ---- ----- ---- ----- 10.0.1.1 10.0.1.2
1 ---- NW ---- ----- ---- ----- 10.0.1.1 10.0.5.1
1 ---- NW ---- ----- ---- ----- 10.0.1.1 10.0.2.2
1 ---- NW ---- ----- ---- ----- 10.0.1.1 10.0.2.1
1 SITEA-PRO AC xe7 - Single Hommed port - 2 ----- ---- ----
1 SITEA-PRO AC xe1 - Single Hommed port - 1010 ----- ---- ----
1 SITEA-PRO AC xe1 - Single Hommed port - 100 ----- ---- ----
1 SITEA-PRO AC xe1 - Single Hommed port - 2020 ----- ---- ----
1 SITEA-PRO AC po1 - Single Hommed port - 100 ----- ---- ----
1 SITEA-PRO AC po1 - Single Hommed port - 2 ----- ---- ----
1 SITEA-PRO AC po1 - Single Hommed port - 200 ----- ---- ----
1 SITEA-PRO AC xe8 - Single Hommed port - ---- ----- ---- ----
1 SITEA-PRO AC po2 - Single Hommed port - ---- ----- ---- ----
Total number of entries are 16
```



## show nvo vxlan xconnect

Use this command to display the VPWS xconnect details of the MTU, AC-NW connections, and network status.

### Command Syntax

```
show nvo vxlan xconnect
```

### Parameters

None

### Command Mode

Exec mode

### Applicability

This command was introduced in OcNOS version 5.1.

### Example

```
MH-VTEP3#sh nvo vxlan xconnect
EVPN Xconnect Info
=====
AC-AC: Local-Cross-connect
AC-NW: Cross-connect to Network
AC-UP: Access-port is up
AC-DN: Access-port is down
NW-UP: Network is up
NW-DN: Network is down
NW-SET: Network and AC both are up

Local                Remote      Connection-Details
=====
VPN-ID      EVI-Name    MTU  VPN-ID    Source      Destination      PE-IP      MTU  Type  NW-Status
=====
92          ----      1500  91        xe2 92      --- Single Homed Port ---  102.1.1.1  1500  AC-NW  NW-SET
94          ----      1500  93        xe2 94      --- Single Homed Port ---  102.1.1.1  1500  AC-NW  NW-SET
38052      ----      1500  38051     xe2 380 716  00:11:22:33:00:00:00:55:66:77  101.1.1.1  1500  AC-NW  NW-SET
                                                102.1.1.1  1500  ----  ----
39012      ----      1500  39011     xe2 390 715  00:00:00:12:34:90:90:00:00:00  101.1.1.1  1500  AC-NW  NW-SET
                                                102.1.1.1  1500  ----  ----

Total number of entries are 4
```

[Table 1-14](#) explains the output fields.

**Table 1-14: show nvo vxlan xconnect fields**

| Field          | Description                   |
|----------------|-------------------------------|
| Local VPN-ID   | Source VPWS ID                |
| Local EVI-Name | EVI name of the local VPWS ID |
| Local MTU      | Local MTU                     |
| Remote VPN-ID  | Remote (target) VPWS ID       |
| Source         | Source AC port                |

**Table 1-14: show nvo vxlan xconnect fields (Continued)**

| <b>Field</b>            | <b>Description</b>  |
|-------------------------|---|
| Destination             | Destination AC port: "Single Homed Port" or ESI value if it is multi-homed port |
| PE-IP                   | IP Address of the provider edge.  |
| MTU                     | Remote MTU  |
| Type                    | Connection details of the AC port   |
| NW-Status               | Connection details of the NW port   |
| Total number of entries | Total number of entries listed.   |

---

## show running-config interface irb

Use this command to display the current running configuration of IRB interface.

### Command Syntax

```
show running-config interface irb<1-4094>
```

### Parameters

None

### Command Mode

Exec mode

### Applicability

This command was introduced in a version before OcNOS version 4.1.

### Example

```
#show running-config interface irb1
!  
  interface irb1  
    ip vrf forwarding vrfip  
    ip address 144.144.144.1/24  
    ipv6 address 1201::1/48  
    evpn irb-if-forwarding anycast-gateway-mac  
    shutdown  
  !
```

---

## show running-config nvo vxlan

Use this command to display the current running configuration of VxLANs.

### Command Syntax

```
show running-config nvo vxlan
```

### Parameters

None

### Command Mode

Exec mode

### Applicability

This command was introduced in a version before OcNOS version 1.3; `nvo vxlan id xconnect` was introduced in OcNOS version 5.1.

### Example

```
#sh running-config nvo vxlan
!
evpn vxlan multihoming enable
!
evpn esi hold-time 100
!
nvo vxlan enable
!
nvo vxlan irb
!
evpn irb-forwarding anycast-gateway-mac 0000.0000.ff10
!
nvo vxlan vtep-ip-global 2.2.2.2
!
nvo vxlan mac-ageing-time 10
!
nvo vxlan id 10 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp vrfred
evpn irbl
!
nvo vxlan id 100 xconnect target-vxlan-id 200
vxlan host-reachability-protocol evpn-bgp vrfblue
!
nvo vxlan access-if port-vlan xe13 10
no shutdown
map vnid 10
mac 0000.0000.2222 ip 12.12.12.2
!
nvo vxlan access-if port-vlan xe17 10
no shutdown
map vnid 10
mac 0000.0000.bbbb ip 11.11.11.1
!
nvo vxlan access-if port-vlan xe17 30
```

```
no shutdown
map vnid 10
mac 0000.1111.2222
!
nvo vxlan access-if port-vlan xe1 11
description member-port xe1 with vlan 11
no shutdown
map vnid 10
!
nvo vxlan access-if port-vlan xe1 10
no shutdown
map vnid 10
!
nvo vxlan access-if port-vlan xe1 12
no shutdown
map vnid 10
!
nvo vxlan access-if port-vlan xe9 100
no shutdown
map vnid 100
!
```

---

## shutdown

Use this command to administratively shut down an NVO access interface.

Use the `no` form of this command to start an NVO access interface.

### Command Syntax

```
shutdown
no shutdown
```

### Parameters

None

### Default

The NVO access interface is running by default.

### Command Mode

NVO access interface mode

### Applicability

This command was introduced before OcNOS version 1.3.

### Example

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xel 2
(config-nvo-acc-if)#shutdown
(config-nvo-acc-if)#exit
```

---

## vxlan host-reachability-protocol evpn-bgp

Use this command to set the host reachable protocol to Ethernet-VPN over BGP. This defines BGP as the mechanism for host reachability advertisement.

Use the no form of this command to remove Ethernet-VPN as the host reachable protocol.

### Command Syntax

```
vxlan host-reachability-protocol evpn-bgp NAME
no vxlan host-reachability-protocol evpn-bgp
```

### Parameters

|      |                                      |
|------|--------------------------------------|
| NAME | Name of the VRF to carry VNID routes |
|------|--------------------------------------|

### Command Mode

NVO mode

### Applicability

This command was introduced before OcnOS version 1.3.

### Example

```
(config)#nvo vxlan id 3 ingress-replication inner-vid-disabled
(config-nvo)#vxlan host-reachability-protocol evpn-bgp Blue
```





## CHAPTER 2 VxLAN Quality of Service Commands

---

This chapter describes the VxLAN commands for QoS (Quality of Service):

- `clear nvo vxlan tunnels`
- `cos queue`
- `dscp queue`
- `I2 queue dscp`
- `I3 dscp dscpEncap`
- `map qos-profile`
- `map qos-profile cos-to-queue`
- `map qos-profile queue-color-to-cos`
- `nvo vxlan tunnel qos-map-mode cos-dscp`
- `qos profile cos-to-queue`
- `qos profile dscp-encap`
- `qos profile dscp-to-queue`
- `qos profile queue-color-to-cos`
- `qos profile queue-color-to-dscp`
- `queue cos`
- `queue dscp`
- `show qos-profile type dscp-encap`
- `show running-config interface irb`

---

## clear nvo vxlan tunnels

Use this command to clear the nvo vxlan tunnels to re-establish the tunnel after mapping/un-mapping the QoS profile to vxlan tunnel.

### Command Syntax

```
clear nvo vxlan tunnels dst-ip A.B.C.D
```

### Parameters

|         |                          |
|---------|--------------------------|
| dst-ip  | VxLAN tunnel destination |
| A.B.C.D | destination IPv4 address |

### Command Mode

Exec mode

### Applicability

This command was introduced in OcNOS version 3.0.

### Example

```
#clear nvo vxlan tunnels dst-ip 2.2.2.2
```

---

## cos queue

Use this command to configure user defined mapping for cos and queue.

Use the `no` form of this command to remove the mapping.

### Command Syntax

```
cos <0-7> queue <0-7>
no cos <0-7>
```

### Parameters

<0-7>                    COS and Queue ranger

### Default

Default cos and queue value is one-one default mapping if it is not configured.

### Command Mode

QoS config mode

### Applicability

This command was introduced in OcNOS version 3.0.

### Example

```
(config)#qos profile cos-to-queue ac_port_ingress
(config-ingress-cos-map)#cos 1 queue 7
(config-ingress-cos-map)#no cos 1
```

---

## dscp queue

Use this command to configure user defined mapping for DSCP to queue. This will be mapped with nvo VxLAN tunnel of remote VTEP.

Use the `no` form of this command to delete the mapping.

### Command Syntax

```
dscp <0-63> queue <0-7> (color (green|yellow|red)|) (dscp <0-63>|)
no dscp <0-63>
```

### Parameters

|        |                                |
|--------|--------------------------------|
| <0-63> | DSCP                           |
| <0-7>  | Queue number                   |
| color  | Color to map                   |
| green  | Set mapping for green packets  |
| red    | Set mapping for red packets    |
| yellow | Set mapping for yellow packets |
| <0-63> | out DSCP value                 |

### Default

Default queue and cos value is one-one default mapping if it is not configured.

### Command Mode

Ingress-dscp-map mode

### Applicability

This command was introduced in OcNOS version 3.0.

### Example

```
(config)#qos profile dscp-to-queue nw_profile
(config-ingress-dscp-map)#dscp 50 queue 1
(config-ingress-dscp-map)#no dscp 50
```

---

## I2 queue dscp

Use this command to configure or update user defined mapping for queue to dscp for egress L2 Traffic over VxLAN tunnel.

Use the `no` form of this command to delete the mapping.

### Command Syntax

```
l2 queue <0-7> (color (green|yellow|red|all)|) dscp <0-63>
no l2 queue <0-7> (color (green|yellow|red|all)|)
```

### Parameters

|        |                                |
|--------|--------------------------------|
| <0-7>  | Queue values                   |
| <0-63> | Select DSCP value              |
| color  | Color to map                   |
| all    | Set mapping for all packets    |
| green  | Set mapping for green packets  |
| red    | Set mapping for red packets    |
| yellow | Set mapping for yellow packets |

### Default

Default queue and dscp value is one-one default mapping if it is not configured.

### Command Mode

egress-dscp-encap-map mode

### Applicability

This command was introduced in OcNOS version 4.2.

### Example

```
#configure terminal
(config)#qos profile dscp-encap DSCP_ENCP
(config-egress-dscp-encap-map)#l2 queue 1 dscp 32
(config-egress-dscp-encap-map)#l2 queue 5 color green dscp 16
(config-egress-dscp-encap-map)#no l2 queue 1
```

---

## I3 dscp dscpEncap

Use this command to configure or update user defined mapping for dscp to dscp for egress L3 Traffic over VxLAN tunnel.

Use the `no` form of this command to delete the mapping.

### Command Syntax

```
13 dscp <0-63> dscpEncap <0-63>
no 13 dscp <0-63>
```

### Parameters

<0-63>                    DSCP values

### Default

Default dscp and dscp encap value is one-one default mapping if it is not configured.

### Command Mode

egress-dscp-encap-map mode

### Applicability

This command was introduced in OcNOS version 4.2.

### Example

```
#configure terminal
(config)#qos profile dscp-encap DSCP_ENCP
(config-egress-dscp-encap-map)#13 dscp 10 dscpEncap 48
(config-egress-dscp-encap-map)#no 13 dscp 10
```

---

## map qos-profile

Use this command to map (attach) the qos profile to an IRB interface.

Use the `no` form of this command to remove a profile.

We can map the following qos profile type on IRB interface.

- dscp-to-queue for ingress traffic and
- dscp-to-dscp profile for egress traffic

from/to the IRB interface.

On doing `no map qos-profile`, default profile is applied to the IRB interface.

In order for dscp-to-dscp - qos profile type to be effective on L3 IRB interface , "qos remark dscp" is enabled globally.

Note: Default profile is applied to all the IRB interface only when qos is enabled.

### Command Syntax

```
map qos-profile (dscp-to-dscp | dscp-to-queue) <NAME>
no map qos-profile (dscp-to-dscp | dscp-to-queue) <NAME>
```

### Parameters

|      |              |
|------|--------------|
| NAME | Profile name |
|------|--------------|

### Default

By default, the default dscp-to-queue and dscp-to-dscp profile is attached to all IRB interface and if user changes the value in the default profile, it will affect to all the IRB interfaces and L3 interfaces.

### Command Mode

IRB\_IF\_Mode

### Default

Default queue and cos value is one-one default mapping if it is not configured.

### Applicability

This command was introduced in OcNOS version 4.2.

### Example

```
#configure terminal
(config)#interface irb 1
(config-irb-if)# map qos-profile dscp-to-dscp DSCP_DSCP
(config-irb-if)# no map qos-profile dscp-to-dscp DSCP_DSCP

(config)#interface irb 1
(config-irb-if)# map qos-profile dscp-to-queue DSCP_QUE
(config-irb-if)# no map qos-profile dscp-to-queue DSCP_QUE
```

---

## map qos-profile cos-to-queue

Use this command to map the cos-to-queue profile to vxlan access port on the local VTEP.

Use the `no` form of the command to remove the mapping.

### Command Syntax

```
map qos-profile cos-to-queue NAME
no map qos-profile cos-to-queue NAME
```

### Parameters

|      |              |
|------|--------------|
| NAME | Profile name |
|------|--------------|

### Default

None

### Command Mode

NVO access interface mode

### Applicability

This command was introduced before OcNOS version 3.0.

### Example

```
(config)#nvo vxlan access-if port-vlan xel 10
(config-nvo-acc-if)#map qos-profile cos-to-queue ac_port_ingress
(config-nvo-acc-if)#no map qos-profile cos-to-queue ac_port_ingress
```



---

## map qos-profile queue-color-to-cos

Use this command to map the queue-color-to-cos profile to vxlan access port on the remote VTEP.

Use the `no` form of the command to remove the mapping.

### Command Syntax

```
map qos-profile queue-color-to-cos NAME
no map qos-profile queue-color-to-cos NAME
```

### Parameters

|      |              |
|------|--------------|
| NAME | Profile name |
|------|--------------|

### Default

None

### Command Mode

NVO access interface mode

### Applicability

This command was introduced before OcNOS version 3.0.

### Example

```
(config)#nvo vxlan access-if port-vlan xe2 10
(config-nvo-acc-if)#map qos-profile queue-color-to-cos ac_profile
(config-nvo-acc-if)#no map qos-profile queue-color-to-cos ac_profile
```

---

## nvo vxlan tunnel qos-map-mode cos-dscp

Use this command to map QoS profile for network side to nvo vxlan tunnel. For outgoing/incoming traffic, you need to provide the direction with the keyword `egress/ingress`.

Use the `no` form of this command to delete the mapping.

You must give the [clear nvo vxlan tunnels](#) command to do the network port setting for QoS profile mapped.

### Command Syntax

```
nvo vxlan tunnel qos-map-mode cos-dscp (ingress|egress) NAME
no nvo vxlan tunnel qos-map-mode cos-dscp (ingress|egress)
```

### Parameters

|         |                   |
|---------|-------------------|
| NAME    | Profile name      |
| ingress | Ingress direction |
| egress  | Egress direction  |

### Command Mode

Configure mode

### Applicability

This command was introduced in OcNOS version 3.0.

### Example

```
(config)#nvo vxlan tunnel qos-map-mode cos-dscp egress nw_profile
(config)#no nvo vxlan tunnel qos-map-mode cos-dscp egress
(config)#nvo vxlan tunnel qos-map-mode cos-dscp ingress nw_profile
(config)#no nvo vxlan tunnel qos-map-mode cos-dscp ingress
```

---

## qos profile cos-to-queue

Use this command to configure cos-to-queue profile. This profile has to be mapped to VxLAN access port on the local VTEP.

Use the `no` form of this command to delete the qos profile.

### Command Syntax

```
qos profile cos-to-queue (NAME|default)
no qos profile cos-to-queue NAME
```

### Parameters

|         |                                   |
|---------|-----------------------------------|
| NAME    | QoS profile name for cos-to-queue |
| default | Default name                      |

### Command Mode

Configure mode

### Applicability

This command was introduced in OcNOS version 3.0.

### Example

```
(config)#qos profile cos-to-queue ac_port_ingress
(config)#no qos profile cos-to-queue ac_port_ingress
```

---

## qos profile dscp-encap

Use this command to create new profiles or to update "default" profiles for dscp-dscpEncap and Queue to DSCP value.

Use the `no` form of this command to remove the profiles.

Note: "default" profiles can only be updated and not be deleted. User can create/delete user-defined profiles.

Note: Use this command to configure QoS profile for both VxLAN L2 and VxLAN L3 traffic.

Note: This profile will be mapped to `nvo vxlan tunnel` at the egress direction of the VTEP.

Note: Default QoS profile `dscp-encap` would take preference than default qos profile `queue-color-to dscp` when no user-defined qos profile is configured on the `nvo vxlan tunnel` mode.

### Command Syntax

```
qos profile dscp-encap (NAME | default)
no qos profile dscp-encap NAME
```

### Parameters

|         |                               |
|---------|-------------------------------|
| NAME    | Profile name                  |
| default | update global mapping profile |

### Command Mode

Configure mode

### Applicability

This command was introduced in OcNOS version 4.2.

### Example

```
#configure terminal
(config)#qos profile dscp-encap DSCP_ENCP
(config)#no qos profile dscp-encap DSCP_ENCP
```

---

## qos profile dscp-to-queue

Use this command to configure QoS profile for DSCP to Queue mapping. This profile will be mapped to nvo vxlan tunnel of remote VTEP. The created profile will support remarking of the data packets.

Use the `no` form of this command to delete the QoS profile

### Command Syntax

```
qos profile dscp-to-queue (NAME|default)
no qos profile dscp-to-queue NAME
```

### Parameters

|         |              |
|---------|--------------|
| NAME    | Profile name |
| default | Default name |

### Command Mode

Configure mode

### Applicability

This command was introduced in OcNOS version 3.0.

### Example

```
(config)#qos profile dscp-to-queue nw_profile
(config-ingress-dscp-map)#exit
(config)#no qos profile dscp-to-queue nw_profile
(config)#
```

---

## qos profile queue-color-to-cos

Use this command to configure queue-color-to-cos profile. This profile has to be mapped to VxLAN access port on remote VTEP.

Use the `no` form of this command to delete the qos profile.

### Command Syntax

```
qos profile queue-color-to-cos (NAME|default)
no qos profile queue-color-to-cos NAME
```

### Parameters

|         |              |
|---------|--------------|
| NAME    | Profile name |
| default | Default name |

### Command Mode

Configure mode

### Applicability

This command was introduced in OcNOS version 3.0.

### Example

```
(config)#qos profile queue-color-to-cos ac_profile
(config)#no qos profile queue-color-to-cos ac_profile
```

---

## qos profile queue-color-to-dscp

Use this command to create a QoS profile queue-color-to-dscp. This profile will be mapped to nvo vxlan tunnel of local VTEP. The created profile supports remarking of the data packets.

Note: The profile name of "default" is not supported for VxLAN QoS.

Use the `no` form of this command to delete the profile.

### Command Syntax

```
qos profile queue-color-to-dscp (NAME|default)
no qos profile queue-color-to-dscp NAME
```

### Parameters

|         |              |
|---------|--------------|
| NAME    | Profile name |
| default | Default name |

### Default

None

### Command Mode

Configure mode

### Applicability

This command was introduced in OcNOS version 3.0.

### Example

```
(config)#qos profile queue-color-to-dscp nw_profile
(config-egress-dscp-map)#exit
(config)#no qos profile queue-color-to-dscp nw_profile
```

## queue cos

Use this command to configure user defined mapping for queue and cos.

Use the no form of this command to remove the mapping.

### Command Syntax

```
queue <0-7> (color (green|yellow|red|all)|) cos <0-7>
no queue <0-7> (color (green|yellow|red|all)|)
```

### Parameters

|        |                                |
|--------|--------------------------------|
| <0-7>  | Queue and cos range            |
| color  | Color to map                   |
| all    | Set mapping for all packets    |
| green  | Set mapping for green packets  |
| red    | Set mapping for red packets    |
| yellow | Set mapping for yellow packets |

### Default

Default queue and cos value is one-one default mapping if it is not configured.

### Command Mode

QoS config mode

### Applicability

This command was introduced in OcNOS version 3.0.

### Example

```
(config)#qos profile queue-color-to-cos ac_profile
(config-egress-cos-map)#queue 5 cos 2
(config-egress-cos-map)#no queue 5
```



---

## queue dscp

Use this command to configure user-defined mapping for queue to DSCP. This will be mapped with nvo VxLAN tunnel of local VTEP.

Use the `no` form of this command to remove the queue-to-DSCP mapping.

### Command Syntax

```
queue <0-7> (color (green|yellow|red|all)|) dscp <0-63>
no queue <0-7> (color (green|yellow|red|all)|)
```

### Parameters

|        |                                |
|--------|--------------------------------|
| <0-7>  | Queue number                   |
| <0-63> | DSCP                           |
| color  | Color to map                   |
| all    | Set mapping for all packets    |
| green  | Set mapping for green packets  |
| red    | Set mapping for red packets    |
| yellow | Set mapping for yellow packets |

### Default

Default queue and cos value is one-one default mapping if it is not configured.

### Command Mode

QoS config mode

### Applicability

This command was introduced in OcNOS version 3.0.

### Example

```
(config)#qos profile queue-color-to-dscp nw_profile
(config-egress-dscp-map)# queue 1 dscp 63
(config-egress-dscp-map)#no queue 1
```

## show qos-profile type dscp-encap

Use this command to show all the default and configured QoS profiles configurations.

### Command Syntax

```
show qos-profile type dscp-encap (| NAME)
```

### Parameters

NAME                      Profile name

### Command Mode

Exec Mode.

### Applicability

This command was introduced in OcNOS version 4.2.

### Example

```
VTEP1#show qos-profile type dscp-encap
```

```
profile name: default
```

```
profile type: dscp-encap
```

```
configured mapping:
```

```
Detailed mapping:
```

```
L3 DSCP to DSCP-ENCAP
```

| INPUT |      | OUTPUT |      | INPUT |      | OUTPUT |      | INPUT |      | OUTPUT |      |
|-------|------|--------|------|-------|------|--------|------|-------|------|--------|------|
| DSCP  | DSCP | DSCP   | DSCP | DSCP  | DSCP | DSCP   | DSCP | DSCP  | DSCP | DSCP   | DSCP |
| 0     | 0    | 16     | 16   | 32    | 32   | 48     | 48   |       |      |        |      |
| 1     | 1    | 17     | 17   | 33    | 33   | 49     | 49   |       |      |        |      |
| 2     | 2    | 18     | 18   | 34    | 34   | 50     | 50   |       |      |        |      |
| 3     | 3    | 19     | 19   | 35    | 35   | 51     | 51   |       |      |        |      |
| 4     | 4    | 20     | 20   | 36    | 36   | 52     | 52   |       |      |        |      |
| 5     | 5    | 21     | 21   | 37    | 37   | 53     | 53   |       |      |        |      |
| 6     | 6    | 22     | 22   | 38    | 38   | 54     | 54   |       |      |        |      |
| 7     | 7    | 23     | 23   | 39    | 39   | 55     | 55   |       |      |        |      |
| 8     | 8    | 24     | 24   | 40    | 40   | 56     | 56   |       |      |        |      |
| 9     | 9    | 25     | 25   | 41    | 41   | 57     | 57   |       |      |        |      |
| 10    | 10   | 26     | 26   | 42    | 42   | 58     | 58   |       |      |        |      |
| 11    | 11   | 27     | 27   | 43    | 43   | 59     | 59   |       |      |        |      |
| 12    | 12   | 28     | 28   | 44    | 44   | 60     | 60   |       |      |        |      |
| 13    | 13   | 29     | 29   | 45    | 45   | 61     | 61   |       |      |        |      |
| 14    | 14   | 30     | 30   | 46    | 46   | 62     | 62   |       |      |        |      |
| 15    | 15   | 31     | 31   | 47    | 47   | 63     | 63   |       |      |        |      |

```
L2 Queue + Color to DSCP-ENCAP
```

| INPUT |       |      | OUTPUT |        |      | INPUT |       |      | OUTPUT |       |      |
|-------|-------|------|--------|--------|------|-------|-------|------|--------|-------|------|
| Queue | Color | DSCP | Queue  | Color  | DSCP | Queue | Color | DSCP | Queue  | Color | DSCP |
| 0     | green | 0    | 0      | yellow | 0    | 0     | red   | 0    |        |       |      |

|   |       |    |  |   |        |    |  |   |     |    |
|---|-------|----|--|---|--------|----|--|---|-----|----|
| 1 | green | 8  |  | 1 | yellow | 8  |  | 1 | red | 8  |
| 2 | green | 16 |  | 2 | yellow | 16 |  | 2 | red | 16 |
| 3 | green | 24 |  | 3 | yellow | 24 |  | 3 | red | 24 |
| 4 | green | 32 |  | 4 | yellow | 32 |  | 4 | red | 32 |
| 5 | green | 40 |  | 5 | yellow | 40 |  | 5 | red | 40 |
| 6 | green | 48 |  | 6 | yellow | 48 |  | 6 | red | 48 |
| 7 | green | 56 |  | 7 | yellow | 56 |  | 7 | red | 56 |

profile name: DSCP\_ENCAP  
 profile type: dscp-encap  
 profile attached to 0 instances  
 configured mapping:

13 dscp 16 dscpEncap 24  
 12 queue 3 color all dscp 40

Detailed mapping:

L3 DSCP to DSCP-ENCAP

| INPUT | OUTPUT | INPUT | OUTPUT | INPUT | OUTPUT | INPUT | OUTPUT |
|-------|--------|-------|--------|-------|--------|-------|--------|
| DSCP  | DSCP   | DSCP  | DSCP   | DSCP  | DSCP   | DSCP  | DSCP   |
| 0     | 0      | 16    | 24     | 32    | 32     | 48    | 48     |
| 1     | 1      | 17    | 17     | 33    | 33     | 49    | 49     |
| 2     | 2      | 18    | 18     | 34    | 34     | 50    | 50     |
| 3     | 3      | 19    | 19     | 35    | 35     | 51    | 51     |
| 4     | 4      | 20    | 20     | 36    | 36     | 52    | 52     |
| 5     | 5      | 21    | 21     | 37    | 37     | 53    | 53     |
| 6     | 6      | 22    | 22     | 38    | 38     | 54    | 54     |
| 7     | 7      | 23    | 23     | 39    | 39     | 55    | 55     |
| 8     | 8      | 24    | 24     | 40    | 40     | 56    | 56     |
| 9     | 9      | 25    | 25     | 41    | 41     | 57    | 57     |
| 10    | 10     | 26    | 26     | 42    | 42     | 58    | 58     |
| 11    | 11     | 27    | 27     | 43    | 43     | 59    | 59     |
| 12    | 12     | 28    | 28     | 44    | 44     | 60    | 60     |
| 13    | 13     | 29    | 29     | 45    | 45     | 61    | 61     |
| 14    | 14     | 30    | 30     | 46    | 46     | 62    | 62     |
| 15    | 15     | 31    | 31     | 47    | 47     | 63    | 63     |

L2 Queue + Color to DSCP-ENCAP

| INPUT | OUTPUT | INPUT | OUTPUT | INPUT  | OUTPUT |   |     |    |
|-------|--------|-------|--------|--------|--------|---|-----|----|
| Queue | Color  | DSCP  | Queue  | Color  | DSCP   |   |     |    |
| 0     | green  | 0     | 0      | yellow | 0      | 0 | red | 0  |
| 1     | green  | 8     | 1      | yellow | 8      | 1 | red | 8  |
| 2     | green  | 16    | 2      | yellow | 16     | 2 | red | 16 |
| 3     | green  | 40    | 3      | yellow | 40     | 3 | red | 40 |
| 4     | green  | 32    | 4      | yellow | 32     | 4 | red | 32 |
| 5     | green  | 40    | 5      | yellow | 40     | 5 | red | 40 |
| 6     | green  | 48    | 6      | yellow | 48     | 6 | red | 48 |
| 7     | green  | 56    | 7      | yellow | 56     | 7 | red | 56 |

VTEP1#

---

## show running-config interface irb

Use this command to display the current QoS running configuration of IRB interface.

### Command Syntax

```
show running-config interface irb<1-4094>
```

### Parameters

None

### Command Mode

Exec Mode.

### Applicability

This command was introduced in OcNOS version 4.2.

### Example

```
VTEP1#sh run int irb1010
!
interface irb1010
 ip vrf forwarding FAX
 ip address 10.210.32.1/24
 ipv6 address 3001:ab8:1::1/64
 qos map-profile dscp-to-queue DSCP_QUE
 qos map-profile dscp-to-dscp DSCP_DSCP
!
```

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