

OcnOS® Open Compute Network Operating System for Data Centers Version 6.6.0

Virtual Extensible Local Area Network Guide February 2025

IP Infusion Inc. Proprietary

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Contents

Preface
IP Maestro Support
Audience
Conventions
Chapter Organization.
Related Documentation
Feature Availability
Migration Guide
Support
Comments
Command Line Interface
Overview
Command Line Interface Help1
Command Completion
Command Abbreviations1
Command Line Errors
Command Negation
Syntax Conventions1
Variable Placeholders
Command Description Format1
Keyboard Operations1
Show Command Modifiers1
String Parameters
Command Modes
Transaction-based Command-line Interface
Virtual eXtensible Local Area Network Configuration
CHAPTER 1 VXLAN Overview
Terminology
VxI AN - Data Forwarding Configuration
CHAPTER 1 Static VxLAN Configuration
Configuration
CHADTER 2 // ANI to V/NID Manning 2
Configuration
VI AN VNID Mapping Command 4
Glossarv
Clocodi y
VxLAN - Ethernet Virtual Private Network

CHAPTER 1 Topology LAG as Acc	VXLAN-EVPN Configuration	45 45 51
CHAPTER 2 Overview Validation	VXLAN Multi-homing Configuration.	67 67 85
CHAPTER 3 Overview Topology Validation	VXLAN Hybrid Access Port Configuration.	104 104 104 108
CHAPTER 4 Topology	VXLAN Trunk Access Port.	116 116
CHAPTER 5 Overview Topology VXLAN-EVF Validation	EVPN-VXLAN Hybrid Port Support	137 137 137 138 149
CHAPTER 6 Overview Topology COS-DSCP	VXLAN Quality of Service Configuration	157 157 157 157
VxLAN - EVPN w	ith Integrated Routing and Bridging Deployment Mode .	168
VxLAN - EVPN w CHAPTER 1 Overview Topology Base Config Centralized IRB Configu Anycast Ga Distributed 0 VXLAN IRB	rith Integrated Routing and Bridging Deployment Mode VXLAN-EVPN with IRB	
VxLAN - EVPN w CHAPTER 1 Overview Topology Base Config Centralized IRB Config Anycast Ga Distributed 0 VXLAN IRB CHAPTER 2 Overview Topology	rith Integrated Routing and Bridging Deployment Mode VXLAN-EVPN with IRB	. 168 . 169 169 169 170 186 186 191 212 219 227 227
VxLAN - EVPN w CHAPTER 1 Overview Topology Base Config Centralized IRB Configu Anycast Ga Distributed 0 VXLAN IRB CHAPTER 2 Overview Topology CHAPTER 3 Overview Configuratio Glossary	rith Integrated Routing and Bridging Deployment Mode VXLAN-EVPN with IRB	. 168 . 169 169 169 170 186 186 191 212 219 227 227 227 227 252 252 257
VxLAN - EVPN w CHAPTER 1 Overview Topology Base Config Centralized IRB Configu Anycast Ga Distributed 0 VXLAN IRB CHAPTER 2 Overview Topology CHAPTER 3 Overview Configuration Glossary	vith Integrated Routing and Bridging Deployment Mode VXLAN-EVPN with IRB juration - L2 VXLAN. Gateway irration for Centralized Gateway teway Gateway. ECMP. EVPN IRB - Anycast Support for Multiple Subnets VxLAN-EVPN Symmetric IRB Support with Connected host on VXLAN-IRB-Inter-VRF Route Leaking	. 168 . 169 . 169 . 169 . 170 . 186 . 186 . 191 . 212 . 219 . 227 . 227 . 227 . 227 . 227 . 252 . 252 . 252 . 259 . 259

Topology		298
CHAPTER 6 Overview Topology Base Configur Centralized Ga IRB Configura Anycast Gatev IRB Configura Distributed Ga	VXLAN-EVPN with IRB QoS ration - L2 VXLAN. ateway tion for Centralized Gateway way tion for Anycast ateway.	305 305 305 318 318 327 327 348
IRB QoS Cont	figuration for Distributed	348
CHAPTER 7 Overview Prerequisites . Topology for 0 Configuration. Topology for 1 Implementatio New CLI Com Validation Abbreviations Glossary	Single Home VxLAN IRB with OSPF or ISIS OSPF	361 361 362 362 362 362 362 375 375 375 375 393 393
C.00001		000
CHAPTER 8 Overview Prerequisites . Topology for 0 Configuration. Abbreviations Glossary	Multi Home VxLAN-EVPN IRB with OSPF or ISIS	
CHAPTER 8 Overview Prerequisites . Topology for 0 Configuration. Abbreviations Glossary	Multi Home VxLAN-EVPN IRB with OSPF or ISIS	
CHAPTER 8 Overview Prerequisites . Topology for 0 Configuration. Abbreviations Glossary VxLAN - EVPN for CHAPTER 1 Overview Topology Validation	Multi Home VxLAN-EVPN IRB with OSPF or ISIS	

CHAPTER 3 VXLAN Tunnel Over SVI	466
	466
l opology	466
	483
VxLAN Command Reference	. 490
CHAPTER 1 VXLAN Commands	491
arp-cache disable	493
arp-nd flood-suppress	494
arp-nd refresh timer	495
clear mac address table dynamic vxlan	496
clear nvo vxlan counters	497
clear nvo vxlan tunnels	498
clear nvo vxlan mac-stale-entries	499
description	500
dynamic-learning disable	501
encapsulation	502
evpn esi holdtime	503
evpn-mac-holdtime	504
evpn vxlan multi-homing enable	505
evpn multi-homed	506
evpn-vlan-service	507
garp-gna enable	508
load-balance rtag7 vxlan inner-l2	509
load-balance rtag7 vxlan inner-l3	510
mac	511
mac-ageing	512
mac vrf	513
mac-holdtime	514
map vnid	515
nd-cache disable	516
no nvo vxlan	517
nvo vxlan	518
nvo vxlan id	519
nvo vxlan access-if	521
nvo vxlan mac-ageing-time	523
nvo vxlan mh-mac-relocate-scan	
nvo vxlan vtep-ip-global	
show nvo vxian	
	530
	532
	535
	537
	540

show nvo vxlan static host state	542
show nvo vxlan tunnel	544
show running-config nvo vxlan	545
show evpn multi-homing all	547
show evpn multihoming-status	548
show nvo vxlan route-count	549
show nvo vxlan vni-name	551
show hsl evpn multihoming esi	552
shutdown	554
vxlan host-reachability-protocol evpn-bgp	555
vlan-xlate-1 large	556
	FF7
evon irb	558
evon irb-forwarding anvcast-gateway-mac	550
evpn irb-if-forwarding anycast-gateway-mac	560
interface irb	561
I3vni	562
nvo vylan irb	563
show interface irb	564
show evon l3vni-map	565
show even irb-status	566
show running-config interface irb	567
CHAPTER 3 VXLAN Quality of Service Commands	568
	569
cos queue	570
	5/1
	572
map qos-profile cos-to-queue	573
map dos-profile queue-color-to-cos.	574
	575
	576
	5//
	5/8
	579
	200
	201
	JQ7
Index	583

Preface

This guide describes how to configure OcNOS.

IP Maestro Support

Monitor devices running OcNOS Release 6.3.4-70 and above using IP Maestro software.

Audience

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

Conventions

Table 1 on page 8 shows the conventions used in this guide.

Table 1: Conventions

Convention	Description
Italics	Emphasized terms; titles of books
Note:	Special instructions, suggestions, or warnings
monospaced type	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

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.

Migration Guide

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

Support

For support-related questions, contact support@ipinfusion.com.

Comments

If you have comments, or need to report a problem with the content, contact techpubs@ipinfusion.com.

Command Line Interface

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

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-directional lsp status and configuration
 bi-lsp
 bridge
                                   Bridge group commands
 ce-vlan
                                   COS Preservation for Customer Edge VLAN
 class-map
                                   Class map entry
                                   Show CLI tree of current mode
 cli
 clns
                                   Connectionless-Mode Network Service (CLNS)
  control-adjacency
                                   Control Adjacency status and configuration
 control-channel
                                   Control Channel status and configuration
                                   CSPF Information
 cspf
 customer
                                   Display Customer spanning-tree
 cvlan
                                   Display CVLAN information
                                   Debugging functions
 debugging
 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

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 2 on page 37 describes the conventions used to represent command syntax in this reference.

Convention	Description	Example
monospaced font	Command strings entered on a command line	show ip ospf
lowercase	Keywords that you enter exactly as shown in the command syntax.	show ip ospf
UPPERCASE	See Variable Placeholders	IFNAME
()	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.	(A.B.C.D <0-4294967295>)
()	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.	(A.B.C.D <0-4294967295>)
()	Optional parameter which you can specify or omit. Do not enter the parentheses or vertical bar as part of the command.	(IFNAME)
{}	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.	{intra-area <1-255> inter-area <1-255> external <1-255>}

Table 2: Syntax conventions

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.	<pre>[<1-65535> AA:NN internet local-AS no-advertise no-export]</pre>
?	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>

Table 2: Syntax conventions (Continued)

Variable Placeholders

Table 3 on page 38 shows the tokens used in command syntax use to represent variables for which you supply a value.

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	MAC address
<1-5> <1-65535> <0-2147483647> <0-4294967295>	Numeric range

Table 3: Variable placeholders

Command Description Format

Table 4 on page 39 explains the sections used to describe each command in this reference.

Section	Description
Command Name	The name of the command, followed by what the command does and when should it be used
Command Syntax	The syntax of the command
Parameters	Parameters and options for the command
Default	The state before the command is executed
Command Mode	The mode in which the command runs; see Command Modes
Example	An example of the command being executed

Table 4: Command descriptions

Keyboard Operations

Table 5 on page 39 lists the operations you can perform from the keyboard.

Table 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

Key combination	Operation
Ctrl+t	Transposes the current character with the previous character
Ctrl+c	Ignores the current line and redisplays 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

Table 5: Keyboard operations (Continued)

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[2-4]
```

```
...skipping
```

```
interface xe2
 shutdown
T
interface xe4
 shutdown
Т
interface svlan0.1
no shutdown
1
route-map myroute permit 2
route-map mymap1 permit 10
route-map rmap1 permit 2
1
line con 0
login
line vty 0 4
 login
Т
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 6 on page 43 apply for all string parameters used in OcNOS commands, unless some other restrictions are noted for a particular command.

Restriction	Description
Input length	1965 characters or less
Restricted special characters	"?", ",", ">", " ", and "="
	The " " character is allowed only for the description command in interface mode.

Table 6: String parameter restrictions

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.

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 show, exit, quit, help, and enable.
Privileged executive mode	Also called <i>enable</i> mode, in this mode you can run additional basic commands such as debug, write, and show.
Configure mode	Also called <i>configure terminal</i> mode, in this mode you can run configuration commands and go into other modes such as interface, router, route map, key chain, and address family.
	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.

Table 7: Common command modes

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 Local Area Network Configuration

CHAPTER 1 VxLAN Overview

This chapter provides an overview of Virtual Extensible Local Area Network (VxLAN) and its implementation within OcNOS.

VxLAN

Virtual eXtensible Local Area Network (VxLAN) is widely used in Data Centers (DC) networks. VxLAN is an overlay transport virtualization technology commonly used in cloud networks to support the ever-increasing Virtual LAN (VLAN) and multi-tenant networks in data centers. It enables the "stretching" of a Layer 2 network over a physical Layer 3 network.

Overlay Network

VxLAN creates an overlay of virtual L2 LAN segments using a MAC address, and L4 UDP packets in IP encapsulation on top of the physical underlay L3 infrastructure. Technically, it encapsulates L2 Ethernet frames received from a host with L3 IP/UDP packets in a VxLAN header and sends it to the destination in the data center network using IP tunnels. This allows for the extension of L2 networks across data center without changing the underlying physical infrastructure.

EVPN - VxLAN

VxLAN creates LAN segments using 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 VXLAN Tunnel End Points (VTEPs). The VxLAN segments 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 the same IP or MAC addresses.

Ethernet Virtual Private Network (EVPN) is a protocol based on industry standards used for network virtualization in multi-tenant data center and service provider networks. When used with VxLAN networks, it provides a control plane to create L2 overlays across a L3 network. This enables seamless communication between virtual machines (VMs) or containers across different physical locations as though they are on the same Ethernet segment. EVPN leverages BGP for scalable routing information exchange and distribution of L2 and L3 reachability information across a large network. It also tracks and updates the location of devices based on MAC and IP addresses as they move across the network. It is a critical feature in virtualized environments where VMs or containers may frequently migrate.

Additionally, EVPN supports redundant and active-active multi-homing for robust failover and high availability, by allowing a host to connect to multiple VTEPs. Thus, EVPN ensures, that the traffic is rerouted through an alternate VTEP if a connection to VTEP fails. EVPN is essential for scalable, resilient, and efficient multi-tenant network virtualization when deployed in conjunction with VxLAN in modern data center environments.

Underlay Network

The underlay network consists of a physical L3 infrastructure, which provides the foundation for communication in the network. The underlay network is abstracted in the overlay network, allowing seamless communication of the large virtualized L2 network.

Note: For OcNOS, broadcast, unknown unicast, and multicast traffic is not load-balanced over tunnel L3 next hops or ECMP. Instead, a single next hop is used for forwarding this traffic over the tunnel.

VxLAN Architecture

Typically, VxLAN network operates as an overlay network over an IP underlay network based on a Spine-Leaf CLOS architecture. The underlay network is often referred to as IP fabric or CLOS fabric.

VxLAN allows the network to support several tenants with minimum changes in the network. They carry tenant data in virtual 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, or VMs.

Each overlay tunnel is referred to as a VxLAN segment. VMs can only communicate with each other within the same VxLAN segment, similar to how communication occurs within a traditional VLAN. 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. For VMs on different VxLAN segments to communicate, inter-VxLAN routing can be performed on a VxLAN-enabled router or distributed gateway. This is similar to routing between VLANs in a traditional L2 network.

The VNI determines the scope of the inner MAC frame originated from the individual VM. This ensures there can be overlapping MAC addresses across segments, but traffic remains isolated due to the VNI preventing cross-segment interference.



Figure 1-1: VxLAN Deployment - VTEPs across a L3 Network

Features

Leaf nodes act as VTEP for hosts to connect to the data center and provide VPN services

- With multihoming facility load distribution, link and node level redundancies of the CLOS fabric are extended to hosts
- Hosts are identified using either the port number, port number with VLAN ID or VLAN range, or the port number with a stacked VLAN ID.
- Any packets (including ARP-ND) that are uplifted to the VxLAN CPU queue from any port are rate limited to 500 packets per second. This is done to protect the system and CPU during an ARP storm.
- OcNOS supports VxLAN IPv4 tunnels, but both IPv4 and IPv6 hosts.
- VxLAN works over UDP, with destination port 4789. Source port can be randomized based on L2 frame information carried, hence provides good hashing input for load-sharing on ECMP/LAG paths in the L3 fabric.
- EVPN uses multiprotocol BGP with AFI=25 (L2VPN) and SAFI=70 (EVPN).
- EVPN is used with VxLAN data-plane encapsulations in OcNOS Data Center.
- EVPN helps with discovering VTEPs and learning MAC and IP addresses of the connected hosts in a VxLAN network.
- EVPN is used to implement Integrated routing and bridging (IRB), and E-Tree in OcNOS Data Center. It's becoming umbrella for multiple service types.
- EVPN provides multihoming service, with redundancy and more bandwidth with multihoming facility load distribution, extends link and node level redundancies of the CLOS fabric to hosts.

Terminology

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

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 L2 overlay network over which VMs communicate

VxLAN - Data Forwarding Configuration

CHAPTER 1 Static VxLAN Configuration

This chapter explains the static configurations of VxLAN using dynamic OSPF routing protocol configuration.

Configuration

This configuration establishes Layer 2 connectivity over an IP network by setting up two spine switches and VXLAN Tunnel Endpoints (VTEPs) with static VXLAN routing.

In this configuration, each VTEP (VTEP1 and VTEP2) operates as a multilayer switch. Here, xe34/xe34 serves as the access port for VTEP1/VTEP2 while ce50/ce49 and ce12/ce11 acts as the transport network port towards SPINE1 and 2 respectively.

When VM1 sends an untagged IPv4 packet, it arrives at VTEP1 via the access port xe34. VTEP1 encapsulates the packet using the configured VXLAN Network Identifier (VNID 3) and forwards it through the tunnel interface over (ce50/ce49). The encapsulated packet is then received by VTEP2 on its transport port (ce12/ce11). VTEP2 performs decapsulation, extracting the original packet, and forwards it through its access port xe34 by looking up its local forwarding table using VNID. Finally, the packet reaches the destination VM (VM2), completing the communication.

This process ensures seamless Layer 2 connectivity between the two VMs over the IP network using static VXLAN routing.

Topology

The procedures in this section use the topology shown in Figure 1-2



Figure 1-2: Static VxLAN Routing

Procedure to configure Static VxLAN Routing

Configure the VTEP1:

1. Login to VTEP1 and configure VxLAN mode, assign VNID, map network tunnel with VNID, and enter static route for remote VM (VTEP 2) with MAC address and IP address.

```
(config) #hostname VTEP1
(config) #nvo vxlan enable
(config) #nvo vxlan id 3
(config-nvo) #vxlan map-network tunnel Tunnel4
(config-nvo) #vxlan static-entry host-mac 0000.0000.aaaa remote-vtep-ip 11.11.11.1
```

 Configure VxLAN tunnel with source IP address as VTEP1 IP address and destination IP address as VTEP 2 IP address.

```
(config) #interface Tunnel4
(config-if) #tunnel mode vxlan
(config-if) #tunnel source 10.10.10.1
(config-if) #tunnel destination 11.11.11.1
```

3. Configure VTEP 1 network interface ce49.

```
(config)#interface ce49
(config-if)#ip address 4.4.4.4/24
```

4. Configure VTEP 1 network interface ce50 with IP address.

```
(config) #interface ce50
(config-if) #ip address 2.2.2.4/24
```

5. Configure VTEP1 loop back address.

```
(config) #interface lo
(config-if) #ip address 127.0.0.1/8
(config-if) #ip address 10.10.10.1/32 secondary
```

6. Configure VTEP 1 switchport interface xe34.

```
(config)#interface xe34
(config-if)#switchport
```

7. Configure a dynamic routing using OSPF router for the network tunnel interfaces ce50 and ce49 source IP address.

```
(config)router ospf 1
(config-router)ospf router-id 10.10.10.1
(config-router)network 2.2.2.0/24 area 0.0.0.0
(config-router)network 4.4.4.0/24 area 0.0.0.0
(config-router)network 10.10.10.1/32 area 0.0.0.0
```

8. Map the access port interface xe34 with network tunnel VNID 3.

```
(config)#nvo vxlan access-if port xe34
(config-nvo-acc-if)#map vnid 3
```

Configure the VTEP2

1. Login to VTEP2 and configure VxLAN mode, assign VNID, map network tunnel with VNID, and enter static route for remote VM (VTEP 2) with MAC address and IP address.

```
(config) #hostname VTEP2
(config) #nvo vxlan enable
(config) #nvo vxlan id 3
(config-nvo) #vxlan map-network tunnel Tunnel4
(config-nvo) #vxlan static-entry host-mac 0000.0000.bbbb remote-vtep-ip 10.10.10.1
```

2. Configure VxLAN tunnel with source IP address as VTEP2 IP address and destination IP as VTEP2 IP address.

```
(config) #interface Tunnel4
(config-if) #tunnel mode vxlan
(config-if) #tunnel source 11.11.11.1
(config-if) #tunnel destination 10.10.10.1
```

3. Configure VTEP2 network interface cell.

```
(config)#interface cell
(config-if)#ip address 5.5.5.4/24
```

4. Configure VTEP2 network interface cel2 with IP address.

```
(config)#interface ce12
(config-if)#ip address 3.3.3.4/24
```

5. Configure VTEP2 loop back address.

```
(config) #interface lo
(config-if) #ip address 127.0.0.1/8
(config-if) #ip address 11.11.11.1/32 secondary
```

6. Configure VTEP 2 switchport interface xe34.

```
(config)#interface xe34
(config-if)#switchport
```

7. Configure a dynamic routing using OSPF router for the network tunnel interfaces ce50 and ce49 source IP address.

```
(config)router ospf 1
(config-router)ospf router-id 11.11.11.1
(config-router)network 3.3.3.0/24 area 0.0.0.0
(config-router)network 5.5.5.0/24 area 0.0.0.0
(config-router)network 11.11.11.1/32 area 0.0.0.0
```

8. Map the access port interface xe34 with network tunnel VNID 3.

```
(config)#nvo vxlan access-if port xe34
(config-nvo-acc-if)#map vnid 3
```

Configure the SPINE1

```
1. Login to SPINE1 and configure the network interfaces.
```

```
(config) #hostname SPINE1
(config) #interface ce1/1
(config-if) # ip address 3.3.3.1/24
(config-if) #exit
(config) #interface ce2/1
(config-if) #ip address 2.2.2.1/24
```

2. Configure SPINE1 loop back address.

```
(config)#interface lo
(config-if)#ip address 127.0.0.1/8
(config-if)#ip address 12.12.12.1/32 secondary
```

3. Configure a dynamic routing using OSPF router.

```
(config)router ospf 1
(config-router)ospf router-id 12.12.12.1
(config-router)network 2.2.2.0/24 area 0.0.0.0
(config-router)network 3.3.3.0/24 area 0.0.0.0
(config-router)network 12.12.12.1/32 area 0.0.0.0
```

Configure the SPINE2

1. Login to SPINE2 and configure the network interfaces.

```
(config) #hostname SPINE1
(config) #interface ce11/1
(config-if) # ip address 5.5.5.1/24
(config-if) #exit
(config) #interface ce14/1
(config-if) #ip address 4.4.4.1/24
```

2. Configure SPINE2 loop back address.

```
(config)#interface lo
(config-if)#ip address 127.0.0.1/8
(config-if)#ip address 13.13.13.1/32 secondary
```

3. Configure a dynamic routing using OSPF router.

```
(config)router ospf 1
(config-router)ospf router-id 13.13.13.1
(config-router)network 4.4.4.0/24 area 0.0.0.0
(config-router)network 5.5.5.0/24 area 0.0.0.0
(config-router)network 13.13.13.1/32 area 0.0.0.0
```

Validation

Execute following show commands to verify the static VxLAN to reach remote virtual machines through the network tunnel interface.

VTEP1

Verify the OSPF neighbors towards SPINEs:

VTEP1#show ip ospf neighbor

```
Total number of full neighbors: 2
OSPF process 1 VRF(default):
```

Neighbor ID	Pri	State	Dead Time	Address	Interface	Instance ID
12.12.12.1	1	Full/DR	00:00:37	2.2.2.1	ce50	0
13.13.13.1	1	Full/Backup	00:00:36	4.4.4.1	ce49	0
VTEP1#						

Verify the static VxLAN tunnel on VTEP1:

VTEP1#show nvo v	vxlan tunnel			
VXLAN Network tu	nnel Entries			
Source	Destination	Status	Up/Down	Update
10.10.10.1	11.11.11.1	Installed	00:11:58	00:10:13

Total number of entries are 1 VTEP1#

Verify the VNID Mapping:

VNID	VNI-Name	VNI-Type	Туре	Interface	ESI	VLAN	DF-Status	Src-Addr	Dst-Addr
3		L2	NW					10.10.10.1	11.11.11.1
3			AC	xe34	Single Homed Port	0			

Total number of entries are 2 VTEP1#

Verify the local and remote MAC address configured:

VTEP1#show nvo vxlan mac-table

			VXLAN MAC Entr:	les				
VNID	Interface VlanId	In-VlanId Mac-Addr	VTEP-Ip/ESI	Туре	Status	MAC move	AccessPortDesc	LeafFlag
3		0000.0000.aaa	aa 11.11.11.1	Static Ren	mote	- 0		
Total n	number of entries are	: 1						
VTEP1#								
VTEP1#s	show nvo vxlan mac-tab	ole vnid 3 ====================================						
			VXLAN MAC Entr	Les				
VNID	Interface VlanId	In-VlanId Mac-Addr	VTEP-Ip/ESI	Туре	Status	MAC move	AccessPortDesc	LeafFlag
3		0000.0000.aaa	a 11.11.11.1	Static Re	mote	- 0		
Total n	number of entries are	: 1						

VTEP1#

VTEP2

Verify the OSPF neighbors towards SPINEs.

VTEP2#show ip ospf neighbor

Total number	of full	neighbors: 2				
OSPF process	1 VRF (de	efault):				
Neighbor ID	Pri	State	Dead Time	Address	Interface	Instance ID
12.12.12.1	1	Full/DR	00:00:35	3.3.3.1	ce12	0
13.13.13.1 VTEP2#	1	Full/Backup	00:00:31	5.5.5.1	cell	0

Verify the static tunnel configured on VTEP2:

VTEP2#sho VXLAN Net Source	w nvo vxlan work tunnel Dest	tunnel Entries ination	St	tatus	Up	/Down	Update				
11.11.11.	1 10.1	0.10.1	II	nstalled	00	:11:32	00:10:28				
Total num VTEP2#	ber of entri	es are 1									
Verify the	e VNID Map	ping:									
VTEP2#sho VXLAN Inf	w nvo vxlan formation										
Codos.	NW - Notwor	k Port									
coues.	AC - Access (u) - Untagg	Port ed									
VNID	VNI-Name	VNI-Type	Туре	Interface	ESI			VLAN	DF-Status	Src-Addr	Dst-Addr
3		L2	NW							11.11.11.1	10.10.10.1
3			AC	xe34		Single Homed	d Port	0			

Total number of entries are 2 VTEP2#

Verify the local and remote MAC address configured:

VTEP2#

VTEP2#sho	w nvo vxlan	mac-tabl	le								
					VXLAN M	AC Entries					
VNID	Interface	VlanId	In-VlanI	d Mac-Addr	VTEP-I	p/ESI	 Туре	Status	MAC move	AccessPortDesc	LeafFlag
3				0000.0000.b	obb 10.10.1	10.1	Static Re	emote	0		
Total num	ber of entr	ies are :	: 1								
VTEP2# VTEP2#sho	w nvo vxlan	mac-tabl	le vnid 3								
					VXLAN M	AC Entries					
VNID	Interface	VlanId	In-Vlan]	Id Mac-Addr	VTEP-1	p/ESI	Туре	Status	MAC move	AccessPortDesc	LeafFlag
3				0000.0000.bk	bb 10.10.1	0.1	Static R	emote	0		
Total num	ber of entr	ies are :	: 1								
VTEP2# VTEP2#sho VXLAN Net Source	w nvo vxlan work tunnel Des	tunnel Entries tination	Stat	us Up	/Down	Update					
11.11.11.	1 10.	10.10.1	Inst	alled 00	:11:32	00:10:28	=				
Total num VTEP2# VTEP2#sho	wber of entr	ies are 1	1								

VXLAN In	formation												
Codes	: NW - Netwo: AC - Access (u) - Untage	rk Port 3 Port ged											
VNID	VNI-Name	VNI-Type	Туре	Interface	ESI			VLAN	DF-Stat	us Src-	Addr	Dst-A	Addr
3 3		L2 	NW AC	 xe34	Sin	gle Homed Por	t	0		11.	11.11.1 -	10.1	0.10.1
Total nu VTEP2# VTEP2# VTEP2#sh	mber of entr: ow nvo vxlan	ies are 2 mac-table											
						VXLAN MAC Ent	ries						
VNID	Interface	VlanId	In-Vla	nId Mac-A	ddr	VTEP-Ip/ESI		Type	Status	MAC mov	7e Access	PortDesc	LeafFlag
3				0000.0	000.bbbb	o 10.10.10.1	Sta	tic Remote		0			
Total nu	mber of entr	ies are :	1										
VTEP2# VTEP2#sh	ow nvo vxlan	mac-table	vnid	3									
						VXLAN MAC Ent	ries						
VNID LeafFlag	Interface '	VlanId :	In-Vla	nId Mac-Ac	ldr	VTEP-Ip/ESI		Туре	S	tatus	MAC mov	e AccessP	ortDesc
3				0000.00	00.bbbb	10.10.10.1	Sta	atic Remote	9	- 0			

Total number of entries are : 1

CHAPTER 2 VLAN to VNID Mapping

Overview

OcNOS supports mapping Virtual Local Area Network Identifier (VLAN ID) to Virtual Extensible Local Area Network Identifier (VNID) to extend the Layer 2 VLAN over to the Layer 3 VxLAN. The VLAN ID is a unique number assigned to a specific VLAN, and the VNID is the same for a specific VxLAN. The Virtual Tunnel Endpoint (VTEP) is a network device or a software component that encapsulates the ethernet frames from a specific VLAN ID into a VxLAN header that contains the VNID. This encapsulated frame is the VxLAN packet, which is again encapsulated in the UDP packet and wrapped in an outer IP header to transport it to the IP network.

Feature Characteristics

- The VLAN ID to VNID communication is regardless the physical and logical port.
- Each VNID is allowed to map with a single VLAN ID.
- VLAN is removed over the tunnel and re-added when egressing out of the host-connected port.

Benefits

The feature enhances the scalability and flexibility by extending the VLAN to VxLAN boundaries.

Configuration

This section shows the procedure for configuring VxLAN using VLAN to VNI mapping.

Topology

This topology demonstrates the configuration necessary to enable VxLAN VLAN-to-VNID mapping. Leaf1 and Leaf2 are VxLAN VTEPs in the Autonomous System (ASN) 100, and the Spine1 resides in a different Autonomous System (ASN) 200. The setup involves establishing eBGP IPv4 (underlay) neighborship between interface addresses and L2VPN EVPN (overlay) neighborship between loopback interfaces.

Once the underlay and overlay neighborships are established, configure the VxLAN tunnel between Leaf1 and Leaf2. The global VTEP IP is the loopback address.



Figure 2-3: VLAN to VNID mapping

Configuring VLAN to VNID mapping

Follow the steps to configure the VxLAN EVPN using VLAN to VNI mapping. The detailed configuration procedure demonstrates how access-if VxLAN is configured on a switchport in trunk mode.

Note: The configuration of access-if VxLAN is allowed in the access mode also. The example is as follows:

```
(config)#interface xe12
(config-if)# switchport
(config-if)# bridge-group 1 spanning-tree disable
(config-if)# switchport mode access
(config-if)# switchport access vlan 20
(config-if)# access-if-vxlan
(config-if)#exit
```

Configure the Leaf1 and Leaf2:

The parameters used in the configuration procedure are as present for Leaf1. Use the same commands with the Leaf2 parameters to configure the Leaf2.

1. Configure the hostname of the VTEP.

```
(config) #hostname Leaf1
(config) #commit
```

2. Configure the bridge type using the bridge 1 protocol rstp vlan-bridge command. This command enables the RSTP VLAN bridge type.

```
(config) #bridge 1 protocol rstp vlan-bridge
```

3. Enter the VLAN database using the ${\tt vlan}$ database command and associate the VLAN with a bridge.

```
(config)#vlan database
(config-vlan)#vlan 10 bridge 1 state enable
```

4. Enable the VxLAN globally on the VTEP.

(config) #nvo VxLAN enable

Note: Save and reboot the system to enable the VxLAN in the hardware.

5. Create the MAC VRF and name it using mac vrf vrf10. Configure the VLAN-based service type using evpnvlan-service vlan-based command, assign a unique route distinguisher and route target value using rd 1.1.1.1:10 and route-target both 100:10 commands respectively.

```
(config) #mac vrf vrf10
(config-vrf) #evpn-vlan-service vlan-based
(config-vrf) #rd 1.1.1.1:10
(config-vrf) #route-target both 100:10
```

6. Configure a global IP to the VTEP. This IP address uniquely identifies the VTEP.

(config) #nvo VxLAN vtep-ip-global 1.1.1.1

7. Create a VNID and map it with the bridge VLAN using nvo VxLAN id 10 ingress-replication bridgevlan 10. Configure the host-reachability-protocol as BGP-EVPN and associate the MAC VRF.

```
(config) #nvo VxLAN id 10 ingress-replication bridge-vlan 10
(config-nvo) #VxLAN host-reachability-protocol evpn-bgp vrf10
```

8. Assign the IP addresses to the physical and loopback interfaces of the Leaf1 to connect to the Spine.

```
(config)#interface ce49
(config-if)#ip address 11.10.1.1/24
(config-if)#exit
(config)#interface lo
(config-if)#ip address 1.1.1.1/32 secondary
```

9. Configure the interface xell as a switchport. Use the command bridge-group 1 spanning-tree disable to associate the bridge group to this interface and disable the Spanning Tree Protocol (STP) to avoid the port block. Configure the switching characteristic of this interface to trunk mode using the switchport mode trunk command and this allows multiple VLANs to run in the interface. Use the command switchport trunk allowed vlan add 10 to enable VLAN 10 through this interface. Map this interface with the VxLAN using access-if-VxLAN command.

```
(config)#interface xell
(config-if)#switchport
(config-if)# bridge-group 1 spanning-tree disable
(config-if)#switchport mode trunk
(config-if)#switchport trunk allowed vlan add 10
(config-if)#access-if-vxlan
```

10. Configure the BGP and specify the autonomous number (ASN).

(config) #router bgp 100

11. Configure the router ID.

(config-router) #bgp router-id 1.1.1.1

12. Configure the neighboring eBGP peers in a different ASN.

```
(config-router)#neighbor 11.10.1.2 remote-as 200
(config-router)#neighbor 11.11.11.11 remote-as 200
```

- 13. Configure eBGP multihop as the neighboring peer is not directly connected. (config-router) #neighbor 11.11.11.11 ebgp-multihop
- 14. Configure the source loopback address.

```
(config-router) #neighbor 11.11.11.11 update-source lo
```

15. Configure the IPv4 address family and activate the neighbor.

```
(config-router)#address-family ipv4 unicast
(config-router-af)#network 1.1.1.1/32
(config-router)#neighbor 11.10.1.2 activate
(config-router-af)#neighbor 11.10.1.2 allowas-in 1
(config-router-af)#exit-address-family
```

16. Configure the Layer 2 VPN address family and activate the neighbor.

```
(config-router)#address-family l2vpn evpn
(config-router-af)#neighbor 11.11.11.11 activate
(config-router-af)#neighbor 11.11.11.11 allowas-in 1
(config-router-af)#exit-address-family
(config-router)#exit
(config)#commit
```

Configure the Spine1:

1. Configure the hostname of the Spine.

```
(config) #hostname Spinel
(config) #commit
```

2. Assign the IP addresses to the physical and loopback interfaces of the Spine.

```
(config)#interface ce1
(config-if)#ip address 11.10.1.2/24
(config-if)#exit
(config)#interface ce24
(config-if)#ip address 21.10.1.2/24
(config-if)#exit
(config)#interface lo
(config-if)#ip address 11.11.11.11/32 secondary
(config-if)#exit
```

3. Configure the BGP and specify the ASN.

(config) #router bgp 200

4. Configure the router ID.

(config-router) #bgp router-id 11.11.11.11

5. Disable the inbound route filter.

(config-router)#no bgp inbound-route-filter

6. Configure the neighboring eBGP neighbor in a different ASN.

```
(config-router)#neighbor 11.10.1.1 remote-as 100
(config-router)#neighbor 21.10.1.1 remote-as 100
(config-router)#neighbor 1.1.1.1 remote-as 100
(config-router)#neighbor 2.2.2.2 remote-as 100
```

7. Configure eBGP multihop as the neighboring peer might not be directly connected.

(config-router)#neighbor 1.1.1.1 ebgp-multihop
(config-router)#neighbor 2.2.2.2 ebgp-multihop

8. Configure the source loopback address.

(config-router)#neighbor 1.1.1.1 update-source
(config-router)#neighbor 2.2.2.2 update-source

9. Configure the IPv4 address family and activate the neighbor.
```
(config-router)#address-family ipv4 unicast
(config-router-af)#network 11.11.11.11/32
(config-router-af)#neighbor 11.10.1.1 activate
(config-router-af)#neighbor 21.10.1.1 activate
(config-router-af)#exit-address-family
```

10. Configure the Layer 2 VPN address family and activate the neighbor.

```
(config-router)#address-family l2vpn evpn
(config-router-af)#neighbor 1.1.1.1 activate
(config-router-af)#neighbor 2.2.2.2 activate
(config-router-af)#exit-address-family
(config-router)#exit
(config)#commit
```

Running configurations

The running configuration for the Leaf1 is as follows:

```
hostname Leaf1
bridge 1 protocol rstp vlan-bridge
tfo Disable
1
vlan database
 vlan 10 bridge 1 state enable
1
nvo VxLAN enable
mac vrf vrf10
 evpn-vlan-service vlan-based
 rd 1.1.1.1:10
route-target both 100:10
1
nvo VxLAN vtep-ip-global 1.1.1.1
1
nvo VxLAN id 10 ingress-replication bridge-vlan 10
VxLAN host-reachability-protocol evpn-bgp vrf10
1
interface ce49
 ip address 11.10.1.1/24
L
interface lo
 ip address 1.1.1.1/32 secondary
 1
interface xell
 switchport
 bridge-group 1 spanning-tree disable
 switchport mode trunk
 switchport trunk allowed vlan add 10
 access-if-vxlan
 exit
1
router bgp 100
 bgp router-id 1.1.1.1
 neighbor 11.10.1.2 remote-as 200
 neighbor 11.11.11 remote-as 200
 neighbor 11.11.11.11 ebgp-multihop
```

```
neighbor 11.11.11.11 update-source lo
!
address-family ipv4 unicast
network 1.1.1.1/32
neighbor 11.10.1.2 activate
neighbor 11.10.1.2 allowas-in 1
exit-address-family
!
address-family l2vpn evpn
neighbor 11.11.11.11 activate
neighbor 11.11.11.11 allowas-in 1
exit-address-family
!
exit
!
end
```

The running configuration for the Spine1 is as follows:

```
hostname Spinel
T
interface cel
 ip address 11.10.1.2/24
I.
interface ce24
 ip address 21.10.1.2/24
 lldp-agent
!
interface lo
  ip address 11.11.11.11/32 secondary
!
router bgp 200
 bgp router-id 11.11.11.11
 no bgp inbound-route-filter
 neighbor 1.1.1.1 remote-as 100
 neighbor 2.2.2.2 remote-as 100
 neighbor 11.10.1.1 remote-as 100
 neighbor 21.10.1.1 remote-as 100
 neighbor 1.1.1.1 ebgp-multihop
 neighbor 1.1.1.1 update-source lo
 neighbor 2.2.2.2 ebgp-multihop
 neighbor 2.2.2.2 update-source lo
 !
 address-family ipv4 unicast
 network 11.11.11.11/32
 neighbor 11.10.1.1 activate
 neighbor 21.10.1.1 activate
 exit-address-family
 !
 address-family 12vpn evpn
 neighbor 1.1.1.1 activate
 neighbor 2.2.2.2 activate
 exit-address-family
```

! exit end

Validation

Validate the show output after configuration as shown below.

Leaf1:

```
Leaf1#show ip bgp summary
BGP router identifier 1.1.1.1, local AS number 100
BGP table version is 7
3 BGP AS-PATH entries
0 BGP community entries
Neighbor
                       V
                           AS
                                 MsgRcv
                                           MsgSen TblVer
                                                                        Up/Down
                                                            InQ
                                                                 OutQ
State/PfxRcd
             Desc
11.10.1.2
                        200
                                 266
                                         264
                                               7
                                                      0
                                                           0 01:37:50
                     4
2
Total number of neighbors 1
Total number of Established sessions 1
Leaf1#show bgp 12vpn evpn summary
BGP router identifier 1.1.1.1, local AS number 100
BGP table version is 8
3 BGP AS-PATH entries
0 BGP community entries
Neighbor
                                 MsgRcv
                                                                        Up/Down
                       V
                           AS
                                           MsgSen TblVer
                                                            InQ
                                                                 OutQ
State/PfxRcd
               AD MACIP MCAST
                                 ESI PREFIX-ROUTE
11.11.11.11
                        200
                                 237
                                          235
                                                  8
                                                      0
                                                            0 01:36:10
                     4
            1
                   2
                                   0
3
      0
                          0
Total number of neighbors 1
Total number of Established sessions 1
Leaf1#show nvo VxLAN tunnel
VxLAN Network tunnel Entries
Source
               Destination
                                            Up/Down
                                                         Update
                                                                      Redund
                               Status
Description
_____
_____
1.1.1.1
               2.2.2.2
                              Installed
                                          01:35:22
                                                      01:35:22
                                                                    ____
Total number of entries are 1
Leaf1#show nvo VxLAN vlan-vnid bridge-vlan 10
VLAN
        VNID
                 Interface
10
        10
                 xe11
```

Total r	number of	entries are	1						
Leaf1#s	show nvo V	xLAN vlan-vr	nid vnid 10						
VLAN	VNID	Interface	9						
10	10	xell							
Total r	number of	entries are	1						
Leaf1#s	how nvo V	xLAN vlan-vr	nid						
VLAN	VNID	Interface	e						
10	10	xell							
Total r Leaf1#	number of	entries are	2						
Leafl#s VxLAN I	show nvo v nformatio	xlan n							
VNID Status	AC - A (u) - U VNI-Name Src-Addr	ccess Port ntagged e VNI-Ty Dst-	pe Type Inter -Addr	face ESI Redund	Descrip	tion		VLAN	DF-
10		L2	NW						
 10	1.1.1.1	2	.2.2.2 AC xell	S	ingle H	omed 1	Port	10	-
Spine1	lumber of	entries are	2						
Spinel# BGP rou BGP tak 2 BGP A 0 BGP c	show ip b ter ident le versio S-PATH en community	gp summary ifier 11.11 n is 3 tries entries	.11.11, local	AS number	200				
Neighbo)r	V	AS Msgl	Rcv Msg	Sen Tbl	LVer	InQ Out	Q Up/I	Down
11.10.1	1	4 1	00 247	246	3	0	0 01:44:	11	
21.10.1 1	1	4 1	00 249	247	3	0	0 01:44:	11	
_									

Total number of neighbors 2

```
Total number of Established sessions 2
Spine1#
Spinel#show bgp l2vpn evpn summary
BGP router identifier 11.11.11.11, local AS number 200
BGP table version is 9
2 BGP AS-PATH entries
0 BGP community entries
V AS MsgRcv
State/PfxRcd AD MACIP MCAST ESI PR
                                              MsgSen TblVer InQ OutQ
                                                                            Up/Down
                                   ESI PREFIX-ROUTE
                                  249
                                            252
                                                    9
                                                          0
1.1.1.1
                     4
                        100
                                                                0 01:42:31
     0
             1
                    2
3
                           0
                                    0
                                            250
                                                    9
                                                          0 0 01:42:01
2.2.2.2
                         100
                                  251
                      4
3
      0
             1
                    2
                           0
                                     0
Total number of neighbors 2
Total number of Established sessions 2
```

VLAN VNID Mapping Command

The VLAN VNID mapping feature introduces the following configuration command.

access-if-vxlan

Use this command to create a logical port per parent interface for egress VLAN translation.

Use no form of this command to unconfigure the access-if-vxlan.

Command Syntax

```
access-if-vxlan
no access-if-vxlan
```

Parameters

None

Default

None

Command Mode

Interface mode

Applicability

Introduced in OcNOS version 6.5.2.

Example

The below example shows how to configure a logical port per parent interface:

```
OcNOS#configure terminal
```

```
OcNOS(config)#interface xe1
OcNOS(config-if)#access-if-vxlan
```

show nvo VxLAN vlan-vnid

Use this command to display the VLAIN ID to VNID mapping.

Command Syntax

show nvo VxLAN vlan-vnid (bridge-vlan <VLAN ID> (summary |) | vnid <VNID> | summary)

Parameters

vnid <vnid></vnid>	(Optional) Displays all the VLAN ID to VNID mapping.
bridge-vlan <vlan id=""></vlan>	(Optional) Displays all the VLAN ID to VNID mapping.
summary	(Optional) Displays the total count of VLAN to VNID mapping.

Default

None

Command Mode

Exec mode

Applicability

Introduced in OcNOS version 6.5.2.

Example

The below examples show the output of VLAN to VNID mapping:

```
OcNOS#show nvo VxLAN vlan-vnid
VLAN
                   Interface
         VNID
10
         10
                   xel1
Total number of entries are 1
OcNOS#
OcNOS#show nvo VxLAN vlan-vnid bridge-vlan 10
VLAN
      VNID
                   Interface
10
         10
                   xel1
Total number of entries are 1
```

OcNOS#

 Table P-2-1 explains the output fields.

Table	2-1:	VLAN	VNID	fields
IUDIC				110100

Field	Description
VLAN	VLAN Identifier.
VNID	VxLAN Identifier.
Interface	Name of the interface.

Glossary

The following provides definitions for key terms or abbreviations and their meanings used throughout this document:

Key Terms/Acronym	Description
Virtual Local Area Network Identifier (VLAN ID)	Virtual Local Area Network Identifier is a 12-bit unique identifier assigned to a VLAN to identify it in a network.
Virtual Extensible Local Area Network Identifier (VNID)	Virtual Extensible Local Area Network Identifier is a unique 24-bit identifier assigned to a VxLAN to identify it in a network.
Virtual Local Area Network (VLAN)	Virtual Local Area Network in a network configuration creates a separate and isolated virtual network with other virtual networks over a single physical interface.
Virtual Extensible Local Area Network (VxLAN)	Virtual Extensible Local Area Network (VxLAN) enables the creation of a virtualized Layer 2 network over the Layer 3 infrastructure. This is an overlay network on Layer 3 designed to overcome the limitations of VLANs.
Virtual Tunnel Endpoint (VTEP)	Virtual Tunnel Endpoint is a significant component in VxLAN that encapsulates or decapsulates the VxLAN traffic as it enters or leaves the VxLAN overlay network respectively.

VxLAN - Ethernet Virtual Private Network

CHAPTER 1 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 1-4.



Figure 1-4: VXLAN EVPN

VTEP1

#configure terminal	Enter configure mode
(config)#interface xel	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.
(config)#interface xe22	Enter interface mode.
(config-if)#ip address 10.1.1.1/24	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.
<pre>(config-if)#ip address 1.1.1.1/32 secondary</pre>	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 49.0001.1111.1111.100	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 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 1	Define the routing process. The number 1 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 1	Define BGP neighbor: 2.2.2.2 is the IP address of the neighbor (VTEP2), and 1 is the neighbor's AS number.
<pre>(config-router)# neighbor 2.2.2.2 update- source 1.1.1.1</pre>	Define BGP neighbor: 1.1.1.1 is the peer interface.
(config-router)#address-family 12vpn evpn	Configure address-family L2VPN EVPN.
(config-router-af)#neighbor 2.2.2.2 activate	Activate the neighbor in the EVPN address family.
(config-router-af)#exit-address-family	Exit the address-family mode.
(config-router) #exit	Exit router mode.
(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 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 xel 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 <code>vrf_evpn_100</code>
(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

RR

#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 xell	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 49.0001.3333.3333.333.00	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 xell	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

#configure terminal	Enter configure mode.
(config) #interface xel	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 xell	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 49.0001.2222.2222.222.00	Set a Network Entity Title for this instance, specifying the area address and the system ID.
(config-router) #exit	Exit router mode.
(config)#interface xell	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 <pre>vrf_evpn_100.</pre>
(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	Define BGP neighbor: 1.1.1.1 is the IP address of the neighbor (VTEP1), and 1 is the neighbor's AS number.
<pre>(config-router)# neighbor 1.1.1.1 update- source 2.2.2.2</pre>	Define BGP neighbor: 2.2.2.2 is the peer interface.

(config-router-af) #neighbor 1.1.1.1 activateActivate the neighbor in the EVPN address family.(config-router-af) #exit-address-familyExit address-family mode.(config-router) #exitExit router mode.(config) #nvo vxlan enableEnable VXLAN globally on this VTEP.(config) #nvo vxlan vtep-ip-global 2.2.2.2Assign a global IP to the VTEP.(config) #nvo vxlan id 100 ingress- replicationConfigure a VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100.(config-nvo) #exitExit NVO mode.(config-nvo-acc-if) #map vnid 100Map VNID 100 to access-port xe1 and map vlan 2(config-nvo-acc-if) #exitExit NVO access-if mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure second VNID on this VTEP and enter NVO mode.(config-nvo-acc-if) #map vnid 100Map VNID 100 to access-port xe1.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure second VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100
(config-router-af) #exit-address-familyExit address-family mode.(config-router) #exitExit router mode.(config) #nvo vxlan enableEnable VXLAN globally on this VTEP.(config) #nvo vxlan vtep-ip-global 2.2.2.2Assign a global IP to the VTEP.(config) #nvo vxlan id 100 ingress- replicationConfigure a VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100.(config-nvo) #exitExit NVO mode.(config) #nvo vxlan access-if port-vlan xelConfigure access-port xel and map vlan 2(config-nvo-acc-if) #map vnid 100Map VNID 100 to access-port xel.(config) #nvo vxlan id 200 ingress- replicationConfigure second VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure access-port xel and map vlan 2(config-nvo-acc-if) #map vnid 100Map VNID 100 to access-port xel.(config-nvo) #vxlan id 200 ingress- replicationConfigure second VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100
(config-router) #exitExit router mode.(config) #nvo vxlan enableEnable VXLAN globally on this VTEP.(config) #nvo vxlan vtep-ip-global 2.2.2.2Assign a global IP to the VTEP.(config) #nvo vxlan id 100 ingress- replicationConfigure a VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100.(config-nvo) #exitExit NVO mode.(config) #nvo vxlan access-if port-vlan xel 2Configure access-port xe1 and map vlan 2(config-nvo-acc-if) #map vnid 100Map VNID 100 to access-port xe1.(config) #nvo vxlan id 200 ingress- replicationConfigure second VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure second VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100
(config) #nvo vxlan enableEnable VXLAN globally on this VTEP.(config) #nvo vxlan vtep-ip-global 2.2.2.2Assign a global IP to the VTEP.(config) #nvo vxlan id 100 ingress- replicationConfigure a VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100.(config-nvo) #exitExit NVO mode.(config) #nvo vxlan access-if port-vlan xel 2Configure access-port xel and map vlan 2(config-nvo-acc-if) #map vnid 100Map VNID 100 to access-port xel.(config) #nvo vxlan id 200 ingress- replicationConfigure second VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure second VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100
(config) #nvo vxlan vtep-ip-global 2.2.2.2Assign a global IP to the VTEP.(config) #nvo vxlan id 100 ingress- replicationConfigure a VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100.(config-nvo) #exitExit NVO mode.(config) #nvo vxlan access-if port-vlan xe1Configure access-port xe1 and map vlan 2(config-nvo-acc-if) #map vnid 100Map VNID 100 to access-port xe1.(config) #nvo vxlan id 200 ingress- replicationConfigure second VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100
(config) #nvo vxlan id 100 ingress- replicationConfigure a VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100.(config-nvo) #exitExit NVO mode.(config) #nvo vxlan access-if port-vlan xe1Configure access-port xe1 and map vlan 2(config-nvo-acc-if) #map vnid 100Map VNID 100 to access-port xe1.(config) #nvo vxlan id 200 ingress- replicationExit NVO access-if mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100
(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100.(config-nvo) #exitExit NVO mode.(config) #nvo vxlan access-if port-vlan xel 2Configure access-port xel and map vlan 2(config-nvo-acc-if) #map vnid 100Map VNID 100 to access-port xel.(config-nvo-acc-if) #exitExit NVO access-if mode.(config) #nvo vxlan id 200 ingress- replicationConfigure second VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #exitExit NVO mode.
(config-nvo) #exitExit NVO mode.(config) #nvo vxlan access-if port-vlan xelConfigure access-port xel and map vlan 2(config-nvo-acc-if) #map vnid 100Map VNID 100 to access-port xel.(config-nvo-acc-if) #exitExit NVO access-if mode.(config) #nvo vxlan id 200 ingress- replicationConfigure second VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #exitExit NVO mode.
(config) #nvo vxlan access-if port-vlan xe1Configure access-port xe1 and map vlan 2(config-nvo-acc-if) #map vnid 100Map VNID 100 to access-port xe1.(config-nvo-acc-if) #exitExit NVO access-if mode.(config) #nvo vxlan id 200 ingress- replicationConfigure second VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #exitExit NVO mode.
(config-nvo-acc-if) #map vnid 100Map VNID 100 to access-port xe1.(config-nvo-acc-if) #exitExit NVO access-if mode.(config) #nvo vxlan id 200 ingress- replicationConfigure second VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #exitExit NVO mode.
(config-nvo-acc-if) #exitExit NVO access-if mode.(config) #nvo vxlan id 200 ingress- replicationConfigure second VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #exitExit NVO mode.
(config) #nvo vxlan id 200 ingress- replicationConfigure second VNID on this VTEP and enter NVO mode.(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #exitExit NVO mode.
(config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100Configure host-reachability-protocol as BGP-EVPN and associate the VNID with vrf_evpn_100(config-nvo) #exitExit NVO mode.
(config-nvo) #exit Exit NVO mode.
(config) #nvo vxlan access-if port-vlan xe2 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

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 tu	nnel Entries				
Source	Destination	Status	Up/Down	Update	

1.1.1. Total	1 number of	2.2.2.2 entries a	re 1	Installe	d 00:0	5:53	00:05:53		
VTEP-2 VXLAN Sourc	#show nvo Network tu e	vxlan tun unnel Entr Destina	nel ies tion	Status	U	p/Down	Upd	ate	
2.2.2. Total	2 number of	1.1.1.1 entries a	re 1	Installe	d 00:0	5:46	00:05:46		
VTEP A VTEP-1 VXLAN	ARP Cache #sh nvo v ARP-CACHE	xlan arp-c Informati	ache on						
ARP Ti VNID Retrie	meout : 30 Ip-Addr s-Left	00 sec Ran	== dom-Jitt Mac-Add:	er-Max : r	640 Туре			Age-Out	
200 200 100 Total VTEP-2 VXLAN	13.13. 13.13. 12.12. 12.12. number of #sh nvo vz ARP-CACHE	13.10 0 13.20 0 12.20 0 12.10 00 entries a xlan arp-c Informati	000.0b60 000.0b60 000.0000 00.0000. re 4 ache on	.25f2 .25f3 .cdcd abab	Dynamic L Dynamic R Dynamic R Dynamic Lo	ocal emote emote cal	246 246		2
===== ARP Ti VNID Out	meout : 30 Ip-Add Retrie	======================================	== dom-Jitt Ma	er-Max : c-Addr	640	Туре			Age
200 200 2 100	13.13.13 13.13.13 12.12.12	3.10 3.20 2.10	0.0000 d0.0000 0.0000	b60.25f2 60.25f3 000.abab	Dyna Dynamic Dynam	mic Remo c Local ic Remo	ote -	257	
100 2 Total	12.12.12 number of	e.20 entries a	0000.00 re 4	00.cdcd	Dynamic	c Local		257	
VTEP N VTEP-1	MAC Tables #show nvo	vxlan mac	-table						
				VXLAN MAC	Entries				
===== VNID Status	Interface Access	========= VlanId PortDesc	Inner-	-VlanId	Mac-Addr	V	TEP-Ip/ESI	Туре	

100 Dynamic	 Remote		 0000.0000.cdcd	2.2.2.2
100 Dynamic	xel Local	2	 0000.0000.abab	1.1.1.1
200 Dynamic	xe2 Local	3	 0000.0b60.25f2	1.1.1.1
200 Dynamic	Remote		 0000.0b60.25f3	2.2.2.2
Total nu	imber of	entries are : 4		

VTEP-2#show nvo vxlan mac-table

=====									
			VXLAN MAC Ent	ries					
						=======			
VNID	Interface	VlanId	Inner-VlanId	Mac-Addr	VTEP-Ip/ESI	Туре	Status	AccessPortDe	esc
100	xel	2			0000.0000.cdcd	2.2.2.2	Dynamic Loc	al	
100					0000.0000.abab	1.1.1.1	Dynamic Remot	e	
200					0000.0b60.25f2	1.1.1.1	Dynamic Remot	e	
200	xe2	3			0000.0b60.25f3	2.2.2.2	Dynamic Loo	cal	
Total	number of e	ntries are	e : 4						

VTEP MAC-IP BGP EVPN Entries

VTEP-1#sh	ow bgp 12	2vpn evpn mac-i	р					
RD[1.1.1.1:1]	VRF[vrf evp	n 100]:						
ESI	Eth-Tag	 Mac-Address	IP-Address	VN	ID L3VI	NID Ne	xthop	GW-Type
0	100	0000:0000:abab	12.12.12.10	100	0 C	1.	1.1.1	
0	200	0000:0b60:25f2	13.13.13.10	200	0 C	1.	1.1.1	
RD[2.2.2.2:1]								
ESI	Eth-Tag	Mac-Address	IP-Address	VNID	L3VNI) Next	hop	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 b	gp 12vpn evp	n 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 evp	n 100]:						
ESI	Eth-Ta	g Mac-Address	IP-Addres	s	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 1-5.



Figure 1-5: 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 pol	Enter interface mode
(config-if) #switchport	Set the interface as Layer2 port
(config-if) #exit	Exit interface mode.
(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 pol	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 pol	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 xel	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 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	Set a Network Entity Title for this instance, specifying the
49.0001.1111.1111.1111.00	area address and the system ID.
(config-router)#exit	Exit router mode.
(config)#interface xel	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) #load-balance rtag7	Enable load balancing for RTAG7 globally.
(config)#load-balance rtag7 ipv4 src-ipv4	Enable load balancing for RTAG7 for IPv4 for source IP.
(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.
<pre>(config-router)# neighbor 2.2.2.2 update- source 1.1.1.1</pre>	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.
<pre>(config-router)# neighbor 3.3.3.3 update- source 1.1.1.1</pre>	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)#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 <pre>vrf_evpn_100.</pre>
(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 pol 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 pol 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

RR-1

#configure terminal	Enter configure mode.
(config)#interface lo	Enter interface mode
<pre>(config-if)#ip address 12.12.12.12/32 secondary</pre>	Set an IP address on the interface.
(config-if)#no shutdown	Bring the interface into operation
(config-if) #exit	Exit interface mode.
(config)#interface xel	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 intereface 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 xel	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

RR-2

#configure terminal	Enter configure mode.
(config)#interface lo	Enter interface mode.
(config-if)#ip address 13.13.13.13/32 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 xel	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 49.0001.5555.5555.555.00	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 xel	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).

Configure instance as level-1-only routing.
Exit interface mode.
Enter interface mode.
Enable IS-IS routing on an interface (ABC).
Configure instance as level-1-only routing.
Exit interface mode.
Commit the configurations
-

VTEP-2

#configure terminal	Enter configure mode
(config)#interface pol	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 xel	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.
<pre>(config-if)#ip address 2.2.2.2/32 secondary</pre>	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 49.0001.2222.2222.222.00	Set a Network Entity Title for this instance, specifying the area address and the system ID.
(config-router)#exit	Exit router mode.
(config)#interface xel	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)#load-balance rtag7	Enable load balancing for RTAG7 globally.
(config) #load-balance rtag7 ipv4 src-ipv4	Enable load balancing for RTAG7 for IPv4 for source IP.
(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 the neighbor at VTEP1 in the EVPN address family.
activate	, , , , , , , , , , , , , , , , , , ,
<pre>(config-router-af)#neighbor 3.3.3.3 activate</pre>	Activate the neighbor at VTEP3 in the EVPN address family.
<pre>(config-router-af)#neighbor 3.3.3.3 activate (config-router-af)#exit-adress-family</pre>	Activate the neighbor at VTEP3 in the EVPN address family. Exit address-family mode.
<pre>(config-router-af)#neighbor 3.3.3.3 activate (config-router-af)#exit-adress-family (config-router)#exit</pre>	Activate the neighbor at VTEP3 in the EVPN address family. Exit address-family mode. Exit router mode.
<pre>(config-router-af)#neighbor 3.3.3.3 activate (config-router-af)#exit-adress-family (config-router)#exit (config-router)#exit (config)#nvo vxlan enable</pre>	Activate the neighbor at VTEP3 in the EVPN address family. Exit address-family mode. Exit router mode. Enable VXLAN globally on this VTEP.
<pre>(config router af) #neighbor 1.1.1.1 activate (config-router-af) #neighbor 3.3.3.3 activate (config-router) #exit (config-router) #exit (config) #nvo vxlan enable (config) #nvo vxlan vtep-ip-global 2.2.2.2</pre>	Activate the neighbor at VTEP3 in the EVPN address family. Exit address-family mode. Exit router mode. Enable VXLAN globally on this VTEP. Assign a global IP to the VTEP.
<pre>(config router af) #neighbor 1.1.1.1 activate (config-router-af) #neighbor 3.3.3.3 activate (config-router) #exit-adress-family (config) #nvo vxlan enable (config) #nvo vxlan vtep-ip-global 2.2.2.2 (config) #nvo vxlan id 100001 ingress- replication</pre>	Activate the neighbor at VTEP3 in the EVPN address family. Exit address-family mode. Exit router mode. Enable VXLAN globally on this VTEP. Assign a global IP to the VTEP. Configure a VNID on this VTEP and enter NVO mode.
<pre>(config router af)#neighbor 1.1.1.1 activate (config-router-af)#neighbor 3.3.3.3 activate (config-router)#exit-adress-family (config)#nvo vxlan enable (config)#nvo vxlan vtep-ip-global 2.2.2.2 (config)#nvo vxlan id 100001 ingress- replication (config-nvo)#vxlan host-reachability- protocol evpn-bgp vrf_evpn_100</pre>	Activate the neighbor at VTEP3 in the EVPN address family. Exit address-family mode. Exit router mode. Enable VXLAN globally on this VTEP. Assign a global IP to the VTEP. Configure a VNID on this VTEP and enter NVO mode. Configure host-reachability-protocol as BGP-EVPN and associate the VNID with VRF vrf_evpn_100.
<pre>(config router af) #neighbor 1.1.1.1 activate (config-router-af) #neighbor 3.3.3.3 activate (config-router) #exit-adress-family (config) #nvo vxlan enable (config) #nvo vxlan vtep-ip-global 2.2.2.2 (config) #nvo vxlan id 100001 ingress- replication (config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100 (config-nvo) #exit</pre>	Activate the neighbor at VTEP3 in the EVPN address family. Exit address-family mode. Exit router mode. Enable VXLAN globally on this VTEP. Assign a global IP to the VTEP. Configure a VNID on this VTEP and enter NVO mode. Configure host-reachability-protocol as BGP-EVPN and associate the VNID with VRF vrf_evpn_100. Exit NVO mode.
<pre>(config router af)#neighbor 1.1111 activate (config-router-af)#neighbor 3.3.3.3 activate (config-router)#exit-adress-family (config)#nvo vxlan enable (config)#nvo vxlan vtep-ip-global 2.2.2.2 (config)#nvo vxlan id 100001 ingress- replication (config-nvo)#vxlan host-reachability- protocol evpn-bgp vrf_evpn_100 (config-nvo)#exit (config)#nvo vxlan access-if port-vlan xe3 2</pre>	Activate the neighbor at VTEP3 in the EVPN address family. Exit address-family mode. Exit router mode. Enable VXLAN globally on this VTEP. Assign a global IP to the VTEP. Configure a VNID on this VTEP and enter NVO mode. Configure host-reachability-protocol as BGP-EVPN and associate the VNID with VRF vrf_evpn_100. Exit NVO mode. Configure access-port xe3 and map vlan 2
<pre>(config router af) #neighbor 1.1111 activate (config-router-af) #neighbor 3.3.3.3 activate (config-router) #exit-adress-family (config) #nvo vxlan enable (config) #nvo vxlan enable (config) #nvo vxlan vtep-ip-global 2.2.2.2 (config) #nvo vxlan id 100001 ingress- replication (config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100 (config-nvo) #exit (config) #nvo vxlan access-if port-vlan xe3 2 (config-nvo-acc-if) #map vnid 100001</pre>	Activate the neighbor at VTEP3 in the EVPN address family. Exit address-family mode. Exit router mode. Enable VXLAN globally on this VTEP. Assign a global IP to the VTEP. Configure a VNID on this VTEP and enter NVO mode. Configure host-reachability-protocol as BGP-EVPN and associate the VNID with VRF vrf_evpn_100. Exit NVO mode. Configure access-port xe3 and map vlan 2 Map VNID 100001 to access-port xe3.
<pre>(config router af) #neighbor 1.1111 activate (config-router-af) #neighbor 3.3.3.3 activate (config-router) #exit-adress-family (config-router) #exit (config) #nvo vxlan enable (config) #nvo vxlan vtep-ip-global 2.2.2.2 (config) #nvo vxlan id 100001 ingress- replication (config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100 (config-nvo) #exit (config) #nvo vxlan access-if port-vlan xe3 2 (config-nvo-acc-if) #map vnid 100001 (config-nvo-acc-if) #exit</pre>	Activate the neighbor at VTEP3 in the EVPN address family. Exit address-family mode. Exit router mode. Enable VXLAN globally on this VTEP. Assign a global IP to the VTEP. Configure a VNID on this VTEP and enter NVO mode. Configure host-reachability-protocol as BGP-EVPN and associate the VNID with VRF vrf_evpn_100. Exit NVO mode. Configure access-port xe3 and map vlan 2 Map VNID 100001 to access-port xe3. Exit NVO access-if mode.
<pre>(config router af) #neighbor 1.1111 activate (config-router-af) #neighbor 3.3.3.3 activate (config-router) #exit-adress-family (config) #nvo vxlan enable (config) #nvo vxlan enable (config) #nvo vxlan vtep-ip-global 2.2.2.2 (config) #nvo vxlan id 100001 ingress- replication (config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100 (config-nvo) #exit (config) #nvo vxlan access-if port-vlan xe3 2 (config-nvo-acc-if) #map vnid 100001 (config-nvo-acc-if) #exit (config) #nvo vxlan id 200001 ingress- replication</pre>	Activate the neighbor at VTEP3 in the EVPN address family. Exit address-family mode. Exit router mode. Enable VXLAN globally on this VTEP. Assign a global IP to the VTEP. Configure a VNID on this VTEP and enter NVO mode. Configure host-reachability-protocol as BGP-EVPN and associate the VNID with VRF vrf_evpn_100. Exit NVO mode. Configure access-port xe3 and map vlan 2 Map VNID 100001 to access-port xe3. Exit NVO access-if mode. Configure second VNID on this VTEP and enter NVO mode.
<pre>(config router af) #neighbor 1.1111 activate (config-router-af) #neighbor 3.3.3.3 activate (config-router) #exit-adress-family (config) #nvo vxlan enable (config) #nvo vxlan enable (config) #nvo vxlan vtep-ip-global 2.2.2.2 (config) #nvo vxlan id 100001 ingress- replication (config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100 (config-nvo) #exit (config) #nvo vxlan access-if port-vlan xe3 2 (config-nvo-acc-if) #map vnid 100001 (config-nvo-acc-if) #exit (config) #nvo vxlan id 200001 ingress- replication (config-nvo) #vxlan host-reachability- protocol evpn-bgp vrf_evpn_100</pre>	Activate the neighbor at VTEP3 in the EVPN address family. Exit address-family mode. Exit router mode. Enable VXLAN globally on this VTEP. Assign a global IP to the VTEP. Configure a VNID on this VTEP and enter NVO mode. Configure host-reachability-protocol as BGP-EVPN and associate the VNID with VRF vrf_evpn_100. Exit NVO mode. Configure access-port xe3 and map vlan 2 Map VNID 100001 to access-port xe3. Exit NVO access-if mode. Configure host-reachability-protocol as BGP-EVPN and associate the VNID on this VTEP and enter NVO mode. Configure second VNID on this VTEP and enter NVO mode. Configure host-reachability-protocol as BGP-EVPN and associate the VNID with VRF vrf_evpn_100.

(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-adress-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 xel	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.
<pre>(config-if)#ip address 3.3.3.3/32 secondary</pre>	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).
<pre>(config) #router isis ABC (config-router) #is-type level-1</pre>	Create an IS-IS routing instance (ABC). Configure instance as level-1-only routing.
<pre>(config) #router isis ABC (config-router) #is-type level-1 (config-router) #net 49.0001.3333.3333.333.00</pre>	Create an IS-IS routing instance (ABC). Configure instance as level-1-only routing. Set a Network Entity Title for this instance, specifying the area address and the system ID.
<pre>(config) #router isis ABC (config-router) #is-type level-1 (config-router) #net 49.0001.3333.3333.00 (config-router) #exit</pre>	Create an IS-IS routing instance (ABC). Configure instance as level-1-only routing. Set a Network Entity Title for this instance, specifying the area address and the system ID. Exit router mode.
<pre>(config) #router isis ABC (config-router) #is-type level-1 (config-router) #net 49.0001.3333.3333.300 (config-router) #exit (config) #interface xel</pre>	Create an IS-IS routing instance (ABC). Configure instance as level-1-only routing. Set a Network Entity Title for this instance, specifying the area address and the system ID. Exit router mode. Enter interface mode.
<pre>(config) #router isis ABC (config-router) #is-type level-1 (config-router) #net 49.0001.3333.3333.333.00 (config-router) #exit (config) #interface xel (config) #interface xel</pre>	Create an IS-IS routing instance (ABC). Configure instance as level-1-only routing. Set a Network Entity Title for this instance, specifying the area address and the system ID. Exit router mode. Enter interface mode. Enable IS-IS routing on an interface (ABC).
<pre>(config) #router isis ABC (config-router) #is-type level-1 (config-router) #net 49.0001.3333.3333.00 (config-router) #exit (config) #interface xe1 (config) #interface xe1 (config-if) #ip router isis ABC (config-if) #isis circuit-type level-1</pre>	Create an IS-IS routing instance (ABC). Configure instance as level-1-only routing. Set a Network Entity Title for this instance, specifying the area address and the system ID. Exit router mode. Enter interface mode. Enable IS-IS routing on an interface (ABC). Configure instance as level-1-only routing.
<pre>(config) #router isis ABC (config-router) #is-type level-1 (config-router) #net 49.0001.3333.3333.333.00 (config-router) #exit (config) #interface xe1 (config-if) #ip router isis ABC (config-if) #isis circuit-type level-1 (config-if) #exit</pre>	Create an IS-IS routing instance (ABC). Configure instance as level-1-only routing. Set a Network Entity Title for this instance, specifying the area address and the system ID. Exit router mode. Enter interface mode. Enable IS-IS routing on an interface (ABC). Configure instance as level-1-only routing. Exit interface mode.
<pre>(config) #router isis ABC (config-router) #is-type level-1 (config-router) #net 49.0001.3333.3333.333.00 (config-router) #exit (config) #interface xe1 (config) #interface xe1 (config-if) #ip router isis ABC (config-if) #isis circuit-type level-1 (config-if) #exit (config) #interface xe2</pre>	Create an IS-IS routing instance (ABC).Configure instance as level-1-only routing.Set a Network Entity Title for this instance, specifying the area address and the system ID.Exit router mode.Enter interface mode.Enable IS-IS routing on an interface (ABC).Configure instance as level-1-only routing.Exit interface mode.Enter interface mode.Enter interface mode.Enter interface mode.Enter interface mode.Enter interface mode.
<pre>(config) #router isis ABC (config-router) #is-type level-1 (config-router) #net 49.0001.3333.3333.333.00 (config-router) #exit (config) #interface xe1 (config-if) #ip router isis ABC (config-if) #isis circuit-type level-1 (config-if) #exit (config-if) #exit (config) #interface xe2 (config) #interface xe2</pre>	Create an IS-IS routing instance (ABC). Configure instance as level-1-only routing. Set a Network Entity Title for this instance, specifying the area address and the system ID. Exit router mode. Enter interface mode. Enable IS-IS routing on an interface (ABC). Configure instance as level-1-only routing. Exit interface mode. Enter interface mode. Enter interface mode. Enter interface mode.
<pre>(config) #router isis ABC (config-router) #is-type level-1 (config-router) #net 49.0001.3333.3333.333.00 (config-router) #exit (config) #interface xe1 (config) #interface xe1 (config-if) #isis circuit-type level-1 (config-if) #exit (config-if) #exit (config) #interface xe2 (config-if) #ip router isis ABC (config-if) #ip router isis ABC</pre>	Create an IS-IS routing instance (ABC). Configure instance as level-1-only routing. Set a Network Entity Title for this instance, specifying the area address and the system ID. Exit router mode. Enter interface mode. Enable IS-IS routing on an interface (ABC). Configure instance as level-1-only routing. Exit interface mode. Enter interface mode. Enter interface mode. Enter interface mode. Enter interface mode. Enter interface mode. Enter interface mode. Configure instance as level-1-only routing.
<pre>(config) #router isis ABC (config-router) #is-type level-1 (config-router) #net 49.0001.3333.3333.333.00 (config-router) #exit (config) #interface xe1 (config-if) #ip router isis ABC (config-if) #isis circuit-type level-1 (config-if) #exit (config-if) #ip router isis ABC (config-if) #ip router isis ABC (config-if) #ip router isis ABC (config-if) #ip router isis ABC (config-if) #ip router isis ABC</pre>	Create an IS-IS routing instance (ABC). Configure instance as level-1-only routing. Set a Network Entity Title for this instance, specifying the area address and the system ID. Exit router mode. Enter interface mode. Enable IS-IS routing on an interface (ABC). Configure instance as level-1-only routing. Exit interface mode. Enter interface mode. Enter interface mode. Enable IS-IS routing on an interface (ABC). Configure instance as level-1-only routing. Exit interface mode. Enable IS-IS routing on an interface (ABC). Configure instance as level-1-only routing. Exit interface mode.
<pre>(config) #router isis ABC (config-router) #is-type level-1 (config-router) #net 49.0001.3333.3333.333.00 (config-router) #exit (config) #interface xe1 (config-if) #ip router isis ABC (config-if) #isis circuit-type level-1 (config) #interface xe2 (config) #interface xe2 (config-if) #ip router isis ABC (config-if) #ip router isis ABC (config-if) #ip router isis ABC (config-if) #ip router isis ABC</pre>	Create an IS-IS routing instance (ABC). Configure instance as level-1-only routing. Set a Network Entity Title for this instance, specifying the area address and the system ID. Exit router mode. Enter interface mode. Enable IS-IS routing on an interface (ABC). Configure instance as level-1-only routing. Exit interface mode. Enter interface mode. Enter interface mode. Enter interface mode. Enable IS-IS routing on an interface (ABC). Configure instance as level-1-only routing. Exit interface mode. Enter interface mode. Exit interface mode. Exit interface mode.
<pre>(config) #router isis ABC (config-router) #is-type level-1 (config-router) #net 49.0001.3333.3333.333.00 (config-router) #exit (config) #interface xe1 (config) #interface xe1 (config-if) #isis circuit-type level-1 (config-if) #exit (config) #interface xe2 (config-if) #ip router isis ABC (config-if) #ip router isis ABC (config-if) #ip router isis ABC (config-if) #ip router isis ABC (config-if) #ip router isis ABC</pre>	Create an IS-IS routing instance (ABC). Configure instance as level-1-only routing. Set a Network Entity Title for this instance, specifying the area address and the system ID. Exit router mode. Enter interface mode. Enable IS-IS routing on an interface (ABC). Configure instance as level-1-only routing. Exit interface mode. Enter interface mode. Enter interface mode. Enable IS-IS routing on an interface (ABC). Configure instance as level-1-only routing. Exit interface mode. Enable IS-IS routing on an interface (ABC). Configure instance as level-1-only routing. Exit interface mode. Enter interface mode. Enter interface mode. Enter interface mode.

(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)#load-balance rtag7	Enable load balancing for RTAG7 globally.
(config)#load-balance rtag7 ipv4 src-ipv4	Enable load balancing for RTAG7 for IPv4 for source IP.
(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 (RR1), and 65535 is the neighbor's AS number.
(config-router)#neighbor 1.1.1.1 update- source 3.3.3.3	Define BGP neighbor: 3.3.3.3 is the peer interface.
(config-router)#neighbor 2.2.2.2 remote-as 65535	Define BGP neighbor: 2.2.2.2 is the IP address of the neighbor (VTEP3), and 65535 is the neighbor's AS number.
(config-router)#neighbor 2.2.2.2 update- source 3.3.3.3	Define BGP neighbor: 3.3.3.3 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-adress-family	Exit address-family mode.
(config-router) #exit	Exit router mode.
(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 <pre>vrf_evpn_100.</pre>
(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-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 <pre>vrf_evpn_100</pre>
(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) #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 nv VXLAN Networl Source	vo vxlan tunnel k tunnel Entries Destination	Status	Up/Down	Update	
1.1.1.1	3.3.3.3	Installed	01:25:20	01:25:20	
1.1.1.1 Total number	2.2.2.2 of entries are 2	Installed	01:35:19	01:35:19	
VTEP2#show nv VXLAN Networl	vo vxlan tunnel k 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 ny	vo vxlan tunnel				
VXLAN Networl	k tunnel Entries				
Source	Destination	Status	Up/Down	Update	
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	VXLAN ARP-CACHE Information						
ARP Ti	ARP Timeout : 300 sec Random-Jitter-Max : 640						
VNID	Ip-Addr	Mac-Addr	Туре	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 entrie	s are 4					
ARP Ti	lmeout : 300 sec	Random-Jitter-Max :	640				
VNID	Ip-Addr	Mac-Addr	Туре	Age-Out	Retries-Left		
200	13.13.13.10	0000.0b60.25f2	Dynamic Remot	.e			
200	13.13.13.20	0000.0b60.25f3	Dynamic Local	. 257	2		
100	12.12.12.10	0000.0000.abab	Dynamic Remot	e			
100	12.12.12.20	0000.0000.cdcd	Dynamic Local	. 257	2		
Total	number of entrie	s are 4					

VTEP3#show nvo vxlan arp-cache VXLAN ARP-CACHE Information

_____ VNID Ip-Addr Mac-Addr Age-Out Retries-Left Туре 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 VlanId Inner-VlanId Mac-Addr VTEP-Ip/ESI Status Туре AccessPortDesc xel/1 1000 2000 0000.339a.9abb 33.33.33.0 1 Dynamic Local -----_____ ____ ___ ____ 0000.339a.9397 34.34.34.0 1 Dynamic Remote _____ _____ 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 Status AccessPortDesc Туре 0000 339a 9abb 33 33 33 0 1 ____ ___ ____

	Dynamic Local				
1	xe1/1	1000	2000	0000.339a.9397	34.34.34.0
	Dynamic Remot	е			
1				0000.5554.5400	55.55.55.0

Total number of entries are : 2

VTEP MAC-IP BGP EVPN Entries

VTEP-1#shc	ow bgp l2vpn	evpn mac-ip					
RD[1.1.1.1	1:1] VRF[vrf_	evpn_100]:					
ESI Nexthop	Eth-T GW-Typ	ag Mac-Addre e	ess II	P-Addres	ss V	VNID	L3VNID
0 1.1.1.1	100	0000:0000	:abab 12.12.	12.10	100	0	
0 1.1.1.1	200	0000 : 0b60:	:25f2 13.13	.13.10	200	0	
RD[2.2.2.2	2:1]						
ESI GW-Type	Eth-Tag	Mac-Address	IP-Address	VNID	L3VI	NID Ne	exthop
\cap	100	0000.0000.00	ded 12.12	12 20	100		0

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]						
ESI Nexthop	Eth-Tag GW-Type	Mac-Address	IP-Address	VNID		L3VNID
0 1.1.1.1	100	0000:0000:abab	12.12.12.10	100	0	
0 1.1.1.1	200	0000:0b60:25f2	13.13.13.10	200	0	
RD[2.2.2.2:1]	VRF[vrf_evpn	_100]:				
ESI Nexthop	Eth-Tag GW-Type	Mac-Address	IP-Address	VNID		L3VNID
0 2.2.2.2	100 _	0000:0000:cdcd	12.12.12.20	100	0	
0 2.2.2.2	100 _	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		Eth-Tag	Mac-Address	IP-Address
VNID	L3VNID	Nexthop	GW-Type	
0		100001	0000:0000:dddd	d b
100001	0	3.3.3.3		
0		100001	0000:0000:dddd	12.12.12.40
100001	0	3.3.3.3		
0		200001	0000:058e:2184	4
200001	0	3.3.3.3		
0		200001	0000:058e:2184	14.14.14.40
200001	0	3.3.3.3		
RD[1.1.1	.1:1]			
FOT	· · ·	Fth-Tag	Mac-Address	TP-Address

ESI VNTD	T.3VNTD	Eth-Tag Nexthon	Mac-Address IP-Address
0	LOVINID	100001	
100001	0	1.1.1.1	
0		100001	0000:0000:aaaa 12.12.12.10
100001	0	1.1.1.1	
0		100001	dddd:0000:0000
100001	0	1.1.1.1	
0		100001	0000:0000:bbbb 12.12.12.20
100001	0	1.1.1.1	
0		100001	0000:0000:cccc
100001	0	2.2.2.2	
0		100001	0000:0000:cccc 12.12.12.30
100001	0	2.2.2.2	
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	0	200001	0000:058e:2182
200001	0	1.1.1.1	
0	0	200001	0000:058e:2182 14.14.14.20
200001	0	1.1.1.1	
0	0	200001	0000:058e:2183
ZUUUUI	U	∠•∠•∠•∠	

0 200001 0 200001 0000:058e:2183 14.14.14.30 --

CHAPTER 2 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.EVPN Multi-homing helps in VTEP to host failure and VTEP 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 an 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 config 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 2-6: 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 pol	Enter interface mode for po1
(config-if)#switchport	Make it L2 interface
(config-if)#evpn multi-homed system-mac 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 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 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)

Generic Configuration

#configure terminal	Enter Configure mode.
(config) #evpn vxlan multihoming enable	Enable Multihoming, save configs and reboot the board for multihoming to be effective
(config)#qos enable	Enabling QoS
(config) #commit	Commit the candidate configuration to the running configuration

Interface and Loopback Configuration

(config)#interface pol	Enter Interface mode for po1 (MH1)
(config-if) #switchport	Make it L2 interface
<pre>(config-if)# evpn multi-homed system-mac 0000.0000.1111</pre>	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 xel0	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
<pre>(config-if)#ip address 1.1.1.1/32 secondary</pre>	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
<pre>(config-router)#neighbor 2.2.2.2 update- source lo</pre>	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
<pre>(config-router)#neighbor 3.3.3.3 update- source lo</pre>	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
<pre>(config-router-af)#neighbor 2.2.2.2 activate</pre>	Activate 2.2.2.2 (VTEP2) into ipv4 unicast address family mode
<pre>(config-router-af)#neighbor 3.3.3.3 activate</pre>	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
<pre>(config-router-af)#neighbor 2.2.2.2 activate</pre>	Activate 2.2.2.2 (VTEP2) into L2VPN evpn address family mode
<pre>(config-router-af)#neighbor 3.3.3.3 activate</pre>	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
(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 90	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 1.1.1.1	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.
<pre>(config) #nvo vxlan id 20 ingress-replication inner-vid-disabled</pre>	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 pol 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 pol 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 pol 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

VTEP2

(Multi-homed group1) – Part of both Multi-homed with p01. And it has xe32 as single home access-if port (SH2)

Generic Configuration

#configure terminal	Enter Configure mode.
(config) #evpn vxlan multihoming enable	Enable Multihoming, save configs and reboot the board for multihoming to be effective
(config)#qos enable	Enabling QoS
(config) #commit	Commit the candidate configuration to the running configuration

Interface and Loopback Configuration

(config)#interface pol	Enter Interface mode for po1 (MH1)
(config-if) #switchport	Make it L2 interface
<pre>(config-if)# evpn multi-homed system-mac 0000.0000.1111</pre>	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
<pre>(config-if)#ip address 2.2.2.2/32 secondary</pre>	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
<pre>(config-router)#neighbor 3.3.3.3 update- source lo</pre>	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
<pre>(config-router-af)#neighbor 1.1.1.1 activate</pre>	Activate 1.1.1.1 (VTEP2) into ipv4 unicast address family mode
<pre>(config-router-af)#neighbor 3.3.3.3 activate</pre>	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
<pre>(config-router-af)#neighbor 3.3.3.3 activate</pre>	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 2.2.2:11	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 2.2.2:21	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 90	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 pol 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 pol 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 pol 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) #commit	Commit the candidate configuration to the running configuration
(config) #exit	Exit from configuration mode

VTEP3

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

Generic Configuration

#configure terminal	Enter Configure mode.
(config) #evpn vxlan multihoming enable	Enable Multihoming, save configs and reboot the board for multihoming to be effective
(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	Add 50.50.50.0 (Spine1) network into area 0
(config-router)#network 60.60.60.0/24 area 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
<pre>(config-router)#neighbor 2.2.2.2 update- source lo</pre>	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
<pre>(config-router-af)#neighbor 2.2.2.2 activate</pre>	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
(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	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 3.3.3.3:11	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 VRF2 name and enter into VRF mode		
(config-vrf) #rd 3.3.3.3:21	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		
(config) #commit	Commit the candidate configuration to the running configuration		

VxLAN Configuration

(config)#nvo vxlan enable	Enable VxLAN
(config)#nvo vxlan vtep-ip-global 3.3.3.3	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.
<pre>(config) #nvo vxlan id 20 ingress-replication inner-vid-disabled</pre>	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 xe48 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 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 pol	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		
<pre>(config-if)#switchport hybrid allowed vlan add 1001-1002,3001 egress-tagged enable</pre>	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)#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) #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

#configure terminal	Enter Configure mode.
(config)#qos enable	Enabling QoS
(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 xel	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 xel8	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	Add 30.30.30.0 (VTEP2) network into area 0
(config-router)#network 50.50.50.0/24 area 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-if) #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	Configure router-id as 11.11.11.11 (lo IP address)
(config-router)#network 22.22.22.22/32 area 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	Add 20.20.20.0 (VTEP1) network into area 0
(config-router)#network 40.40.40.0/24 area 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	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-if) #exit	Exit Interface mode and return to Configure mode.
(config) #commit	Commit the candidate configuration to the running configuration

Validation

VTEP1

VTEP1#sh VXLAN In	ow nvo vx formation	lan				
Codes	: NW - Ne AC - Ac (u) - Un	twork Port cess Port: tagged	5			
VNID Src-Addr	VNI-Name	VNI-Ty Dst-Addr	уре Тур	e Inter	rface ESI	VLAN DF-Status
 10 1.1.1.1	VNI-RED	L2 3.3.3.3	NW			
10 1.1.1.1	VNI-RED	L2 2.2.2.2	NW			
10	VNI-RED		AC	pol	00:00:00:00:00:11:11:00:00:	00 1001 NON-DF
10	VNI-RED		AC	pol	00:00:00:00:00:11:11:00:00:	:00 1002 DF
20 1.1.1.1	VNI-BLUE	L2 3.3.3.3	NW			
20 1.1.1.1	VNI-BLUE	L2 2.2.2.2	NW			
20	VNI-BLUE		AC	pol	00:00:00:00:00:11:11:00:00:	00 3001 NON-DF
Total nu	mber of e	entries are	e 7			
VTEP1#sh	low nvo vx	lan access	s-if br	ief		
Interfac	e Vlan	Inner vlan Ifir	ndex V	nid	Admin Link status status	

pol	1002	 500001	10	up	up
pol	1001	 500000	10	up	up
pol	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 PfxRcd AI	D MACIP	V AS MCAST	S MsgRcv ESI PREFIX	MsgSen K-ROUTE	TblVer	InQ	OutQ	Up/Down	State/
2.2.2.2 6 3	0	4 500 2 1	161 0	163	5	0	0 01:0)5:15	
3.3.3.3 2 0	0	4 500 2 0	157 0	161	5	0	0 01:0)5:07	
Total number	of neig	hbors 2							
Total number	of Esta	blished s	essions 2						
VTEP1#show nv VXLAN Networ} Source	vo vxlan k tunnel Des	tunnel Entries tination	Status		Up/Do	wn	Upda	ate	
1.1.1.1	3.3		Installe	====== ed	00:31	======= :11	 00:3	====== 31:11	
1.1.1.1	2.2	.2.2	Installe	ed	01:05	:25	00:3	31:11	
Total number	of entr	ies are 2							
VTEP1#show bo	gp 12vpn	evpn mul	tihoming es-1	route					
RD[1.1.1.1:1]] VRF[ev]	pn-gvrf-1]: PE IP-Addre	as N	exthop T	ו ס	Encan		
00.00.00.00.00.00	0.11.11	• • • • • • • • • • • •	1 1 1 1	255 IN 1	1 1 1	г 1 т	UYTAN		
00:00:00:00:00:00:00	0:11:11 0:11:11	:00:00:00	2.2.2.2	2	.2.2.2	7	VXLAN		
RD[2.2.2.2:1]]					_	_		
ESI 00:00:00:00:00:0	00:11:11	:00:00:00	PE 1P-Addre 2.2.2.2	ess N 2	exthop 1 .2.2.2	Р 1	Encap VXLAN		
VTEP1#show bo	gp 12vpn	evpn mul	tihoming ethe	ernet-a	d-per-es				
RD[1.1.1.1:1]] VRF[ev]	pn-gvrf-1]:						
ESI			Eth-Tag	VNID/	LABEL	Nexth	op IP	Encap	
00:00:00:00:00	0:11:11	:00:00:00	4294967295	0		1.1.1	.1	VXLAN	
RD[1.1.1.1:11	L] VRF[V	RF1]:		(_	
ESI	0 11 11		Eth-Tag	VNID/	LABEL	Nexth	op IP	Encap	
00:00:00:00:00	00:11:11	:00:00:00	4294967295	0		2.2.2	• 2	VXLAN	
RD[1.1.1.1:21	L] VRF[V	RF2]:							
ESI			Eth-Tag	VNID/	LABEL	Nexth	op IP	Encap	
00:00:00:00:00	0:11:11	:00:00:00	4294967295	0		2.2.2	.2	VXLAN	
RD[2.2.2.2:1]]								
ESI			Eth-Tag	VNID/	LABEL	Nexth	op IP	Encap	
00:00:00:00:00	00:11:11	:00:00:00	4294967295	0		2.2.2	.2	VXLAN	
VTEP1#show bo	gp 12vpn	evpn mul	tihoming ethe	ernet-a	d-per-ev	i			

RD[1.1.1:11] VRF[VRF1]:

ESI 00:00:00:00:00:11:11:00:00:00 00:00:00:00:00:11:11:00:00:00	Eth-Tag 10 10	VNID/LABEL 10 10	Nexthop 2.2.2.2 1.1.1.1	IP Encap VXLAN VXLAN	
RD[1.1.1.1:21] VRF[VRF2]: ESI 00:00:00:00:00:11:11:00:00:00 00:00:00:00:00:11:11:00:00:00	Eth-Tag 20 20	VNID/LABEL 20 20	Nexthop 2.2.2.2 1.1.1.1	IP Encap VXLAN VXLAN	
RD[2.2.2.2:11] ESI 00:00:00:00:00:11:11:00:00:00	Eth-Tag 10	VNID/LABEL 10	Nexthop 2.2.2.2	IP Encap VXLAN	
RD[2.2.2.2:21] ESI 00:00:00:00:00:11:11:00:00:00	Eth-Tag 20	VNID/LABEL 20	Nexthop 2.2.2.2	IP Encap VXLAN	
<pre>VTEP1#show bgp l2vpn evpn BGP table version is 6, local Status codes: s suppressed, d l - labeled, S S Origin codes: i - IGP, e - EGP</pre>	router ID is damped, h hi tale , ? - incomp	1.1.1.1 story, * val lete	id, > best,	i - internal,	
<pre>[EVPN route type]:[ESI]:[VNID] 1 - Ethernet Auto-discovery Ro 2 - MAC/IP Route 3 - Inclusive Multicast Route 4 - Ethernet Segment Route 5 - Prefix Route</pre>	:[relevent r ute	oute informa	ntion]		
Network Next Hop Encap	Metri	c LocPrf	Weight	Path Peer	
RD[1.1.1.1:1] VRF[evpn-gvrf-1] *> [1]:[00:00:00:00:00:11:11 1.1.1.1	: :00:00:00]:[4294967295]: 0	[0] 100	32768 i ·	
*> [4]:[00:00:00:00:00:11:11 VXLAN	:00:00:00]:[32,1.1.1.1] 0	100	32768 i ·	
* i [4]:[00:00:00:00:00:11:11 2.2.2.2 VXLAN]:[00:00:00] 0	32,2.2.2.2] 100	0	i 2.2.2.2	
RD[1.1.1.1:11] VRF[VRF1]: * i [1]:[00:00:00:00:00:11:11 2.2.2.2	:00:00:00]:[0	10]:[10] 100	0	i 2.2.2.2	
VXLAN *> 1.1.1.1 VXLAN * i [1]:[00:00:00:00:00:11:11	:00:00:001:[0 42949672951:	100	32768 i ·	

17VT 71	NĪ	2.2.2.2	0	100	0	i 2.2.	.2.2
*>	[3]:[10]:[32,1	.1.1.1]					
	VXLAN	1.1.1.1	0	100)	32768	i
* i	[3]:[10]:[32,2	.2.2.2]	0	100	0	i 2 2	2 2
VXLAI	N	2.2.2.2	0	100	0	1 2.2	
* i	[3]:[10]:[32,3	.3.3.3] 3.3.3.3	0	100	0	i 3.3.	.3.3
VXLAI	N						
RD[1	.1.1.1:21] VRF[VRF2]:					
* i	[1]:[00:00:00:	00:00:11:11:00:00:	00]:[20]	:[20]	0		0.0
VXLAI	N	2.2.2.2	0	100	0	1 2.2	.2.2
*>	VXLAN	1.1.1.1	0	100)	32768	i
* i	[1]:[00:00:00:	00:00:11:11:00:00:	00]:[429	4967295] : [0]			
VXLAI	N	2.2.2.2	0	100	0	i 2.2	.2.2
*>	[3]:[20]:[32,1	.1.1.1]					
		1.1.1.1	0	100)	32768	i
 * i	VXLAN	.2.2.21					
-	[0].[10].[01,1	2.2.2.2	0	100	0	i 2.2.	.2.2
VXLAI	N						
* i	[3]:[20]:[32,3	.3.3.3]	0	1.0.0	2		
VXLAI	N	3.3.3.3	0	100	0	1 3.3	.3.3
RD[2	.2.2.2:1]	00.00.11.11.00.00.	001.[400	40672051.[0]			
^>1	[1]:[00:00:00:	2 2 2 2	00]:[429	4967295j:[U] 100	0	i 2 2	2 2
VXLAI	N		0	100	0	I 2.2	
*>i	[4]:[00:00:00:	00:00:11:11:00:00:	00]:[32,	2.2.2.2]			
יע.דעע	M	2.2.2.2	0	100	0	i 2.2.	.2.2
V 23 III 11	- V						
RD[2	.2.2.2:11]						
*>i	[1]:[00:00:00:	00:00:11:11:00:00:	00]:[10]	:[10]			
יע דעע	M	2.2.2.2	0	100	0	i 2.2.	.2.2
*>i	[3]:[10]:[32,2	.2.2.2]					
	,	2.2.2.2	0	100	0	i 2.2.	.2.2
VXLAI	N						
RD[2	.2.2.2:211						
*>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
VXLAI		2 2 21					
^ >1	[3]:[20]:[32,2	2 2 2 2 2	0	100	Ο	i 2 2	2 2
VXLAI	N		U U	700	0	т с. <i>с</i> .	

RD[3.3.3.3:11] *>i [3]:[10]:[32,3.3.	.3.3]						
3 VXI.AN	.3.3.3		0 1	00	0	i 3	3.3.3.3
RD[3.3.3.3:21] *>i [3]:[20]:[32,3.3.	.3.3]				<u>,</u>		
VXLAN 3	.3.3.3		0]	100	U	1 3	3.3.3.3
Total number of prefix	xes 21						
VTEP2							
VTEP2#show nvo vxlan VXLAN Information							
Codes: NW - Network AC - Access (u) - Untagge	k Port Port ed						
VNID VNI-Name V Src-Addr Dst-A	VNI-Type Typ Addr	be Inter	face ESI			7	VLAN DF-Status
10 VNI-RED 1 2.2.2.2 1.1.1	L2 NW						
10 VNI-RED 1 2.2.2.2 3.3.3	L2 NW 3.3						
10 VNI-RED -	- AC	xe32	Si	ngle Homed	Port		
10 VNI-RED -	– AC	pol	00:00:	00:00:00:11	:11:00:00	:00	1001 DF
10 VNI-RED -	– AC	pol	00:00:0	00:00:00:11	:11:00:00	:00	1002 NON-DF
20 VNI-BLUE 2.2.2.2 1.1.1	L2 NW L.1						
20 VNI-BLUE 2.2.2.2 3.3.3	L2 NW 3.3						
20 VNI-BLUE -	- AC	pol	00:00:	00:00:00:11	:11:00:00	:00	3001 DF
Total number of entrie	es are 8						
VTEP2#show nvo vxlan a % Incomplete command.	access-if						
VTEP2#show nvo vxlan a	access-if bi	rief					
Inner Interface Vlan vlan	f Ifindex N	/nid	Admin status	Link status			

xe32			500	004	10	up	up				
pol	1002		500	001	10	up	up				
pol	1001		500	000	10	up	up				
pol	3001		500	002	20	up	up				
Total numb	per of e	entri	es ar	e 4							
VTEP2#show	<i>i</i> bgp 12	vpn	evpn	summ	ary						
BGP router	: identi	fier	2.2.	2.2,	local AS	number	500				
BGP table	versior	n is	4								
1 BGP AS-E	PATH ent	ries									
0 BGP comm	nunity e	entri	es								
Neighbor PfxRcd	AD MA	CIP	V MCAS	AS T	MsgRcv ESI PREI	MsgS FIX-ROU	en TblVer TE	InQ	OutQ	Up/Down	State/
1.1.1.1	0		4 2	500 1	172 0	171	4	0	0 01:	09:28	
3.3.3.3	-		4	500	165	173	4	0	0 01:	09:29	
2 0	0		2	0	0						
Total numb	ber of r	neigh	bors	2							
Total numb	per of E	lstab	lishe	d se	ssions 2						
VTEP2#show	nvo vx	lan	tunne	1							
VXLAN Netw	ork tur	nel	Entri	es							
Source		Dest	inati	on	Statu	S	Up/Do	own	Upo	date	
2.2.2.2		1.1.	 1.1		Insta	lled	01:09	9:38	00:	:35:24	
2.2.2.2		3.3.	3.3		Insta	lled	01:09	9:39	01:	:09:39	
Total numb	ber of e	entri	es ar	e 2							
VTEP2#show	/ bgp 12	vpn	evpn	mult	ihoming e:	s-route					
RD[1.1.1.1	:1]										
ESI					PE IP-Ado	dress	Nexthop 1	ΓP	Encap		
00:00:00:0	0:00:11	:11:	00:00	:00	1.1.1.1		1.1.1.1		VXLAN		
RD[2.2.2.2	2:1] VRE	[evp	n-gvr	f-1]	:						
ESI					PE IP-Ado	dress	Nexthop 1	ΓP	Encap		
00:00:00:0	0:00:11	:11:	00:00	:00	1.1.1.1		1.1.1.1		VXLAN		
00:00:00:0	0:00:11	:11:	00:00	:00	2.2.2.2		2.2.2.2		VXLAN		
VTEP2#show	ı bgp 12	vpn	evpn	mult	ihoming et	thernet	-ad-per-es	5			
RD[1.1.1.1	:1]										
ESI					Eth-Tag	VNI	D/LABEL	Next	thop IP	Encap	
00:00:00:0	0:00:11	:11:	00:00	:00	42949672	95 0		1.1	.1.1	VXLAN	
RD[2.2.2.2	2:1] VRE	[evp	n-gvr	f-1]	:						
ESI					Eth-Tag	VNI	D/LABEL	Next	thop IP	Encap	

00:00:00:00:00:11:11:00:00:00 4294967295 0 2.2.2.2 VXLAN RD[2.2.2.2:11] VRF[VRF1]: EST Eth-Tag VNID/LABEL Nexthop IP Encap 00:00:00:00:00:11:11:00:00:00 4294967295 1.1.1.1 VXLAN 0 RD[2.2.2:21] VRF[VRF2]: ESI VNID/LABEL Nexthop IP Eth-Tag 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[1.1.1:11] ESI Eth-Tag VNID/LABEL Nexthop IP Encap 00:00:00:00:00:11:11:00:00:00 1.1.1.1 10 10 VXLAN RD[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[2.2.2:11] VRF[VRF1]: Eth-Tag VNID/LABEL Nexthop IP EST Encap 00:00:00:00:00:11:11:00:00:00 2.2.2.2 10 10 VXLAN 00:00:00:00:00:11:11:00:00:00 10 10 1.1.1.1 VXLAN RD[2.2.2:21] VRF[VRF2]: VNID/LABEL Nexthop IP ESI Eth-Tag 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 1.1.1.1 20 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, 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 Weight Network Next Hop Metric LocPrf Path Peer Encap RD[1.1.1:1] *>i [1]:[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]

VXLAN		1.1.1.1	0	100		0	i 1.1.	1.1	
RD[1.1.1	.1:11]								
*>i [1]	:[00:00:00:0	0:00:11:11:00:00:0	0]:[10]:[2	10]					
		1.1.1.1	0	100		0	i 1.1.	1.1	
VXLAN	. [10] . [20] 1	1 1 1 1							
~>I [3]	:[10]:[32,1.	· ⊥ • ⊥ • ⊥] 1 1 1 1 1	0	100		0	i 1 1	1 1	
VXLAN		±•±•±•±	0	100		0		±•±	
	1 013								
RD[1.1.1	.1:21]	0.00.11.11.00.00.0	01.[001.[201					
^/1 [1]	:[00:00:00:0		0]:[20]:[.	20]		0	; 1 1	1 1	
VXLAN		1.1.1.	0	100		0	1 1.1.	1 • 1	
*>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[63	von-avrf-11.							
*> [1]	:[00:00:00:0)0:00:11:11:00:00:0	01:[42949	672951	:[0]				
. L – J		2.2.2.2	0]	100		32768	i	
	VXLAN								
* i [4]	:[00:00:00:0	0:00:11:11:00:00:0	0]:[32,1.]	1.1.1]					
		1.1.1.1	0	100		0	i 1.1.	1.1	
VXLAN		0.00.11.11.00.00.0	01.000	0 0 01					
*> [4]	:[00:00:00:0		0]:[32,2	2.2.2]	100		20760	2	
	VXLAN	2.2.2.2	U		100		32700	Ţ	
RD[2.2.2	.2:11] VRF[\	/RF1]:							
*> [1]	:[00:00:00:0	0:00:11:11:00:00:0	0]:[10]:[1	10]	1.0.0		00760		
	VXLAN	2.2.2.2	0		100		32768	l	
* i		1.1.1.1	0	100		0	i 1.1.	1.1	
VXLAN			-			-			
* i [1]	:[00:00:00:0	0:00:11:11:00:00:0	0]:[42949	67295]	:[0]				
		1.1.1.1	0	100		0	i 1.1.	1.1	
VXLAN	. [10] . [20] 1	1 1 1 1							
^ 1 [3]	:[10]:[32,1.	• ⊥ • ⊥ • ⊥] 1 1 1 1 1	0	100		0	4 1 1	1 1	
VXLAN			0	100		0	1 1.1.	1.1	
*> [3]	:[10]:[32,2.	.2.2.2]							
		2.2.2.2	0		100		32768	i	
	VXLAN								
* i [3]	:[10]:[32,3.	.3.3.3]							
ΩΥΤ ΛΝΙ		3.3.3.3	0	100		0	i 3.3.	3.3	
V ЛЦЦЦ V									
RD[2.2.2	.2:21] VRF[\	/RF2]:							
*> [1]	:[00:00:00:0	0:00:11:11:00:00:0	0]:[20]:[2	20]					
		2.2.2.2	0		100		32768	i	
	VXLAN								

* i VXLAN		1.1.1.1		0	1	L00		0	i	1.1.1.	. 1
* i [1]	:[00:00:00:0	00:00:11:1 1.1.1.1	1:00:	:00:00]: 0	4294967. 1	295]: 100	[0]	0	i	1.1.1.	.1
* i [3]	:[20]:[32,1	.1.1.1] 1.1.1.1		0	1	00		0	i	1.1.1.	. 1
VXLAN *> [3]	:[20]:[32,2	.2.2.2]	2		0		100		207	60 -	
	VXLAN	2.2.2.	Ζ		0		100		521	00 1	
* i [3]	:[20]:[32,3	.3.3.3]									
VXLAN		3.3.3.3		0	1	00		0	i	3.3.3.	. 3
RD[3.3.3	3.3:11]										
*>i [3]	:[10]:[32,3	.3.3.3]									
VXLAN		3.3.3.3		0	1	_00		0	i	3.3.3.	. 3
RD[3.3.3	3.3:21]										
*>i [3]	:[20]:[32,3	.3.3.3]		0	-	0.0		0		~ ~ ~ ~	2
VXLAN		3.3.3.3		0	1	100		0	l	3.3.3.	. 3
Total nu	mber of pre:	fixes 21									
VTEP3											
VTEP3# VXLAN Ir	show nvo vx formation	lan									
Codes	: NW - Netwo AC - Acces (u) - Untag	ork Port ss Port gged									
VNID Src-Addr	VNI-Name Ds	VNI-Type t-Addr	туре	e Interfa	ice ESI					VLAN I)F-Status
10	VNI-RED	L2	NW								
3.3.3.3	2.2 VNI-RED	2.2.2 L2	NW								
3.3.3.3 10	1.1 VNI-RED	1.1.1	AC	xe48	Si	ngle	Homed	Port		1001	
 10	 VNI-RED		AC	xe48	Si	ngle	Homed	Port		1002	
20	VNI-BLUE	 L2	NW								
20 27 2 2 2 2 2	VNI-BLUE	L2 L2	NW								
20	VNI-BLUE	 	AC	xe48	Si	ngle	Homed	Port		3001	

Total number of entries are 7 VTEP3#show nvo vxlan access-if brief Inner Admin Link Interface Vlan vlan Ifindex Vnid status 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 V AS MsgRcv MsgSen TblVer InQ OutQ Up/Down State/ PfxRcd AD MACIP MCAST ESI PREFIX-ROUTE 3 1.1.1.1 4 500 177 173 0 0 01:11:49 0 2 0 3 1 6 171 2 2.2.2.2 500 177 0 0 01:11:59 4 2 3 0 0 6 1 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 01:12:00 01:12:00 Installed Total number of entries are 2 VTEP3#show bgp 12vpn evpn multihoming es-route RD[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[2.2.2:1] ESI PE IP-Address Nexthop IP Encap 2.2.2.2 00:00:00:00:00:11:11:00:00:00 2.2.2.2 VXLAN

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

RD[1.1.1:1] ESI Eth-Tag VNID/LABEL Nexthop IP Encap 00:00:00:00:00:11:11:00:00:00 4294967295 1.1.1.1 VXLAN \cap RD[2.2.2:1] ESI Eth-Tag VNID/LABEL Nexthop IP Encap 00:00:00:00:00:11:11:00:00:00 4294967295 2.2.2.2 0 VXLAN RD[3.3.3:11] VRF[VRF1]: ESI VNID/LABEL Nexthop IP Eth-Tag 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 1.1.1.1 4294967295 0 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 1.1.1.1 VXLAN 0 VTEP3#show bgp 12vpn evpn multihoming ethernet-ad-per-evi RD[1.1.1:11] VNID/LABEL Nexthop IP ESI Eth-Tag Encap 00:00:00:00:00:11:11:00:00:00 10 10 1.1.1.1 VXLAN RD[1.1.1:21] VNID/LABEL Nexthop IP ESI Eth-Tag Encap 00:00:00:00:00:11:11:00:00:00 20 20 1.1.1.1 VXLAN RD[2.2.2:11] VNID/LABEL EST Eth-Tag Nexthop IP Encap 00:00:00:00:00:11:11:00:00:00 2.2.2.2 10 10 VXLAN RD[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 2.2.2.2 10 10 VXLAN 1.1.1.1 00:00:00:00:00:11:11:00:00:00 10 10 VXLAN RD[3.3.3.3:21] VRF[VRF2]: ESI Nexthop IP Eth-Tag VNID/LABEL 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 1.1.1.1 20 20 VXLAN VTEP3#show bgp 12vpn 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,

```
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
                 Next Hop
                              Metric
                                         LocPrf
                                                     Weight
                                                              Path Peer
Encap
RD[1.1.1:1]
*>i [1]:[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
                                            100
                                                        0
                                                               i 1.1.1.1
                                    0
VXLAN
RD[1.1.1:11]
0
                                                        0
                                                               i 1.1.1.1
                  1.1.1.1
                                            100
VXLAN
*>i [3]:[10]:[32,1.1.1.1]
                  1.1.1.1
                                    0
                                            100
                                                        0
                                                               i 1.1.1.1
VXLAN
RD[1.1.1:21]
*>i [1]:[00:00:00:00:11:11:00:00:00]:[20]:[20]
                                                               i 1.1.1.1
                  1.1.1.1
                                    0
                                            100
                                                        0
VXLAN
*>i [3]:[20]:[32,1.1.1.1]
                  1.1.1.1
                                    0
                                            100
                                                        0
                                                               i 1.1.1.1
VXLAN
RD[2.2.2:1]
*>i [1]:[00:00:00:00:00:11:11:00:00:00]:[4294967295]:[0]
                                                               i 2.2.2.2
                  2.2.2.2
                                    0
                                            100
                                                        0
VXLAN
*>i [4]:[00:00:00:00:11:11:00:00:00]:[32,2.2.2.2]
                                                               i 2.2.2.2
                  2.2.2.2
                                    0
                                            100
                                                        0
VXLAN
RD[2.2.2:11]
i 2.2.2.2
                  2.2.2.2
                                    0
                                            100
                                                        0
VXLAN
*>i [3]:[10]:[32,2.2.2]
                  2.2.2.2
                                    0
                                            100
                                                        0
                                                               i 2.2.2.2
VXLAN
```

RD[2.2.2 *>i [1]	.2:21] :[00:00:00:00:0	0:00:11:11:00:00:0	01:[201:[2	201				
		2.2.2.2	0	100	0	i	2.2.2.2	
VXLAN								
*>i [3]	:[20]:[32,2.	.2.2.2]	0	1 0 0	0		0 0 0 0	
VXLAN		2.2.2.2	0	100	U	1	2.2.2.2	
RD[3.3.3	.3:11] VRF[\	/RF1]:						
* i [1]	:[00:00:00:0	0:00:11:11:00:00:0	0]:[10]:[1	0]				
		2.2.2.2	0	100	0	i	2.2.2.2	
VXLAN		1 1 1 1	0	100	0	2	1 1 1 1	
^ _ VXLAN			0	100	0	T	1.1.1.1	
* i [1]	:[00:00:00:0	0:00:11:11:00:00:0	0]:[429496	57295] : [0]				
VXLAN		2.2.2.2	0	100	0	i	2.2.2.2	
* i VXLAN		1.1.1.1	0	100	0	i	1.1.1.1	
* i [3]	:[10]:[32,1.	.1.1.1]						
		1.1.1.1	0	100	0	i	1.1.1.1	
VXLAN	[10] [00 0	0 0 01						
* 1 [3]	:[10]:[32,2.	. 2 . 2 . 2	0	100	0	:		
VXLAN		2.2.2.2	0	100	0	T	2.2.2.2	
*> [3]	:[10]:[32,3.	.3.3.3]	0	100		207	co '	
*> [3]	:[10]:[32,3. VXLAN	.3.3.3] 3.3.3.3	0	100		327	68 i	
*> [3] RD[3,3,3	:[10]:[32,3. VXLAN	.3.3.3] 3.3.3.3	0	100		327	68 i	
<pre>*> [3] RD[3.3.3 * i [1]</pre>	:[10]:[32,3. VXLAN .3:21] VRF[V :[00:00:00:0	.3.3.3] 3.3.3.3 /RF2]: 00:00:11:11:00:00:0	0	100		327	68 i	
<pre>*> [3] RD[3.3.3 * i [1]</pre>	:[10]:[32,3. VXLAN .3:21] VRF[V :[00:00:00:0	.3.3.3] 3.3.3.3 /RF2]: 00:00:11:11:00:00:0 2.2.2.2	0 0]:[20]:[2 0	100 20] 100	0	327 i	68 i 2.2.2.2	
<pre>*> [3] RD[3.3.3 * i [1] VXLAN</pre>	:[10]:[32,3. VXLAN .3:21] VRF[V :[00:00:00:0	.3.3.3] 3.3.3.3 /RF2]: 00:00:11:11:00:00:0 2.2.2.2	0 0]:[20]:[2 0	100 20] 100	0	327 i	68 i 2.2.2.2	
<pre>*> [3] RD[3.3.3 * i [1] VXLAN * i VYLAN</pre>	:[10]:[32,3. VXLAN .3:21] VRF[V :[00:00:00:0	.3.3.3] 3.3.3.3 /RF2]: 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1	0 0]:[20]:[2 0 0	100 20] 100 100	0 0	327 i i	68 i 2.2.2.2 1.1.1.1	
<pre>*> [3] RD[3.3.3 * i [1] VXLAN * i VXLAN * i VXLAN * i [1]</pre>	:[10]:[32,3. VXLAN .3:21] VRF[V :[00:00:00:0	.3.3.3] 3.3.3.3 VRF2]: 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1	0 0]:[20]:[2 0 0 0]:[429496	100 20] 100 100	0 0	327 i i	68 i 2.2.2.2 1.1.1.1	
<pre>*> [3] RD[3.3.3 * i [1] VXLAN * i VXLAN * i VXLAN * i [1]</pre>	:[10]:[32,3. VXLAN .3:21] VRF[V :[00:00:00:0	.3.3.3] 3.3.3.3 VRF2]: 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1 00:00:11:11:00:00:0 2.2.2.2	0 0]:[20]:[2 0 0 0]:[429496 0	100 20] 100 100 57295]:[0] 100	0 0	327 i i	68 i 2.2.2.2 1.1.1.1 2.2.2.2	
<pre>*> [3] RD[3.3.3 * i [1] VXLAN * i VXLAN * i [1] VXLAN VXLAN</pre>	:[10]:[32,3. VXLAN .3:21] VRF[V :[00:00:00:0	.3.3.3] 3.3.3.3 VRF2]: 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1 00:00:11:11:00:00:0 2.2.2.2	0 0]:[20]:[2 0 0 0]:[429496 0	100 20] 100 100 57295]:[0] 100	0 0 0	327 i i	68 i 2.2.2.2 1.1.1.1 2.2.2.2	
<pre>*> [3] RD[3.3.3 * i [1] VXLAN * i VXLAN * i [1] VXLAN * i VXLAN * i VXLAN</pre>	:[10]:[32,3. VXLAN .3:21] VRF[V :[00:00:00:0	.3.3.3] 3.3.3.3 VRF2]: 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1	0 0]:[20]:[2 0 0 0]:[429496 0 0	100 20] 100 100 57295]:[0] 100 100	0 0 0	327 i i i	68 i 2.2.2.2 1.1.1.1 2.2.2.2 1.1.1.1	
<pre>*> [3] RD[3.3.3 * i [1] VXLAN * i [1] VXLAN * i [1] VXLAN * i [3]</pre>	:[10]:[32,3. VXLAN .3:21] VRF[V :[00:00:00:0 :[00:00:00:0	.3.3.3] 3.3.3.3 VRF2]: 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1	0 0]:[20]:[2 0 0 0]:[429496 0 0	100 20] 100 100 57295]:[0] 100 100	0 0 0 0	327 i i i	68 i 2.2.2.2 1.1.1.1 2.2.2.2 1.1.1.1	
<pre>*> [3] RD[3.3.3 * i [1] VXLAN * i [1] VXLAN * i [1] VXLAN * i [3] VXLAN</pre>	:[10]:[32,3. VXLAN .3:21] VRF[V :[00:00:00:0 :[00:00:00:0 :[20]:[32,1.	.3.3.3] 3.3.3.3 VRF2]: 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1 1.1.1.1 1.1.1.1	0 0]:[20]:[2 0 0 0]:[429496 0 0 0	100 20] 100 100 57295]:[0] 100 100	0 0 0 0	327 i i i i	68 i 2.2.2.2 1.1.1.1 2.2.2.2 1.1.1.1 1.1.1.1	
<pre>*> [3] RD[3.3.3 * i [1] VXLAN * i [1] VXLAN * i [1] VXLAN * i [3] VXLAN * i [3]</pre>	:[10]:[32,3. VXLAN .3:21] VRF[V :[00:00:00:0 :[00:00:00:0 :[20]:[32,1.	.3.3.3] 3.3.3.3 VRF2]: 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1 1.1.1.1 .1.1.1 2.2.2.2	0 0]:[20]:[2 0 0 0]:[429496 0 0 0	100 20] 100 100 57295]:[0] 100 100	0 0 0 0	327 i i i	68 i 2.2.2.2 1.1.1.1 2.2.2.2 1.1.1.1 1.1.1.1	
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<pre>*> [3] RD[3.3.3 * i [1] VXLAN * i [1] VXLAN * i [1] VXLAN * i [3] VXLAN * i [3] VXLAN</pre>	:[10]:[32,3. VXLAN .3:21] VRF[V :[00:00:00:0 :[00:00:00:0 :[20]:[32,1. :[20]:[32,2.	.3.3.3] 3.3.3.3 VRF2]: 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1 1.1.1.1 .1.1.1 2.2.2.2 2.2.2.2	0 0]:[20]:[2 0 0 0]:[429496 0 0 0 0 0	100 20] 100 100 57295]:[0] 100 100 100		327 i i i i	68 i 2.2.2.2 1.1.1.1 2.2.2.2 1.1.1.1 1.1.1.1 2.2.2.2	
<pre>*> [3] RD[3.3.3 * i [1] VXLAN * i [1] VXLAN * i [1] VXLAN * i [3] VXLAN * i [3] VXLAN * i [3]</pre>	:[10]:[32,3. VXLAN .3:21] VRF[V :[00:00:00:0 :[00:00:00:0 :[20]:[32,1. :[20]:[32,2. :[20]:[32,3.	.3.3.3] 3.3.3.3 VRF2]: 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1 1.1.1.1 .1.1.1 2.2.2.2 2.2.2.2 .3.3.3]	0 0]:[20]:[2 0 0 0]:[429496 0 0 0 0 0	100 20] 100 100 57295]:[0] 100 100 100		327 i i i i	68 i 2.2.2.2 1.1.1.1 2.2.2.2 1.1.1.1 1.1.1.1 2.2.2.2	
<pre>*> [3] RD[3.3.3 * i [1] VXLAN * i [1] VXLAN * i [1] VXLAN * i [3] VXLAN * i [3] VXLAN * i [3] VXLAN * 3]</pre>	:[10]:[32,3. VXLAN .3:21] VRF[V :[00:00:00:0 :[00:00:00:0 :[20]:[32,1. :[20]:[32,2. :[20]:[32,3. VXLAN	.3.3.3] 3.3.3.3 VRF2]: 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1 00:00:11:11:00:00:0 2.2.2.2 1.1.1.1 1.1.1.1 .1.1.1 .1.1.1 .2.2.2] 2.2.2.2 .3.3.3] 3.3.3.3	0 0]:[20]:[2 0 0 0]:[429496 0 0 0 0 0 0	100 20] 100 100 57295]:[0] 100 100 100 100		327 i i i 327	<pre>68 i 2.2.2.2 1.1.1.1 2.2.2.2 1.1.1.1 1.1.1.1 2.2.2.2.</pre>	

```
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.
<pre>(config) # nvo vxlan access-if port-vlan pol 1001</pre>	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 pol 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.
<pre>(config) # nvo vxlan access-if port-vlan xe48 1001</pre>	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#s	how nvo vxlan =========	mac-ta ======	ble ====================================					
						LAN MAC	Entries	
======= VNID Type	Interface Statu	VlanId	Inner-VlanId	Mac-Addr C		VTEP-Ip	/ESI	
10 Static 1	pol Local	1001		0000.1111.	1001	00:00:0	0:00:00:11:11	:00:00:00
10 Static I	 Remote			0000.3333.	1001	3.3.3.3		
Total n [.]	umber of entr	les are	: 2					
VTEP1#s VXLAN A	how nvo vxlan RP-CACHE Info	arp-ca mation	che					
VNID	Ip-Addr	 М	ac-Addr	Туре	Age	e-Out	Retries-Left	
10	11.11.10.1	0	000.1111.1001	Static Loc	al			
10	11.11.10.2	0	000.3333.1001	Static Rem	ote			
Total n	umber of entr	les are	2					

VTEP2

VTEP2#:	show nvo	vxlan mac-t	able 			
				VXI	LAN MAC Entries	
====== =========== VNID Type	 Inte	rface VlanI Status	d Inner-Vlan AccessPortDe	Id Mac-Addr esc	VTEP-Ip/ESI	
10 Static	pol Local	1001		0000.1111.1001	00:00:00:00:00:11:11	.:00:00:00

10 Static I	 Remote		0000.3333.1	001 3.3.3.3	}
Total n	umber of entries a	are : 2			
VTEP2#s] VXLAN A]	how nvo vxlan arp- RP-CACHE Informati	cache .on			
VNID	Ip-Addr	Mac-Addr	Туре	Age-Out	Retries-Left
10 10 Total n	11.11.10.1 11.11.10.2 umber of entries a	0000.1111.1001 0000.3333.1001 are 2	Static Loca Static Remo	1 te	
VTEP3 VTEP3#sl	how nvo vxlan mac-	table			
				VXLAN MAC	Entries
 VNID Type	Interface Vlan Status	Id Inner-VlanId AccessPortDes	Mac-Addr c	VTEP-Ip)/ESI
10 Static I	1001 Remote		0000.1111.1	001 00:00:0	00:00:00:11:11:00:00:00
10 Static I	xe48 1001 Local		0000.3333.1	001 3.3.3.3	3
Total n	umber of entries a	re : 2			
VTEP3#sl VXLAN Al	how nvo vxlan arp- RP-CACHE Informati	cache .on			
VNID	Ip-Addr	Mac-Addr	Туре	Age-Out	Retries-Left
10 10 Total nu	11.11.10.1 11.11.10.2 umber of entries a	0000.1111.1001 0000.3333.1001 are 2	Static Remo Static Loca	te 1	

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#s]	now nvo v	vxlan mac-	table				
	=======			= V	XLAN MAC	Entries	
 VNID Type	Inte	rface Vlan Status	Id Inner-Vla AccessPort	anId Mac-Addr Desc	VTEP-I	p/ESI	
10 Dynamic	pol Local	1001		- 0000.1111.100	2 00:00:	00:00:00:11:11:00	:00:00
10 Dynamic	Remote	1002		0000.1111.100	3 00:00:	00:00:00:11:11:00	:00:00
Total nu VTEP1#s1 VXLAN A1	umber of now nvo v RP-CACHE	entries a: vxlan arp-o Informatio	re : 2 cache on 				
VNID	Ip-Add:	r	Mac-Addr	Туре А	ge-Out	Retries-Left	
10 10 Total n VTEP2 VTEP2#sl	21.21.2 31.1.3 umber of	21.1 1.1 entries a: vxlan mac-1	0000.1111.1 0000.1111.1 re 2 table	.002 Dynamic Local .003 Dynamic Remot	e		
				- V.	XLAN MAC	Entries	
======= VNID Type	Inte:	rface Vlan Status	Id Inner-Vla AccessPort	= anId Mac-Addr :Desc	VTEP-I	p/ESI	
10 Dynamic 10	 Remote pol	1001	 	- 0000.1111.100	2 00:00: 3 00:00:	00:00:00:11:11:00	:00:00
Dynamic Total n VTEP2#sl VXLAN Al	Local umber of now nvo v RP-CACHE	entries a: vxla arp-ca Informatio	re : 2 ache on ==				

VNID	Ip-Addr	Mac-Addr	Туре	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#sh	ow nvo vxlan	mac-ta	able						
		======			=== 	LAN MAC	Entries		
======= VNID Type	Interface Statı	VlanIo vlanIo	d Inner-VlanId AccessPortDes	Mac-Addı c	=== <u>-</u>	VTEP-Iŗ	p/ESI		
		1001				00.00.0	20.00.00.11	. 1 1 . 0 0 . 0 0 . 0	
Dynamic	Remote			0000.111	11.1002	00:00:0		11:00:00:0	J
10 Dynamic	 Remote	1002		0000.111	11.1003	00:00:0	00:00:00:11	:11:00:00:0	С
Total nu	mber of entri	ies ar	e : 2						
VTEP3#sh VXLAN AR	ow nvo vxlan P-CACHE Infor	arp-ca	ache n						
VNID	Ip-Addr		= Mac-Addr	Туре	Age	e-Out	Retries-Le	eft	
10	21.21.21.1		0000.1111.1002	Dynamic	Remote				
10	31.1.31.1		0000.1111.1003	- Dynamic	Remote				
Total nu	mber of entri	ies ar	e 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 3 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 a Layer 2 port that is part of regular Layer 2 bridge (RSTP/MSTP/STP) and a VXLAN bridge. The mapping between Layer 2 bridging and VxLAN untagged and tagged access interface is supported on the same Layer 2 switch port interface. 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.



RTR1/VTEP1

#configure terminal	Enter configure mode.
(config)#interface lo	Enter interface mode for loopback.
<pre>(config-if)#ip address 10.10.10.10/32 secondary</pre>	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 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 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.
<pre>(config-if)# switchport hybrid allowed vlan add 4 egress-tagged enable</pre>	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.
<pre>(config-if)# switchport hybrid allowed vlan add 4 egress-tagged enable</pre>	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 12vpn evpn	Enter I2vpn address family mode.
(config-router-af)#neighbor 20.20.20.1 activate	Activate the peer into address family mode.
(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-af)#exit-address-family	Exit I2vpn address family mode.
(config-router) #exit	Exit BGP router mode.
(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.
<pre>(config) #nvo vxlan access-if port-vlan ce31/ 1 3</pre>	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 xel7	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 xel8	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.
<pre>(config-if)#switchport hybrid allowed vlan add 4 egress-tagged enable</pre>	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
<pre>(config-router)#neighbor 20.20.20.0 remote- as 64512</pre>	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.
<pre>(config-router-af)#neighbor 20.20.20.0 activate</pre>	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.
<pre>(config-if)#ip address 40.40.40.40/32 secondary</pre>	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 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 lp 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 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 xel	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 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- 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 12vpn 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 l2vpn address family mode.
(config-router)#exit	Exit BGP router mode.

(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.
<pre>(config) #nvo vxlan access-if port-vlan xe1 3</pre>	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
1
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
      VNI-Name
VNID
                    VNI-Type Type Interface ESI
                                                                            VLAN DF-
Status Src-Addr
                      Dst-Addr
16777215 ----
                                  ____
                    L2
                            NW
                                               _____
                                                                             ____ __
                     40.40.40.40
-- 10.10.10.10
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 L2 NW ----16777215 ----_____ ____ __ -- 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" 10.10.10.10/32 is directly connected, lo, 01:15:55 С 20.20.20.0/31 is directly connected, xe10/1, 01:07:53 С 40.40.40.40/32 [20/0] via 20.20.20.1, xe10/1, 00:42:54 В 127.0.0.0/8 is directly connected, lo, 1d05h02m С 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 00:26:27 Installed 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
                      V AS
                              MsgRcv
                                       MsqSen TblVer
                                                                  Up/Down
                                                    InQ
                                                           OutQ
                                                                           State/
PfxRcd
          AD MACIP MCAST
                            ESI PREFIX-ROUTE
20.20.20.1
                     4 64513 108
                                      109
                                              10
                                                     0
                                                           0 00:48:14
3
      \cap
             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,
             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
                 Next Hop
                                 Metric
                                           LocPrf
                                                      Weight
                                                                Path Peer
Encap
RD[1.1.1:1] VRF[vrf12345]:
   [2]:[0]:[16777215]:[48,0000.0744.4433]:[0]:[16777215]
                     40.40.40.40
                                                                      64513 64514
                                        \cap
                                                  100
                                                               \cap
  20.20.20.1
i
                 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
                                                 100
                                                              32768
                                        \cap
                                                                         _____
                                                                       i
       VXLAN
___
*
     [3]: [16777215]: [32, 40.40.40.40]
                     40.40.40.40
                                                  100
                                                                      64513 64514
                                        0
                                                               0
 20.20.20.1
                 VXLAN
i
RD[2.2.2:2]
*> [2]:[0]:[16777215]:[48,0000.0744.4433]:[0]:[16777215]
                     40.40.40.40
                                        0
                                                  100
                                                                      64513 64514
                                                               0
i 20.20.20.1
                 VXLAN
*>
   [3]:[16777215]:[32,40.40.40.40]
                                                  100
                                                                      64513 64514
                     40.40.40.40
                                        0
                                                               0
i 20.20.20.1
                 VXLAN
Total number of prefixes 6
VTEP1#show nvo vxlan mac-table
_____
_____
```

```
VXLAN MAC Entries
```

_____ Interface VlanId Inner-VlanId Mac-Addr VNID VTEP-Ip/ESI AccessPortDesc Status Туре 16777215 ce31/1 3 0000.2222.2222 10.10.10.10 ____ _____ Dynamic Local _____ 16777215 ----____ 0000.0744.4433 40.40.40.40 ____ 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 Total number of entries are 0 VTEP1#show vlan brief State H/W Status Bridge VLAN ID Name Member ports (u)-Untagged, (t)-Tagged _____ ____ 32 1 default ce25/2(u) ce31/1(u) ACTIVE Success 32 2 VLAN0002 ACTIVE Success 32 3 VLAN0003 ACTIVE Success 32 4 VLAN0004 ACTIVE Success ce25/2(t) ce31/1(t) VLAN0005 32 5 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 40.40.40/32 [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 12vpn 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
                     V AS
                            MsgRcv
                                     MsgSen TblVer InQ OutQ
                                                               Up/Down
                                                                        State/
PfxRcd
         AD MACIP MCAST
                          ESI PREFIX-ROUTE
20.20.20.0
                    4 64512 111
                                     112
                                            10
                                                   0
                                                        0 00:49:36
            2
                               0
3
     0
                  1
                     0
                    4 64514 101
30.30.30.1
                                     103
                                           10
                                                  0
                                                       0 00:45:10
            2
                               Ο
3
     0
                  1
                        0
Total number of neighbors 2
Total number of Established sessions 2
#show nvo vxlan vnid 16777215
VXLAN Information
_____
  Codes: NW - Network Port
        AC - Access Port
        (u) - Untagged
      VNI-Name
                   VNI-Type Type Interface ESI
                                                                      VLAN DF-
VNTD
Status Src-Addr
                     Dst-Addr
16777215 ----
                  L2
                           NW
                               ____
                                            _____
                                                                       ____ __
      40.40.40.40 10.10.10.10
__
16777215 ----
                        AC xel
                                       --- Single Homed Port ---
                                                                3
                 ___
                                                                     ____
____
Total number of entries are 2
RTR2#show vlan brief
Bridge VLAN ID
                 Name
                             State H/W Status
                                                  Member ports
                                               (u)-Untagged, (t)-Tagged
______ ______
32
       1
              default
                             ACTIVE Success
                                              ce10/2(u) ce11/2(u)
32
       2
              VLAN0002
                             ACTIVE Success
       3
32
              VLAN0003
                             ACTIVE Success
32
      4
              VLAN0004
                             ACTIVE Success ce10/2(t) ce11/2(t)
32
      5
              VLAN0005
                             ACTIVE Success
```

VTEP2

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

```
nvo vxlan enable
1
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 xel 3
no shutdown
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
                           NW ----
16777215 ----
16777215 ---- L2 NW --
-- 40.40.40.40 10.10.10
                                             _____
                                                                         ____ __
16777215 ----
                  ___
                       AC xel
                                      --- 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"
     10.10.10.10/32 [20/0] via 30.30.30.0, xe11/1, 00:27:32
В
С
     30.30.30.0/31 is directly connected, xe11/1, 00:30:00
С
     40.40.40.40/32 is directly connected, lo, 00:31:00
     127.0.0.0/8 is directly connected, lo, 06:25:00
С
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
                               MsgRcv
                                         MsgSen TblVer InO OutO
                                                                      Up/Down
                       V AS
                                                                                State/
PfxRcd
          AD MACIP MCAST
                             ESI PREFIX-ROUTE
30.30.30.0
                                         270
                                                  8
                       4 64513 267
                                                        0
                                                               0 02:09:07
2
      0
             1
                    1
                           0
                                  0
Total number of neighbors 1
Total number of Established sessions 1
VTEP2#show nvo vxlan access-if-config
nvo vxlan access-if port-vlan xe1/1 3
no shutdown
map vnid 16777215
!
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,
             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
                 Next Hop
                                  Metric
                                             LocPrf
                                                          Weight Path Peer
Encap
RD[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] VRF[vrf12345]:
   [2]:[0]:[16777215]:[48,0000.0744.4433]:[0]:[16777215]
*>
```

	VXT.AN	40.40.40.	40	0	100	32768	i	
* [2	1:[0]:[1	67772151:[48,0000	.2222.22	221:[0]:[16	7772151			
i 30.3	0.30.0	10.10.10.1 VXLAN	101	0	100	0	6451	.3 64512
i 30.3	0.30.0	10.10.10.10 VXLAN	.10] LO	0	100	0	6451	.3 64512
*> [3]:[167772 VXLAN	215]:[32,40.40.40 40.40.40.	.40] 40	0	100	32768	i	
Total n	umber of	prefixes 6						
VTEP2#s =======	how nvo •	vxlan mac-table						
	=======		======= VXLAN	MAC Entries	=======	-===		
	=========				=======		======	=======
VNID Type	Inter	face VlanId Inne Status	r-VlanId	Mac-Addr AccessPort	VTI Desc	EP-Ip/ESI		
1677721 Dynamic	5 Remote			0000.2222.2	2222 10	.10.10.10		
1677721 Dynamic	5 xel Local	3	0	000.0744.44	33 40.40	0.40.40		
Total n	umber of	entries are : 2						
VTEP2#s	how vlan	brief						
Bridge	VLAN ID	Name	State	H/W Status	Me u) –U)	ember ports ntagged, (t)-Ta	agged	
32	1	default	ACTIVE	Success	 xel(u)	xe49/2(u)	=	
32	2	VLAN0002	ACTIVE	Success				
32	3	VLAN0003	ACTIVE	Success				
32 32	4 5	VLANUUU4 VLANUOU5	ACTIVE ACTIVE	Success Success	xel(t)	xe49/2(t)		

VTEP2#

CHAPTER 4 VXLAN Trunk Access Port

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

The configurations used in this section use the topology in Figure 4-7.



Figure 4-7: VXLAN Trunk Access Port

Base Configuration - L2 VXLAN

VTEP1

Hardware profile and generic configuration:

#configure terminal	Enter Configure mode.
(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
(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	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
<pre>(config-router)#neighbor 2.2.2.2 update- source lo</pre>	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 12vpn evpn	Enter into I2vpn EVPN address family mode
(config-router-af) #neighbor 2.2.2.2 activate	Activate 2.2.2.2(VTEP2) into I2vpn evpn address family mode
(config-router-af)#exit-address-family	Exit from I2vpn 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)#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 xel4	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
<pre>(config-if)#ip address 2.2.2/32 secondary</pre>	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)
<pre>(config-router)#network 2.2.2.2/32 area 0.0.0</pre>	Add 2.2.2.2 (lo ip address) network into area 0
(config-router)#network 20.20.20.0/24 area 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 12vpn evpn	Enter into I2vpn EVPN address family mode
(config-router-af) #neighbor 1.1.1.1 activate	Activate 1.1.1.1(VTEP1) into I2vpn evpn address family mode
(config-router-af)#exit-address-family	Exit from I2vpn 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 xel4	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
T
nvo vxlan enable
!
nvo vxlan vtep-ip-global 1.1.1.1
Т
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
!
I
VTEP1#sh nvo vxlan tunnel
VXLAN Network tunnel Entries
Source
         Destination
                                Up/Down
                                         Update
                     Status
_____
          2.2.2.2
1.1.1.1
                     Installed
                                00:02:49
                                          00:02:49
Total number of entries are 1
VTEP1#sh nvo vxlan mac-table
_____
_____
                                 VXLAN MAC Entries
_____
_____
VNID
    Interface VlanId Vlan-RangeId Inner-VlanId Mac-Addr
                                       VTEP-Ip/ESI
Туре
         Status AccessPortDesc
```

100 xe7 0000.1111.0001 1.1.1.1 ____ ____ ____ _____ Static Local _____ 100 ----____ 0000.2222.0001 2.2.2.2 ____ Static Remote _____ _____ ____ 100 xe7 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 _____ _____ VNTD Interface VlanId Vlan-RangeId Inner-VlanId Mac-Addr VTEP-Ip/ESI Status Time-out AccessPortDesc Туре ____ 100 xe7 ____ 0000.1111.0001 1.1.1.1 Static Local _____ _____ ___ 100 ___ ____ ____ 0000.2222.0001 2.2.2.2 _____ ___ _____ Remote 100 xe7 ____ b0da.1d10.6496 1.1.1.1 ____ 300 _____ Dynamic Local _____ Total number of entries are 3 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 NW ----100 ____ L2 ____ ____ 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

_____ MACONLY MACIPv4 MACIPv6 Total VNTD _____ 3 3 0 100 Ο 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 Т VTEP1#sh nvo vxlan access-if brief Inner Admin Link Interface Vlan vlan Ifindex Vnid status status _____ --- --- 500000 100 up up xe7 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/ AD MACIP MCAST ESI PREFIX-ROUTE PfxRcd 1 15 0 0 17 2 0 0 00:04:52 2.2.2.2 4 1 1 0 2 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, 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[L2	2VRF1]:	1. [0]. [100]				
^ >	[2]:[0]:[100]:	48,0000:1111:0001		100		20760 -	
VXLAN	1		0	100		52766 I	
* 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	1:[0]:[100]				
		1.1.1.1	0	100		32768 i	
VXLAN	1						
*>	[3]:[100]:[32,1	.1.1.1]					
		1.1.1.1	0	100		32768 i	
VXLAN	1						
* 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	1:[0]:[100]				
		2.2.2.2	0	100	0	i 2.2.2.2	VXLAN
*>i	[3] • [100] • [32.2	2 2 2 1	Ū.	200	Ũ		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
× ±	[0].[100].[02]2	2.2.2.2	0	100	0	i 2.2.2.2	VXLAN
Total VTEP1 VXLAN =====	. number of pref .#sh nvo vxlan a N ARP-CACHE Info	fixes 7 arp-cache prmation					
VNID	Ip-Addr	Mac-Addr	Туре	Age-0	Out	Retries-Lef	Ĩt
Total VTEP1 VXLAN	number of entr #sh nvo vxlan r ND-CACHE Infor	ries are 0 nd-cache mation					
===== VNID Retri	Ip-Addr .es-Left			Mac-Addr		Туре	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
1
!
VTEP2#sh nvo vxlan tunnel
VXLAN Network tunnel Entries
          Destination Status Up/Down Update
Source
_____
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
        Dst-Addr
Src-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
         Status AccessPortDesc
Туре
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 _____ _____ Interface VlanId Vlan-RangeId Inner-VlanId Mac-Addr VTEP-Ip/ESI VNID 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 _____ MACONLY MACIPv4 MACIPv6 VNID Total _____ 3 0 100 3 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 nd-cache disable mac 0000.2222.0001 ! VTEP2#sh nvo vxlan arp-cache VXLAN ARP-CACHE Information _____ Type Age-Out Retries-Left VNID Ip-Addr Mac-Addr Total number of entries are 0 VTEP2#sh nvo vxlan nd-cache

VXLAN ND-CACHE Information _____ VNID Ip-Addr Mac-Addr Age-Out Type 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 AS Neighbor V 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 2 1 0 \cap 3 0 Total number of neighbors 1 Total number of Established sessions 1 VTEP2#sh bgp 12vpn 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, 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 Weight Network Next Hop Metric LocPrf Path Peer Encap RD[1.1.1:1] *>i [2]:[0]:[100]:[48,0000:1111:0001]:[0]:[100] 100 1.1.1.1 0 0 i 1.1.1.1 VXLAN *>i [2]:[0]:[100]:[48,b0da:1d10:6496]:[0]:[100] 0 i 1.1.1.1 1.1.1.1 0 100 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
VXLA	N			
* i	[2]:[0]:[100]:[48,b0da:1d10:6496	5]:[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
VXLAI	N			

```
Total number of prefixes 8 VTEP2#
```

VxLAN Trunk access port with vlan range

When access port with a specific vlan range configured, all the traffic in that specific range are accepted and forwaded.

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

<pre>(config) #nvo vxlan access-if port-vlan xe23 2-100</pre>	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
(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

```
1
nvo vxlan enable
!
nvo vxlan vtep-ip-global 1.1.1.1
1
nvo vxlan id 100 ingress-replication
vxlan host-reachability-protocol evpn-bgp L2VRF1
Т
nvo vxlan access-if port-vlan xe7 2-100
map vnid 100
arp-cache disable
nd-cache disable
mac 0000.1111.0001
1
!
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
                                     Up/Down
                                                Update
                        Status
_____
            2.2.2.2
1.1.1.1
                        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
    VNI-Name
              VNI-Type Type Interface ESI
                                                     VLAN DF-Status
VNID
Src-Addr
           Dst-Addr
             L2
                   NW ----
100
     ____
                               ____
                                                     ____ ___
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
 _____
______
```

VXLAN Trunk Access Port

VNID Interface VlanId Vlan-RangeId Inner-VlanId Mac-Addr VTEP-Ip/ESI Status AccessPortDesc Туре xe7 100 ____ 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 _____ ______ Interface VlanId Vlan-RangeId Inner-VlanId Mac-Addr VTEP-Ip/ESI VNID Status Time-out AccessPortDesc Туре 100 xe7 _____ 2-100 ---- 0000.1111.0001 1.1.1.1 _____ ___ _____ Static Local ____ ____ 0000.2222.0001 2.2.2.2 100 ____ ----_____ Remote _____ 2-100 ----100 xe7 ____ b0da.1d10.6496 1.1.1.1 300 Dynamic Local _____ _____ Total number of entries are 3 VTEP1#sh nvo vxlan arp-cache VXLAN ARP-CACHE Information _____ Age-Out Retries-Left VNID Туре Ip-Addr Mac-Addr 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 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 Inner Admin Link Interface Vlan vlan Ifindex Vnid status status _____ 2 --- 50000 100 xe7 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 _____ Total VNID MACONLY MACIPv4 MACIPv6 _____ 3 3 0 0 100 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 V AS MsgRcv MsgSen TblVer InQ OutQ Up/Down State/ AD MACIP MCAST ESI PREFIX-ROUTE PfxRcd 2.2.2.2 4 1 58 61 5 0 0 00:22:05 0 1 1 0 Ο 2 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[L2VRF	1]:							
*>	[2]:[0]:[100]:[48,	0000:1111:0001]:[0)]:[100]						
	1	.1.1.1	0	100		32768	i		
VXLAI	Ν								
* i	[2]:[0]:[100]:[48,	0000:2222:0001]:[()]:[100]						
	2.	2.2.2	0	100	0	i	2.2	.2.2	VXLAN
*>	[2]:[0]:[100]:[48,]	b0da:1d10:6496]:[()]:[100]						
	1	.1.1.1	0	100		32768	i		
VXLA	N								
*>	[3]:[100]:[32,1.1.	1.1]							
	1	.1.1.1	0	100		32768	i		
VXLA	Ν								
* 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,	0000:2222:00011:[0	01:[100]						
	2.	2.2.2	0	100	0	i	2.2	.2.2	VXLAN
*>i	[3]:[100]:[32,2.2.]	2.21	-		Ţ				
	2.	2.2.2	0	100	0	i	2.2	.2.2	VXLAN

```
Total number of prefixes 7
```

VTEP2

```
VTEP2#sh run nvo vxlan
1
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
!
!
VTEP2#sh nvo vxlan tunnel
VXLAN Network tunnel Entries
              Destination
Source
                                            Up/Down
                                                         Update
                            Status
_____
2.2.2.2
             1.1.1.1
                                            00:19:28
                                                         00:19:28
                            Installed
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 00:21:06 00:21:06 Installed 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 L2 NW ____ 100 ____ ____ ____ ___ 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 AccessPortDesc Туре Status 100 0000.1111.0001 1.1.1.1 ____ ____ ____ _____ Static Remote -----0000.2222.0001 2.2.2.2 100 xe23 ____ 2-100 ----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 _____ _____ Interface VlanId Vlan-RangeId Inner-VlanId Mac-Addr VTEP-Ip/ESI VNID Status Time-out AccessPortDesc Type

---- ____ ____ 0000.1111.0001 1.1.1.1 100 _____ Remote 100 xe23 ____ 2-100 ---- 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 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 Туре Age-Out Retries-Left Total number of entries are 0 VTEP2# VTEP2# VTEP2#sh nvo vxlan access-if brief Inner Admin Link Interface Vlan vlan Ifindex Vnid status status _____ xe23 2 --- 500000 100 up up 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 V AS MsgRcv MsgSen TblVer InQ Up/Down OutQ State/ ESI PREFIX-ROUTE PfxRcd AD MACIP MCAST 3 1 59 57 0 0 00:21:48 1.1.1.1 4 2 0 3 \cap 1 \cap 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, 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 LocPrf Weight Path Peer Next Hop Metric Encap RD[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 [2]:[0]:[100]:[48,b0da:1d10:6496]:[0]:[100] *>i 100 i 1.1.1.1 1.1.1.1 0 0 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] 1.1.1.1 100 i 1.1.1.1 0 0 VXLAN *> [2]:[0]:[100]:[48,0000:2222:0001]:[0]:[100] 2.2.2.2 100 32768 i -----0 VXLAN [2]:[0]:[100]:[48,b0da:1d10:6496]:[0]:[100] * i 1.1.1.1 0 i 1.1.1.1 100 0 VXLAN [3]:[100]:[32,1.1.1.1] * i 1.1.1.1 0 100 0 i 1.1.1.1 VXLAN *> [3]:[100]:[32,2.2.2] 0 100 32768 i -----2.2.2.2 VXLAN

Total number of prefixes 8 VTEP2#

CHAPTER 5 EVPN-VXLAN Hybrid Port Support

This chapter contains the configurations for EVPN-VXLAN Hybrid Port Support.

Overview

This feature is to map VxLAN untagged and tagged (port+vlan) access interfaces on the same parent interface (Physical, Dynamic and Static LAG). It also supports the Bridge vlan and vxlan untagged access on the same parent interface.

Topology

The procedures in this section use the topology in Figure 5-8



Figure 5-8: EVPN-VxLAN hybrid port

VXLAN-EVPN Hybrid Port Configuration

VTEP1

Interface and Loopback Configuration

(config)#interface xe9	Enter Interface mode for xe9
(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
<pre>(config-if)#ip address 1.1.1.1/32 secondary</pre>	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	Add 10.10.10.0 (Spine1) network into area 0
(config-router)#network 20.20.20.0/24 area 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
<pre>(config-router)#neighbor 2.2.2.2 update- source lo</pre>	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) #commit	Commit the candidate configuration to the running configuration

VxLAN Configuration

(config)#nvo vxlan enable	Enable VxLAN
(config)#nvo vxlan vtep-ip-global 1.1.1.1	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.
<pre>(config) #nvo vxlan id 20 ingress-replication inner-vid-disabled</pre>	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-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 xe9	Enable port mapping i.e. access port to the physical interface
(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 xe9 1001	Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) – physical interface
(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 xe9 2001	Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) – physical interface
(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

VTEP2

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 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	Add 2.2.2.2 (lo IP address) network into area 0
(config-router)#network 30.30.30.0/24 area 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	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 2.2.2:11	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) #commit	Commit the candidate configuration to the running configuration

VxLAN Configuration

(config)#nvo vxlan enable	Enable VxLAN
(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 VRF1	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 xe3	Enable port mapping i.e. access port to physical interface
(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 xe3 1002	Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) – physical interface
(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 xe3 2001	Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) – physical interface
(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

VTEP3

Interface and loopback configuration

#configure terminal	Enter Configure mode.
(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
<pre>(config-if)#ip address 3.3.3.3/32 secondary</pre>	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	Add 50.50.50.0 (Spine1) network into area 0
(config-router)#network 60.60.60.0/24 area 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
(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	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 3.3.3.3:11	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) #commit	Commit the candidate configuration to the running configuration

VxLAN Configuration

(config)#nvo vxlan enable	Enable VxLAN
(config)#nvo vxlan vtep-ip-global 3.3.3.3	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.
<pre>(config) #nvo vxlan id 20 ingress-replication inner-vid-disabled</pre>	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-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 xe48	Enable port mapping i.e. access port to physical interface
(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 1001	Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) – physical interface
(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 2001	Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) – physical interface
(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		

Spine 1

Spine node where all VTEPs are connected

Interface and Loopback Configuration

#configure terminal	Enter Configure mode.
(config)#qos enable	Enabling QoS
(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 xel	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 xel8	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	Add 30.30.30.0 (VTEP2) network into area 0
(config-router)#network 50.50.50.0/24 area 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-if) #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

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 xel9	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	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-if) #exit	Exit Interface mode and return to Configure mode.
(config)#commit	Commit the candidate configuration to the running configuration

Validation

VTEP1

VTEP1#sh	nvo	V۶	klan	
VXLAN Inf	orma	ati	on	
		-=-	===	
Codes:	NW	-	Network	Port
	AC	-	Access	Port
	(u)	-	Untagge	d

VNID Status	VNI-Name Src-Addr	VNI-T Dst	ype Type -Addr	Interface	e ESI	VLAN	DF-
10	VNI-RED 1 1 1 1	L2 3	NW 3 3 3				
10	VNI-RED 1.1.1.1	L2 2	NW				-
10	VNI-RED		AC	xe9	Single Homed Port	0	
10	VNI-RED		AC	xe9	Single Homed Port	1001	
20	VNI-BLUE 1.1.1.1	L2 3	NW .3.3.3				-
20	VNI-BLUE 1.1.1.1	L2 2	NW .2.2.2				-
20	VNI-BLUE		AC	xe9	Single Homed Port	2001	

Total number of entries are 7

Inner Admin Link Interface Vlan vlan Ifindex Vnid status status _____ _____ xe57 ___ ___ 500000 10 up up xe57 1001 ___ 500001 10 up up xe57 2001 ___ 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 4 1 BGP AS-PATH entries 0 BGP community entries MsgRcv Neighbor V MsgSen TblVer Up/Down State/ AS InQ OutQ PfxRcd AD MACIP MCAST ESI PREFIX-ROUTE 2.2.2.2 500 53 54 3 0 00:20:58 4 0 2 0 0 2 0 Ο 3 500 53 0 0 00:20:58 3.3.3.3 53 4 2 \cap 0 2 \cap 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 00:10:44 00:10:44 Installed 1.1.1.1 2.2.2.2 00:10:58 00:10:58 Installed Total number of entries are 2 VTEP1#show bgp l2vpn evpn BGP table version is 4, 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
```

VTEP1#sh nvo vxlan access-if brief

cicast Route ent Route					
Next Hop	Metric	LocPrf	Weight	Path Pee	er
[VRF1]:					
1.1.1]					
1.1.1.1	0	100	32768	i	
2.2.2]					
2.2.2.2	0	100	0 1	2.2.2.2	VXLAN
3.3.3]	0	100	o :	2 2 2 2	
3.3.3.3	0	100	0 i	3.3.3.3	VXLAN
	0	100	20760		
1.1.1.1	U	100	32768	1	
2.2.21					
2.2.2.2	0	100	0 i	2.2.2.2	VXLAN
3.3.31	-		-		
3.3.3.3	0	100	0 i	3.3.3.3	VXLAN
2.2.2]					
2.2.2.2	0	100	0 i	2.2.2.2	VXLAN
2.2.2]					
2.2.2.2	0	100	0 i	2.2.2.2	VXLAN
3.3.3]					
3.3.3.3	0	100	0 i	3.3.3.3	VXLAN
3.3.3]					
3.3.3.3	0	100	0 i	3.3.3.3	VXLAN
	<pre>dicast Route nt Route Next Hop VRF1]: 1.1.1] 1.1.1.1 2.2.2] 2.2.2.2 3.3.3] 3.3.3 1.1.1] 1.1.1.1 2.2.2] 2.2.2.2 3.3.3] 3.3.3 2.2.2] 2.2.2.2 3.3.3] 3.3.3 3.3</pre>	Additional content Route Metric Next Hop Metric VRF1]: 1.1.11 0 2.2.2] 0 0 2.2.2] 0 0 3.3.3] 0 0 1.1.1] 0 0 2.2.2] 0 0 2.2.2] 0 0 2.2.2] 0 0 2.2.2] 0 0 2.2.2] 0 0 2.2.2] 0 0 2.2.2] 0 0 3.3.3] 0 0 3.3.3] 0 0	Licast Route Metric LocPrf Next Hop Metric LocPrf VRF1]: 1.1.1] 0 100 2.2.2] 0 100 2.2.2] 0 100 3.3.3] 0 100 1.1.1] 0 100 1.1.1] 0 100 2.2.2] 0 100 2.2.2] 0 100 2.2.2] 0 100 2.2.2.2 0 100 2.2.2.1 0 100 2.2.2.2 0 100 3.3.3] 0 100 3.3.3] 0 100 3.3.3] 0 100	Aicast Route Metric LocPrf Weight Next Hop Metric LocPrf Weight VRF1]: 1.1.1 0 100 32768 2.2.2] 2.2.2.2 0 100 0 i 3.3.3] 3.3.3 0 100 0 i 1.1.1] 0 100 0 i 1.1.1] 0 100 0 i 1.1.1] 0 100 0 i 2.2.2] 0 100 0 i 2.2.2] 0 100 0 i 3.3.3] 0 100 0 i 2.2.2] 0 100 0 i 2.2.2] 0 100 0 i 2.2.2] 0 100 0 i 3.3.3] 0 100 0 i 3.3.3] 0 100 0 i 3.3.3] 0 100 0 i	Next Hop Metric LocPrf Weight Path Pee VRF1]: 1.1.1.1 0 100 32768 i 2.2.2] 2.2.2.2 0 100 0 i 2.2.2.2 3.3.3] 3.3.3.3 0 100 0 i 3.3.3.3 1.1.11 0 100 32768 i 2.2.21 0 100 0 i 3.3.3.3 1.1.11 0 100 32768 i 2.2.21 0 100 0 i 2.2.2.2 2.2.2.2 0 100 0 i 3.3.3.3 3.3.3.3 0 100 0 i 2.2.2.2 2.2.2.2 0 100 0 i 2.2.2.2 2.2.2.2 0 100 0 i 2.2.2.2 3.3.31 0 100 0 i 3.3.3.3 3.3.3.3 0 100 0 i 3.3.3.3 3.3.3.3 0 10

Total number of prefixes 10

VTEP2

10	VNI-RED 2.2.2.2	L2	NW 1.1.1.1				-
10	VNI-RED 2.2.2.2	L2	NW 3.3.3.3				-
10	VNI-RED		AC	xe8	Single Homed Port	0	-
10	VNI-RED		AC	xe8	Single Homed Port	1001	-
20	VNI-BLUE 2.2.2.2	L2	NW 1.1.1.1				-
20	VNI-BLUE 2.2.2.2	L2	NW 3.3.3.3				-
20	VNI-BLUE		AC	xe8	Single Homed Port	2001	-

Total number of entries are 7

VTEP2#sh nvo vxlan access-if brief

		Inner			Admin	Link
Interface	Vlan	vlan	Ifindex	Vnid	status	status
xe8			500000	10	up	up
xe8	1001		500001	10	up	up
xe8	2001		500002	20	up	up

Total number of entries are 3

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

Neighbo PfxRcd	or	AD	MACIP	V MCAS	AS ST	Mso ESI	JRCV PREFIX	MsgSen -ROUTE	TblVer	InQ	01	ıtQ	Up/Down	State/
1.1.1.1.1	1			4	500	53		53	3	0	0	00:20	:56	
2	0		0	2	0		0							
3.3.3.3	3			4	500	51		54	3	0	0	00:20	:56	
2	0		0	2	0		0							

Total number of neighbors 2

Total number of Established sessions 2

VTEP2#show nvo v	vxlan tunnel			
VXLAN Network tu	nnel Entries			
Source	Destination	Status	Up/Down	Update
=======================================				
2.2.2.2	1.1.1.1	Installed	00:11:01	00:11:01

```
EVPN-VXLAN Hybrid Port Support
```

```
2.2.2.2
                3.3.3.3
                                Installed
                                              00:10:47
                                                            00:10:47
Total number of entries are 2
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, 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
                                                         Weight Path Peer
   Network
                 Next Hop
                                  Metric LocPrf
Encap
RD[1.1.1:1]
*>i [3]:[10]:[32,1.1.1.1]
                    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[2.2.2:1] VRF[VRF1]:
* i [3]:[10]:[32,1.1.1.1]
                                        0
                                                100
                                                         0 i 1.1.1.1
                    1.1.1.1
                                                                                VXLAN
     [3]:[10]:[32,2.2.2]
*>
                     2.2.2.2
                                         0
                                                  100
                                                            32768 i -----
VXLAN
* i [3]:[10]:[32,3.3.3.3]
                                        0
                                                100
                                                         0
                                                             i 3.3.3.3
                    3.3.3.3
                                                                                VXLAN
* i [3]:[20]:[32,1.1.1.1]
                                        0
                                                100
                                                         0 i 1.1.1.1
                    1.1.1.1
                                                                                VXLAN
*>
     [3]:[20]:[32,2.2.2]
                     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[3.3.3.3:1]
*>i [3]:[10]:[32,3.3.3.3]
                    3.3.3.3
                                        0
                                                100
                                                         0
                                                              i 3.3.3.3
                                                                                VXLAN
*>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 10
```

VTEP3

VTEP3#s VXLAN I	sh nvo vxl Informatio	an n											
Code	es: NW - N AC - A (u) - U	= etwork ccess ntagge	Port Port d										
VNID Status	VNI-Nam Src-Addr	e 7	/NI-Ty Dst	ype Ty -Addr	pe I	nterfac	ce ESI					VLAN	DF-
10	VNI-RED 3.3.3.3		L2 2	NV - 2 - 2 - 2	√ - 2								_
10	VNI-RED		L2 1	NV	- N -								-
10	S.S.S.S VNI-RED			AC		ce13/1		- Single	Homed	Port	:	0	-
10	 VNI-RED			 A(C c	ce13/1		- Single	Homed	Port		1001	_
20	 VNI-BLU 3.3.3.3	E	- L2 2	 NV .2.2.2	√ - 2								-
20	VNI-BLU	E	L2 1	NV 1 1 1	√ – 1								-
20	VNI-BLU	E		A(С с	ce13/1		- Single	Homed	Port	;	2001	-
Total r VTEP3#s	number of sh nvo vxl	entrie an acc Inner	s are ess-i	7 f brie	ef	А	dmin	Link					
								Status					
ce13/1			5000	00 1	L O	u	p	up					
ce13/1	2001		5000	02 2	20	u u	p	up up					
Total r	number of	entrie	s are	3									
VTEP3#s BGP rou BGP tak 1 BGP Z 0 BGP c	show bgp l iter ident ole versio AS-PATH en community	2vpn e ifier n is 3 tries entrie	vpn s 3.3.3 s	ummary .3, lo	y Dcal	AS num	ber 5(00					
Neighbo PfxRcd	or AD M	ACIP	V MCAST	AS ES	MsgRo SI E	CV M PREFIX-	sgSen ROUTE	TblVer	InQ	Out	Q	Up/Down	State/
1.1.1.1		2	4	500	52 0	5	2	3	0	0 0	0:20	:37	
2.2.2.2	2 0 0	2	4 (500 0	52 0	5	1	3	0	0 0	0:20	:37	

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 _____ Installed 3.3.3.3 2.2.2.2 00:10:50 00:10:50 3.3.3.3 1.1.1.1 Installed 00:10:50 00:10:50 Total number of entries are 2 VTEP3#show bgp l2vpn evpn BGP table version is 3, local router ID is 3.3.3.3 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] *>i [3]:[10]:[32,1.1.1.1] 100 i 1.1.1.1 1.1.1.1 0 0 VXLAN *>i [3]:[20]:[32,1.1.1.1] 0 0 VXLAN 1.1.1.1 100 i 1.1.1.1 RD[2.2.2:1] *>i [3]:[10]:[32,2.2.2] 2.2.2.2 0 100 0 i 2.2.2.2 VXLAN *>i [3]:[20]:[32,2.2.2] 2.2.2.2 0 100 0 i 2.2.2.2 VXLAN RD[3.3.3:1] VRF[VRF1]: * 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 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 * 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	-
VXLA	N				

Total number of prefixes 10

CHAPTER 6 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.



Topology

COS-DSCP

RTR1/VTEP1

#configure terminal	Enter Configure mode.
(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 10.10.10.10:100	Assign route-target value for import/export
(config-vrf) #exit	Exit from vrf mode
(config)#qos enable	Enable qos
(config)#qos profile cos-to-queue COS-QUE	Create qos profile for mapping traffic towards tunnel from access-if.
(config-ingress-cos-map)#cos 2 queue 3	Configure particular COS value to the queue value for con- figured profile.
(config-ingress-cos-map)#exit	Exit from qos profile config mode
(config)#qos profile queue-color-to-dscp QUE-DSCP	Create qos profile for attaching in vxlan tunnel egress.
(config-egress-dscp-map)#queue 3 dscp 16	Configure particular queue value to the dscp value for configured profile.
(config-egress-dscp-encap-map)#exit	Exit from qos profile config mode
(config)#interface po2	Create a port channel po2
(config-if)#switchport	Configure port as switchport
(config-if)#load-interval 30	Set load-interval
(config-if)#interface po24	Create a port channel po24
(config-if)#load-interval 30	Configure port as switchport
(config-if)#ip address 24.1.1.1/30	Set load-interval
(config-if)#interface lo	Enter in to loopback interface
(config-if)#ip address 1.1.1.1/32 secondary	Configure ip address
(config-if) #interface xel	Enter in to interface mode
(config-if)#channel-group 2 mode active	Map to channel-group
(config-if)#interface xe2	Enter in to interface mode
(config-if)#channel-group 2 mode active	Map to channel-group
(config-if)#interface xel4	Enter in to interface mode
(config-if)#channel-group 24 mode ac-tive	Map to channel-group
(config-if)#interface xe15	Enter in to interface mode
(config-if)#channel-group 24 mode ac-tive	Map to channel-group
(config-if)#router ospf 1	Create ospf instance
(config-router) #ospf router-id 1.1.1.1	Configure ospf router-id
(config-router)#network 1.1.1.1/32 area 0.0.0.0	Configure loopback network address in to ospf
(config-router)#network 24.1.1.0/30 area 0.0.0	Configure network address in to ospf
(config-router) #router bgp 100	Enter into Router BGP mode
(config-router)#neighbor 6.6.6.6 re-mote-as 100	Specify a neighbor router with peer ip address and remote-as defined
(config-router)#neighbor 6.6.6.6 up-date- source lo	Specify the neighbor to use loopback address as source
(config-router)#address-family 12vpn evpn	Enter into l2vpn evpn address-family
(config-router-af)#neighbor 6.6.6.6 activate	Activate the neighbor to address-family

onfig-router)#nvo vxlan vtep-ip-global 1.1.1	Configure Source vtep-ip-global configuration
onfig)#nvo vxlan tunnel qos-map-mode cos- cp egress QUE-DSCP	Configure the mapping qos profile in to vxlan tunnel egress
onfig)#nvo vxlan id 1 in-gress-replication ner-vid-disabled	Create vnid 1 and disable inner-vid
onfig-nvo)#vxlan host-reachability- otocol evpn-bgp vrf1	Assign vrf for evpn-bgp to carry EVPN route
onfig-nvo)#nvo vxlan access-if port-vlan 2 1001	Create vxlan access-if with vlan 1001
onfig-nvo-acc-if)#no shutdown	No shut the vxlan access-if
onfig-nvo-acc-if)#map vnid 1	Map vnid to the vxlan access-if
onfig-nvo-acc-if)#map qos-profile cos-to- eue COS-QUE	Map qos profile for vxlan access-if ingress traffic from CE
onfig-nvo-acc-if)#exit	Exit from VxLAN access-interface mode and enter into configuration mode.
onfig)#commit	Commit the candidate configuration to the running configuration
<pre>ptocol evpn-bgp vrf1 pnfig-nvo)#nvo vxlan access-if port-vlan 2 1001 pnfig-nvo-acc-if)#no shutdown pnfig-nvo-acc-if)#map vnid 1 pnfig-nvo-acc-if)#map qos-profile cos-to- eue COS-QUE pnfig-nvo-acc-if)#exit</pre>	Create vxlan access-if with vlan 1001 No shut the vxlan access-if Map vnid to the vxlan access-if Map qos profile for vxlan access-if ingress traffic from CE Exit from VxLAN access-interface mode and enter into configuration mode. Commit the candidate configuration to the running configuration

R2

#configure terminal	Enter Configure mode.
(config)#interface po24	Create port channel
(config-if)#load-interval 30	Set load-interval
(config-if)#ip address 24.1.1.2/30	Assign ip address
(config-if)#interface po46	Create port channel
(config-if)#load-interval 30	Set load-interval
(config-if)#ip address 46.1.1.1/30	Assign ip address
(config-if)#interface lo	Enter in to loopback interface
<pre>(config-if)#ip address 4.4.4.4/32 sec-ondary</pre>	Assign secondary ip address
(config-if)#interface xe4	Enter into interface mode
(config-if)#channel-group 46 mode active	Map port channel to the interface
(config-if)#interface xe5	Enter into interface mode
(config-if)#channel-group 46 mode active	Map port channel to the interface
(config-if)#interface xel4	Enter into interface mode
(config-if)#channel-group 24 mode active	Map port channel to the interface
(config-if)#interface xe15	Enter into interface mode
(config-if)#channel-group 24 mode active	Map port channel to the interface
(config-if) #router ospf 1	Create ospf instance
(config-router) #ospf router-id 4.4.4.4	Configure ospf router-id
(config-router)#network 4.4.4.4/32 area 0.0.0.0	Configure ospf network address with respective area
(config-router)#network 24.1.1.0/30 area 0.0.0.0	Configure ospf network address with respective area

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

RTR3/VTEP2

#configure terminal	Enter Configuration mode
(config) #mac vrf vrf1	Create mac routing/forwarding instance with vrf1 name and enter into vrf mode
(config-vrf) #rd 6.6.6:11	Assign RD value
(config-vrf)#route-target both 10.10.10.10:100	Assign route-target value for import/export
(config-vrf) #exit	Exit from vrf mode
(config)#qos enable	Enable QOS
(config) #qos statistics	Enable QOS statistics
(config) #qos profile queue-color-to-cos QUE- COS	Create qos profile for mapping incoming traffic from tunnel to access-if.
(config-egress-cos-map)#queue 4 cos 5	Configure particular queue value to the cos value for con- figured profile.
<pre>(config-egress-cos-map)#qos profile dscp-to- queue DSCP-QUE</pre>	Create qos profile for attaching in vxlan tunnel ingress.
(config-ingress-dscp-map)#dscp 16 queue 4	Configure particular dscp value to the queue value for con- figured profile.
(config-egress-dscp-map)#interface po46	Create port channel
(config-if)#load-interval 30	Set load interval
(config-if)#ip address 46.1.1.2/30	Assign ip address
(config-if)#interface lo	Enter into loopback interface
<pre>(config-if)#ip address 6.6.6.6/32 secondary</pre>	Assign secondary ip address
(config-if)#interface xe4	Enter into interface mode
(config-if)#channel-group 46 mode active	Map channel group into the interface
(config-if)#interface xe5	Enter into interface mode
(config-if)#channel-group 46 mode active	Map channel group into the interface
(config-if)#interface xe15	Enter into interface mode
(config-if)#switchport	Make interface as L2 port
(config-if)#load-interval 30	Set load interval
(config-if) #router ospf 1	Create ospf instance
(config-router)#ospf router-id 6.6.6.6	Configure ospf router-id
(config-router)#network 6.6.6.6/32 area 0.0.0	Configure ospf network address with respective area
(config-router)#network 46.1.1.0/30 area 0.0.0.0	Configure ospf network address with respective area
(config-router) #router bgp 100	Enter into Router BGP mode

(config-router)#neighbor 1.1.1.1 re-mote-as 100	Specify a neighbor router with peer ip address and remote-as defined
(config-router)#neighbor 1.1.1.1 up-date- source lo	Specify the neighbor to use loopback address as source
(config-router)#address-family 12vpn evpn	Enter into l2vpn evpn address-family
(config-router-af) #neighbor 1.1.1.1 activate	Activate the neighbor to address-family
(config)#nvo vxlan vtep-ip-global 6.6.6.6	Configure Source vtep-ip-global configuration
(config)#nvo vxlan tunnel qos-map-mode cos- dscp ingress DSCP-QUE	Configure the mapping qos profile in to vxlan tunnel ingress
(config) #nvo vxlan id 1 in-gress-replication inner-vid-disabled	Create vnid 1 and disable inner-vid
(config-nvo)#vxlan host-reachability- protocol evpn-bgp vrf1	Assign vrf for evpn-bgp to carry EVPN route
(config-nvo)#nvo vxlan access-if port-vlan xe15 1000	Create vxlan access-if with vlan 1000
(config-nvo-acc-if)#no shutdown	No shut the vxlan access-if
(config-nvo-acc-if)#map vnid 1	Map vnid to the vxlan access-if
(config-nvo-acc-if)#map qos-profile queue- color-to-cos QUE-COS	Map qos profile for vxlan access-if egress traffic to CE
(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

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 overlay dscp value 16 while egress out of tunnel. At VTEP2, when packets with overlay dscp value 16 ingresses 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
!
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 dei all queue 3
1
qos profile queue-color-to-dscp QUE-DSCP
queue 3 color all dscp 16
!
VTEP1#show interface xel4 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 |
+----+
           (E) 12517376 O
q0
                                 0
                                              0
                                                           0
q1
           (E) 12517376 O
                                0
                                              0
                                                           0
            (E) 12517376 O
q2
                                 0
                                              0
                                                           0
                             188040683524
q3
           (E) 12517376 205284588
                                              0
                                                          0
            (E) 12517376 O
                                0
                                              0
                                                          0
q4
                                0
           (E) 12517376 O
                                              0
                                                           0
q5
            (E) 12517376 O
                                0
                                              0
                                                          0
q6
                            1007412
                                              0
                                                          0
           (E) 12517376 7518
q7
VTEP1#show interface xe15 count queue-stats
E - Egress, I - Ingress, Q-Size is in bytes
+----+
 Queue/Class-map | Q-Size | Tx pkts | Tx bytes | Dropped pkts |
1
Dropped bytes |
+----+
q0
           (E) 12517376 O
                                 0
                                              0
                                                           0
           (E) 12517376 O
                                0
                                              0
q1
                                                           0
           (E) 12517376 O
q2
                                0
                                              0
                                                           0
                              188352040168
           (E) 12517376 205624494
q3
                                              0
                                                          0
           (E) 12517376 O
q4
                                0
                                              0
                                                           0
           (E) 12517376 O
                                0
                                              0
                                                           0
q5
            (E) 12517376 O
q6
                                 0
                                              0
                                                           0
                                1136741
                                              0
q7
           (E) 12517376 9006
                                                           0
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
```

NW ----1 ----L2 ____ ____ ___ 1.1.1.1 6.6.6.6 AC po2 --- Single Homed port --- 1001 ----1 ____ ____ Total number of entries are 3 VTEP1#show nvo vxlan mac-table _____ ______ VXLAN MAC Entries _____ ______ VTEP-Ip/ESI VNID Interface VlanId Inner-VlanId Mac-Addr Status AccessPortDesc Type po2 1001 ----0000.2000.9991 1.1.1.1 1 Dynamic Local _____ _____ Total number of entries are : 1 VTEP1#show nvo vxlan tunnel VXLAN Network tunnel Entries Source Destination Up/Down Status Update _____ 1.1.1.1 00:11:29 6.6.6.6 00:11:29 Installed Total number of entries are 2 VTEP1#show qos-profile COS-QUE profile name: COS-QUE profile type: cos-to-queue profile attached to 1 instances configured mapping: cos 2 dei all queue 3 Detailed mapping: INPUT 1 INPUT | OUTPUT OUTPUT COS | DEI | Queue | Color | COS | DEI | Queue | Color _____+ 0 0 0 green | 0 1 0 yellow | 1 yellow 1 0 1 1 1 green | 2 2 0 3 green 1 3 yellow green | 3 3 0 3 1 3 yellow green | 4 green | 5 4 0 4 1 4 yellow 5 5 0 1 5 yellow 6 0 6 | 6 1 6 green yellow

7	0	7 g	reen	7	1	7	yel	low	
VTEP1#s profile profile configu queue 3 Detaileo	how qos-pr name: QUE type: que attached red mappir 3 color al d mapping:	cofile QUE- E-DSCP eue-color-t to 1 insta ng: Ll dscp 16	DSCP o-dscp nces						
11 II	NPUT	OUTPUT	 I	NPUT	OUTPUT	-	INP	UT	OUTPUT
Queue	Color	DSCP	Queue	Color	DSCP	-	Queue	Color	DSCP
0	green	0	 0	yellow	0	-	0	red	0
1	green	10	1	yellow	12	Ι	1	red	14
2	green	18	2	yellow	20	Ι	2	red	22
3	green	16	3	yellow	16		3	red	16
4	green	34	4	yellow	36		4	red	38
5	green	40	5	yellow	40		5	red	40
6	green	48	6	yellow	48		6	red	48
7	green	56	7	yellow	56	I	7	red	56

RTR2/VTEP2

```
VTEP2#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 vrf1
!
nvo vxlan access-if port-vlan xe15 1000
map vnid 1
map qos-profile queue-color-to-cos QUE-COS
!
!
VTEP2#show 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
Т
VTEP2#show nvo vxlan mac-table
_____
                                  VXLAN MAC Entries
_____
______
VNID
     Interface VlanId Inner-VlanId Mac-Addr
                                 VTEP-Ip/ESI
Туре
           Status
                 AccessPortDesc
1
     ____
            ____ ____
                       0000.2000.9991 1.1.1.1
            _____
Dynamic Remote
Total number of entries are : 1
VTEP2#show nvo vxlan tunnel
VXLAN Network tunnel Entries
       Destination Status
                              Up/Down Update
Source
_____
         1.1.1.1
6.6.6.6
                              00:09:39
                                       00:09:39
                   Installed
Total number of entries are 2
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
          L2 NW ----
    ____
                         ____
1
                                           ____ ___
         1.1.1.1
6.6.6.6
    ____
          AC xe15 --- Single Homed port --- 1000 ----
1
                                           ____
____
Total number of entries are 3
VTEP2#show interface 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 O
                             0
                                         0
                                                   0
```

q1		(E) 125	5173	376 0			0				0		0
q2		(E) 125	5173	376 0			0				0		0
q3		(E) 125	5173	376 0			0				0		0
q4		(E) 125	173	76 3789	9587	2	36	455	8298	326	0		0
q5		(E) 125	5173	376 0			0				0		0
q6		(E) 125	5173	376 0			0				0		0
q7		(E) 125	5173	376 0			0				0		0
VTEP2#sh profile profile configur queue 4 Detailed	ow qos-pr name: QUE type: que attached ed mappin color al mapping:	cofile QU C-COS eue-color to 1 ins ag: 1 cos 5	JE-(c-to star	COS D-COS nces									
IN	PUT	OUTPU	- — Г		INPU	 ЈТ	+	PUT	-	INI	 ?UT	OUTPU	 T
Queue	Color	+ COS		 Queu	e	Color	+ COS		-	Queue	Color	+ COS	
0	areen	0		 0	+-	vellow	0		-	0	red	0	
1	green	1		1 1		vellow	1		1	1	red	1	
2	areen	2		2		vellow	2		, I	2	red	2	
3	areen	3		3		vellow	3		, I	3	red	3	
4	green	5		4		vellow	5		·	4	red	5	
5	areen	5		' I 5		vellow	5		·	5	red	5	
6	green	6		6		vellow	6		I	6	red	6	
7	green	7		7		yellow	7			7	red	7	
VTEP2#sh profile profile configur dscp 16 Detailed Ingress	ow qos-pr name: DSC type: dsc attached ed mappin queue 4 mapping: map for +	cofile DS P-QUE p-to-que to 1 ins ug: dscp to	SCP- eue star que	-QUE nces eue-col	or +-				-	+	+		
INPUT INPUT	UUO OUTPU	'PUT 'T		INPU	T +-	OUT	PUT		- 1	INPUT	LOO	'PUT	
DSCP Queue 	Queue Queue Color ++	Color	 	DSCP	י Qu +-	neue Co	olor	 	DS - - 22	CP Qu	eue Col	or	DSCP
6 1 6	green 0 g green	green		17	4	gre gre	en		32 33	4	green	ין י א ר	19

6	2	0 green	green		18	2	green		34	4	green		50
6	3	0 green	green		19	2	green		35	4	green		51
6	4	0 green	green		20	2	yellow	I	36	4	yellow		52
6	5	0 green	green		21	2	green	I	37	4	green		53
6	6	0 green	green		22	2	red	Ι	38	4	red	Ι	54
6	7	0 green	green		23	2	green		39	4	green		55
7	8	1 green	green		24	3	green		40	5	green		56
7	9	1 green	green		25	3	green		41	5	green		57
7	10	1 green	green		26	3	green	Ι	42	5	green		58
7	11	1 green	green		27	3	green	Ι	43	5	green		59
7	12	1 green	yellow		28	3	yellow		44	5	green		60
7	13	1 green	green		29	3	green	Ι	45	5	green		61
7	14	1 green	red		30	3	red		46	5	green		62
7	15	_1 green	green		31	3	green		47	5	green		63

VxLAN - EVPN with Integrated Routing and Bridging Deployment Mode

CHAPTER 1 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 1-10.



Note: In the above topology TS1, TS2 are the tenant systems.

Base Configuration - L2 VXLAN

VTEP1

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

Generic configuration:

#configure terminal	Enter Configure mode.
(config) #evpn vxlan multihoming enable	Enable Multihoming, save configs and reboot the board for multihoming to be effective
(Config)#qos enable	Enabling QoS
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board

Interface and loopback configuration:

(config) #interface pol	Enter Interface mode for po1 (MH2)
(config-if) #switchport	Make it L2 interface
<pre>(config-if)# evpn multi-homed system-mac 0000.0000.2222</pre>	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 and save config and reload board

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 and save config and reload board

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 12vpn evpn	Enter into L2VPN EVPN address family mode
<pre>(config-router-af)#neighbor 2.2.2.2 activate</pre>	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
<pre>(config-router-af)#neighbor 5.5.5.5 activate</pre>	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 and save config and reload board

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 and save config and reload board

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 pol 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 pol 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 and save config and reload board

VTEP2

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

Generic configuration:

#configure terminal	Enter Configure mode.
(config) #evpn vxlan multihoming enable	Enable Multihoming, save configs and reboot the board for multihoming to be effective

(Config)#qos enable	Enabling QoS
(config)#commit	Commit the candidate configuration to running configuration
	and save config and reload board

Interface and loopback configuration:

(config)#interface pol	Enter Interface mode for po1 (MH2)
(config-if)#switchport	Make it L2 interface
<pre>(config-if)# evpn multi-homed system-mac 0000.0000.2222</pre>	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
<pre>(config-if)#ip address 2.2.2.2/32 secondary</pre>	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-if)#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
<pre>(config-if)#channel-group 3 mode active</pre>	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
<pre>(config-if)#channel-group 3 mode active</pre>	Make it member port of po3
(config-if) #exit	Exit Interface mode and return to Configure mode.
<pre>(config)# bridge 1 protocol rstp vlan-bridge</pre>	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
<pre>(config-if)# switchport trunk allowed vlan add 2</pre>	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
	and save config and reload board

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
(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 12vpn 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
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board

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 and save config and reload board

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 pol 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 pol 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 and save config and reload board

VTEP4

Single Home -SH5.

Generic configuration:

#configure terminal	Enter Configure mode.
(Config)#qos enable	Enabling qos

Interface and loopback configuration:

(config)#interface sal	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	Enter L3SI po4.4
(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 and save config and reload board

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 and save config and reload board

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 12vpn 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 and save config and reload board

VRF Configuration:

(config) #mac vrf L2VRF1	Create MAC routing/forwarding instance with L2VRF1 name and enter into VRF mode
(config-vrf) #rd 4.4.4.11	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 4.4.4:21	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 and save config and reload board

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.
<pre>(config) # nvo vxlan access-if port-vlan sa1 20</pre>	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
	and save config and reload board

VTEP5

Single Home -SH3

Generic configuration:

#configure terminal	Enter Configure mode.
(Config) #qos enable	Enabling qos
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board

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 and save config and reload board

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	Add 5.5.5.5 (lo IP address) network into area 0
(config-router)#network 100.15.15.0/24 area 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 and save config and reload board

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 12vpn evpn	Enter into L2VPN EVPN address family mode
<pre>(config-router-af)#neighbor 1.1.1.1 activate</pre>	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 and save config and reload board

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 and save config and reload board

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.
<pre>(config) # nvo vxlan access-if port-vlan xe48 10</pre>	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) #exit	Exit from configuration mode
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board

Switch1 (MH2)

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

#configure terminalEnter Configure mode.(config) # bridge 1 protocol rstp vlan-bridgeConfigure RSTP VLAN bridge(config) # vlan databaseEnter into VLAN database mode(config) #vlan 2-20 bridge 1 state enableConfigure VLANs from 2-20 and associate with bridge 1(config) #interface xe7Enter Interface mode for xe7(config-if) #switchportMake as L2 port by configuring switchport(config-if) #bridge-group 1Associate bridge 1 into interface(config-if) # bridge-group 1 spanning-tree disableConfigure interface as STP disable(config-if) # switchport mode trunkMode as trunk(config-if) # switchport trunk allowed vlan add 2,10,20Trunk allowed VLAN as 2.10.20(config-if) # switchport trunk native vlan 2Native VLAN as 2		
(config) # bridge 1 protocol rstp vlan-bridgeConfigure RSTP VLAN bridge(config) # vlan databaseEnter into VLAN database mode(config) #vlan 2-20 bridge 1 state enableConfigure VLANs from 2-20 and associate with bridge 1(config) #interface xe7Enter Interface mode for xe7(config-if) #switchportMake as L2 port by configuring switchport(config-if) #bridge-group 1Associate bridge 1 into interface(config-if) # bridge-group 1 spanning-tree disableConfigure interface as STP disable(config-if) # switchport mode trunkMode as trunk(config-if) # switchport trunk allowed vlan add 2, 10, 20Trunk allowed VLAN as 2.10.20	#configure terminal	Enter Configure mode.
(config) # vlan databaseEnter into VLAN database mode(config) #vlan 2-20 bridge 1 state enableConfigure VLANs from 2-20 and associate with bridge 1(config) #interface xe7Enter Interface mode for xe7(config-if) #switchportMake as L2 port by configuring switchport(config-if) #bridge-group 1Associate bridge 1 into interface(config-if) # bridge-group 1 spanning-treeConfigure interface as STP disable(config-if) # switchport mode trunkMode as trunk(config-if) # switchport trunk allowed vlanTrunk allowed VLAN as 2.10.20(config-if) # switchport trunk native vlan 2Native VLAN as 2	<pre>(config) # bridge 1 protocol rstp vlan-bridge</pre>	Configure RSTP VLAN bridge
(config) #vlan 2-20 bridge 1 state enableConfigure VLANs from 2-20 and associate with bridge 1(config) #interface xe7Enter Interface mode for xe7(config-if) #switchportMake as L2 port by configuring switchport(config-if) #bridge-group 1Associate bridge 1 into interface(config-if) # bridge-group 1 spanning-tree disableConfigure interface as STP disable(config-if) # switchport mode trunkMode as trunk(config-if) # switchport trunk allowed vlan add 2,10,20Trunk allowed VLAN as 2.10.20(config-if) # switchport trunk native vlan 2Native VLAN as 2	(config)# vlan database	Enter into VLAN database mode
(config) #interface xe7Enter Interface mode for xe7(config-if) #switchportMake as L2 port by configuring switchport(config-if) #bridge-group 1Associate bridge 1 into interface(config-if) # bridge-group 1 spanning-tree disableConfigure interface as STP disable(config-if) # switchport mode trunkMode as trunk(config-if) # switchport trunk allowed vlan add 2,10,20Trunk allowed VLAN as 2.10.20(config-if) # switchport trunk native vlan 2Native VLAN as 2	(config)#vlan 2-20 bridge 1 state enable	Configure VLANs from 2-20 and associate with bridge 1
(config-if) #switchportMake as L2 port by configuring switchport(config-if) #bridge-group 1Associate bridge 1 into interface(config-if) # bridge-group 1 spanning-tree disableConfigure interface as STP disable(config-if) # switchport mode trunkMode as trunk(config-if) # switchport trunk allowed vlan add 2,10,20Trunk allowed VLAN as 2.10.20(config-if) # switchport trunk native vlan 2Native VLAN as 2	(config)#interface xe7	Enter Interface mode for xe7
(config-if) #bridge-group 1Associate bridge 1 into interface(config-if) # bridge-group 1 spanning-tree disableConfigure interface as STP disable(config-if) # switchport mode trunkMode as trunk(config-if) # switchport trunk allowed vlan add 2,10,20Trunk allowed VLAN as 2.10.20(config-if) # switchport trunk native vlan 2Native VLAN as 2	(config-if) #switchport	Make as L2 port by configuring switchport
(config-if) # bridge-group 1 spanning-tree disableConfigure interface as STP disable(config-if) # switchport mode trunkMode as trunk(config-if) # switchport trunk allowed vlan add 2,10,20Trunk allowed VLAN as 2.10.20(config-if) # switchport trunk native vlan 2Native VLAN as 2	(config-if)#bridge-group 1	Associate bridge 1 into interface
(config-if) # switchport mode trunkMode as trunk(config-if) # switchport trunk allowed vlan add 2,10,20Trunk allowed VLAN as 2.10.20(config-if) # switchport trunk native vlan 2Native VLAN as 2	<pre>(config-if)# bridge-group 1 spanning-tree disable</pre>	Configure interface as STP disable
(config-if)# switchport trunk allowed vlan add 2,10,20Trunk allowed VLAN as 2.10.20(config-if)#switchport trunk native vlan 2Native VLAN as 2	(config-if)# switchport mode trunk	Mode as trunk
(config-if)#switchport trunk native vlan 2 Native VLAN as 2	<pre>(config-if)# switchport trunk allowed vlan add 2,10,20</pre>	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 pol	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
<pre>(config-if)# bridge-group 1 spanning-tree disable</pre>	Configure po1 as STP disable
(config-if)# switchport mode trunk	Mode as trunk
<pre>(config-if)# switchport trunk allowed vlan add 2,10,20</pre>	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 xel0	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) #exit	Exit from configuration mode
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board

Switch2 (SH5)

#configure terminal	Enter Configure mode.
<pre>(config) # bridge 1 protocol rstp vlan-bridge</pre>	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)#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
<pre>(config-if)# bridge-group 1 spanning-tree disable</pre>	Configure xe22 as STP disable
(config-if) # switchport mode trunk	Mode as trunk
<pre>(config-if)# switchport trunk allowed vlan add 6,10,20</pre>	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 sal	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
<pre>(config-if)# bridge-group 1 spanning-tree disable</pre>	Configure sa1 as STP disable
(config-if)# switchport mode trunk	Mode as trunk
<pre>(config-if)# switchport trunk allowed vlan add 6,10,20</pre>	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) #exit	Exit from configuration mode
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board

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 and save config and reload board

Interface and loopback configuration:

(config)#interface lo	Enter Interface mode for lo
<pre>(config-if)#ip address 100.100.100.100/32 secondary</pre>	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.
<pre>(config) # bridge 1 protocol rstp vlan-bridge</pre>	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
<pre>(config-if)# switchport trunk allowed vlan add 2</pre>	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	Enter L3SI po4.4
(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 and save config and reload board

OSPF configuration:

(config) #router ospf 100	Enter into router OSPF mode
(config-router)#ospf router-id 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	Add 100.12.12.0 (VTEP2) network into area 0
(config-router)#network 100.14.14.0/24 area 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	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 and save config and reload board

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.

(config)#nvo vxlan irb	Enable VXLAN IRB
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board
(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)# 13vni 1000	Configure L3VNI as 1000 for L3VRF1
(config-vrf)#exit	Exit from VRF mode
<pre>(config) # interface irb1001</pre>	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)# 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 and save config and reload board
(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 and save config and reload board

Validation

VTEP5

TB2-VTEP5#show VXLAN Network t	nvo vxlan tunnel cunnel 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-VTE VXLAN I	P5#show nvo [.] nformation	vxlan					
Code	s: NW - Netw AC - Acce	ork Port ss Port					
	(u) - Unta	gged					
VNID	VNI-Name	VNI-T ₃	ype Type Interf	ace 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 n	umber of ent	ries are	7				
TB2-VTE	P5#show nvo	vxlan arp	p-cache				
VXLAN A	RP-CACHE Inf	ormation					
VNID	Ip-Addr	 Ма	ac-Addr T	ype Age-Out	Retries-Left		
201	21.21.21.5	1 00	000.2222.1020 S	tatic Remote			
201	21.21.21.1	30	c2c.99d6.167a S [.]	tatic Local			
201	21.21.21.1	01 00	000.4444.1020 S	tatic Remote			
101	11.11.11.5	1 00	000.2222.1010 S [.]	tatic Remote			
101	11.11.11.1	30	c2c.99d6.167a S	tatic Local			
101	11.11.11.2	01 00	000.5555.1010 S	tatic Local			
Total n	umber of ent	ries are	6				
VXLAN N	D-CACHE Info	vxlan nd- rmation	-cache				
 VNID	Ip-Addr			Mac-Addr	Type Age-Out	Retries-Left	
201	21:21::21:	1	3c	2c.99d6.167a Static L	ocal		
101	11:11::11:	1	3c:	2c.99d6.167a Static L	ocal		
Total n	umber of ent	ries are	2				
TB2-VTE	P5#show nvo	vxlan 13\ -	vni-map				
L3VNI	L2VNI	1	IRB-interface				
1000	101	i	irb1001				
1000	201	i	irb2001				
TB2-VTE Codes:	P5#show ip r K - kernel, v O - OSPF, IA N1 - OSPF NS E1 - OSPF ex i - IS-IS, L ia - IS-IS i: v - vrf leak * - candidat	oute vrf C - conne - OSPF i SA exterr ternal ty 1 - IS-IS nter area ed e default	L3VRF1 ected, S - stat. inter area hal type 1, N2 - ype 1, E2 - OSP S level-1, L2 - a, E - EVPN, t	ic, R - RIP, B - BGP - OSPF NSSA external - F external type 2 IS-IS level-2,	type 2		
IP Rout	e Table for '	VRF "L3VF	RF1"				
С	11.11.	11.0/24 i	is directly con	nected, irb1001, 00:2	7:00		
С	21.21.	21.0/24 i	is directly con	nected, irb2001, 00:2	6:58		
С	127.0.	0.0/8 is	directly conne	cted, lo.L3VRF1, 00:3	2:53		
Gateway TB2-VTE IPv6 Ro Codes: Timers:	of last res. P5#show ipv6 uting Table K - kernel r IA - OSPF in E2 - OSPF ex N2 - OSPF NS. Uptime	ort is no route vr oute, C - ter area, ternal ty SA exterr	ot set rf L3VRF1 - connected, S , E1 - OSPF ext, ype 2, E - EVPN nal type 2, i -	- static, R - RIP, O - ernal type 1, N1 - OSPF NSSA exte IS-IS, B - BGP	- OSPF, rnal type 1,		
IP Rout	e Table for '	VRF "L3VF	RF1"				
C C	::1/128 via	::, lo.L3	SVKF1, UU:32:53	n			
c	21.21/40 V	1a ::, 11 15 ·· · ·	rb2001, 00:2/:00	8			
<u> </u>	21.21:1/40 V	⊥a ::, 11	LUZUUI, UU:20:3	U			

```
fe80::/64 via ::, irb2001, 00:04:38
С
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
             2
connected
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 12vpn evpn
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
                                 Metric LocPrf
                                                     Weight Path Peer
   Network
                Next Hop
                                                                                 Encap
RD[1.1.1.1:1]
*>i [1]:[00:00:00:00:22:22:00:00]:[4294967295]:[0]
                  1.1.1.1 0 100
                                                     0 i 1.1.1.1
                                                                        VXLAN
*>i [4]:[00:00:00:00:22:22:00:00]:[32,1.1.1.1]
                                                     0 i 1.1.1.1
                   1.1.1.1
                                     0
                                             100
                                                                          VXLAN
RD[1.1.1:11]
*>i [1]:[00:00:00:00:22:22:00:00]:[101]:[101]
                   1.1.1.1 0 100
                                                    0 i 1.1.1.1
                                                                        VXLAN
*>i [2]:[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]:[00:00:00:00:22:22:00:00]:[201]:[201]
                   1.1.1.1 0 100
                                                    0 i 1.1.1.1
                                                                          VXLAN
*>i [2]:[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]
                                    0
                                           100
                                                    0 i 1.1.1.1
                   1.1.1.1
                                                                          VXLAN
```

RD[2.	.2.2.2:1]							
*>i	[1]:[00:00:00:00:	:00:22:22:00:00:00]:[4	1294967295]:[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]:[3	32,2.2.2.2]				
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
	0 0 0 111							
RD[2.	.2.2.2:11]	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	011 (1011					
*>1	[1]:[00:00:00:00:	:00:22:22:00:00:00]:[]		1.0.0	~			
* > 2		2.2.2.2	0	100	0	1	2.2.2.2	VXLAN
*>1	[2]:[00:00:00:00:		.01]:[48,0	100:2222:11	010]:	:32	,11.11.11.51]:[
* > 2		2.2.2.2	0	100	0	1	2.2.2.2	VXLAN
~ / I	[3]:[101]:[32,2.2	2.2.2]	0	100	0	4	2 2 2 2	VVT AN
		2.2.2.2	0	100	0	-	2.2.2.2	VALAN
RD[2	2 2 2 2 2 1 1							
*>i	.00.00.00.00.00.00.00.	00.22.22.00.00.00.1.	2011.12011					
	[_].[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]:[2	201]:[48,0	000:2222:1	020]:	[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]						
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
RD[4.	.4.4.4:11]							
*>i	[3]:[101]:[32,4.4	1.4.4]						
		4.4.4.4	0	100	0	i	4.4.4.4	VXLAN
RD[4.	.4.4.4:21]							
*>i	[2]:[0]:[201]:[48	3,0000:4444:1020]:[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	1.4.4]						
		4.4.4.4	0	100	0	i	4.4.4.4	VXLAN
RD[5.	.5.5.5:11] VRF[L2V	/RF1]:						
* i	[1]:[00:00:00:00:	:00:22:22:00:00:00]:[]	L01]:[101]					
		1.1.1.1	0	100	0	i	1.1.1.1	VXLAN
* 1		2.2.2.2	0	100	0	1	2.2.2.2	VXLAN
* 1	[1]:[00:00:00:00:	:00:22:22:00:00:00]:[4	1294967295]:[0]	~			
		1.1.1.1	0	100	0	1	1.1.1.1	VXLAN
^ 1 + :		2.2.2.2	0	100	0	1	2.2.2.2	VXLAN
T	[2]:[00:00:00:00:00:	1 1 1 1	0	100:2222:11	010]:	:	, 11.11.11.J1]; [
* ;			0	100	0	±	2 2 2 2 2	VALAIN
-		2 2 2 2 2	0	100	0	-		VYT AN
*>	121.101.1011.149	2.2.2.2	0	100	0	l	2.2.2.2	VXLAN
*>	[2]:[0]:[101]:[48	2.2.2.2 3,0000:5555:1010]:[32,	0	100 201]:[101] 100	0	1	i	VXLAN
*>	[2]:[0]:[101]:[48	2.2.2.2 3,0000:5555:1010]:[32, 5.5.5.5 3.3c2c:99d6:167a]:[32.	0 11.11.11.1 0	100 201]:[101] 100	0 32768	1	i	VXLAN VXLAN
*>	[2]:[0]:[101]:[48 [2]:[0]:[101]:[48	2.2.2.2 3,0000:5555:1010]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[32, 5.5.5.5	0 11.11.11.1 0 11.11.11.1	100 201]:[101] 100 1]:[101] 100	0 32768 32768	1	i	VXLAN VXLAN VXLAN
*> *> *>	[2]:[0]:[101]:[48 [2]:[0]:[101]:[48 [2]:[0]:[101]:[48	2.2.2.2 3,0000:5555:1010]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[128	0 11.11.11.1 0 11.11.11.1 0 3,11:11::1	100 201]:[101] 100 1]:[101] 100 1:1]:[101]	0 32768 32768	1 3 3	i	VXLAN VXLAN VXLAN
*> *> *>	<pre>[2]:[0]:[101]:[48 [2]:[0]:[101]:[48 [2]:[0]:[101]:[48</pre>	2.2.2.2 3,0000:5555:1010]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[128 5.5.5.5	0 11.11.11.11. 0 11.11.11.11. 0 3,11:11::11 0	100 201]:[101] 100 1]:[101] 100 1:1]:[101] 100	0 32768 32768 32768	1 3 3	ii	VXLAN VXLAN VXLAN VXLAN
*> *> *> *>	<pre>[2]: [0]: [101]: [48 [2]: [0]: [101]: [48 [2]: [0]: [101]: [48 [3]: [101]: [32, 1.1]</pre>	2.2.2.2 3,0000:5555:1010]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[128 5.5.5.5 .1.1]	0 11.11.11.11.3 0 11.11.11.11.3 0 3,11:11:11 0	100 201]:[101] 100 L]:[101] 100 L:1]:[101] 100	0 32768 32768 32768	1 3 3	ii	VXLAN VXLAN VXLAN VXLAN
*> *> *> * i	<pre>[2]: [0]: [101]: [48 [2]: [0]: [101]: [48 [2]: [0]: [101]: [48 [3]: [101]: [32,1.1]</pre>	2.2.2.2 3,0000:5555:1010]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[128 5.5.5.5 1.1.1] 1.1.1.1	0 11.11.11.11.3 0 11.11.11.11.3 0 3,11:11:11 0	100 201]:[101] 100 1]:[101] 100 1:1]:[101] 100	0 32768 32768 32768 0	1 3 3	ii 1.1.1.1	VXLAN VXLAN VXLAN VXLAN VXLAN
*> *> *> * i * i	<pre>[2]: [0]: [101]: [48 [2]: [0]: [101]: [48 [2]: [0]: [101]: [48 [3]: [101]: [32, 1.1] [3]: [101]: [32, 2.2]</pre>	2.2.2.2 3,0000:5555:1010]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[128 5.5.5.5 1.1.1] 1.1.1.1 2.2.2]	0 11.11.11.11. 0 11.11.11.11. 0 3,11:11:11 0 0	100 201]:[101] 100 1]:[101] 100 1:1]:[101] 100 100	0 32768 32768 32768 0	1 3 3	ii ii 1.1.1.1	VXLAN VXLAN VXLAN VXLAN VXLAN
*> *> * i * i	<pre>[2]: [0]: [101]: [48 [2]: [0]: [101]: [48 [2]: [0]: [101]: [48 [3]: [101]: [32,1.1] [3]: [101]: [32,2.2]</pre>	2.2.2.2 3,0000:5555:1010]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[128 5.5.5.5 1.1.1] 1.1.1.1 2.2.2] 2.2.2.2	0 11.11.11.1 0 11.11.11.1 0 3,11:11:11 0 0 0 0	100 201]:[101] 100 1]:[101] 100 1:1]:[101] 100 100 100	0 32768 32768 32768 0 0	1 3 3 1	ii i 1.1.1.1 2.2.2.2	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
*> *> * i * i * i	<pre>[2]: [0]: [101]: [48 [2]: [0]: [101]: [48 [2]: [0]: [101]: [48 [3]: [101]: [32, 1.1] [3]: [101]: [32, 2.2] [3]: [101]: [32, 4.4]</pre>	2.2.2.2 3,0000:5555:1010]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[128 5.5.5.5 1.1.1] 1.1.1.1 2.2.2] 2.2.2.2 1.4.4]	0 11.11.11.1 0 11.11.11.1 0 3,111.11.11.1 0 0 0 0	100 201]:[101] 100 1]:[101] 100 1:1]:[101] 100 100 100	0 32768 32768 32768 0 0	1 3 1 1	ii ii 1.1.1.1 2.2.2.2	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
*> *> * i * i * i	<pre>[2]: [0]: [101]: [48 [2]: [0]: [101]: [48 [2]: [0]: [101]: [48 [3]: [101]: [32, 1.1] [3]: [101]: [32, 2.2] [3]: [101]: [32, 4.4]</pre>	2.2.2.2 3,0000:5555:1010]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[32, 5.5.5.5 3,3c2c:99d6:167a]:[128 5.5.5.5 1.1.1] 1.1.1.1 2.2.2] 2.2.2.2 1.4.4] 4.4.4.4	0 11.11.11.1 0 11.11.11.1 0 8,111.11:11 0 0 0 0 0	100 201]:[101] 100 1]:[101] 100 1:1]:[101] 100 100 100	0 32768 32768 32768 0 0 0	1 3 1 1	ii i i.1.1.1.1 2.2.2.2 4.4.4.4	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
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Total number of prefixes 39
TB2-VTEP5#
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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.

(config)#nvo vxlan irb	Enable VXLAN IRB
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board
(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
<pre>(config-vrf) # route-target both 100:100</pre>	Assign route-target value for same for import and export.
(config-vrf) # 13vni 1000	Configure L3VNI as 1000 for L3VRF1
(config-vrf) #exit	Exit from VRF mode
<pre>(config) # evpn irb-forwarding anycast- gateway-mac 0000.0000.1111</pre>	Configure anycast MAC address
(config) # interface irb1001	Configure IRB interface 1001
(config-if)#ip vrf forwarding L3VRF1	Configure L3VRF1
<pre>(config-if)#ip address 11.11.11.1/24 anycast</pre>	Configure IP address
(config-if)#ipv6 address 11:11::11:1/48	Configure IPv6 address
<pre>(config-if)#evpn irb-if-forwarding anycast- gateway-mac</pre>	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
<pre>(config-if)#ip address 21.21.21.1/24 anycast</pre>	Configure IP address
(config-if)#ipv6 address 21:21::21:1/48	Configure IPv6 address

<pre>(config-if)#evpn irb-if-forwarding anycast- gateway-mac</pre>	Configure anycast MAC address
(config-if) #exit	Exit from interface config mode
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board
(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 and save config and reload board

(config)#nvo vxlan irb	Enable VXLAN IRB
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board
(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
<pre>(config-vrf)# route-target both 100:100</pre>	Assign route-target value for same for import and export.
(config-vrf)# 13vni 1000	Configure L3VNI as 1000 for L3VRF1
(config-vrf) #exit	Exit from VRF mode
<pre>(config) # evpn irb-forwarding anycast- gateway-mac 0000.0000.1111</pre>	Configure anycast MAC address
(config) # interface irb1001	Configure IRB interface 1001
(config-if)#ip vrf forwarding L3VRF1	Configure L3VRF1
<pre>(config-if)#ip address 11.11.11.1/24 anycast</pre>	Configure IP address
(config-if)#ipv6 address 11:11::11:1/48	Configure IPv6 address
<pre>(config-if)#evpn irb-if-forwarding anycast- gateway-mac</pre>	Configure anycast MAC address

(config-if) #exit	Exit from interface config mode
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board
(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
<pre>(config-if)#evpn irb-if-forwarding anycast- gateway-mac</pre>	Configure anycast MAC 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)# 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 and save config and reload board

(config)#nvo vxlan irb	Enable VXLAN IRB
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board
(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
<pre>(config-vrf)# route-target both 100:100</pre>	Assign route-target value for same for import and export.
(config-vrf)# 13vni 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
<pre>(config) # interface irb1001</pre>	Configure IRB interface 1001

(config-if)#ip vrf forwarding L3VRF1	Configure L3VRF1
<pre>(config-if)#ip address 11.11.11.1/24 anycast</pre>	Configure IP address
(config-if)#ipv6 address 11:11::11:1/48	Configure IPv6 address
<pre>(config-if)#evpn irb-if-forwarding anycast- gateway-mac</pre>	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
<pre>(config-if)#ip address 21.21.21.1/24 anycast</pre>	Configure IP address
(config-if)#ipv6 address 21:21::21:1/48	Configure IPv6 address
<pre>(config-if)#evpn irb-if-forwarding anycast- gateway-mac</pre>	Configure anycast MAC address
(config-if) #exit	Exit from interface config mode
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board
(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 and save config and reload board

(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)# 13vni 1000	Configure L3VNI as 1000 for L3VRF1
(config-vrf) #exit	Exit from VRF mode

<pre>(config)# evpn irb-forwarding anycast- gateway-mac 0000.0000.1111</pre>	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 anycast	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 and save config and reload board
(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
<pre>(config) # nvo vxlan id 101 ingress- replication inner-vid-disabled</pre>	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 and save config and reload board

Validations

VTEP1

TB2-VTEP1#show nvo vxlan tunnel VXLAN Network tunnel Entries Source Destination Status Up/Down Update

VXLAN-EVPN with IRB

1.1.1.1 1.1.1.1	5.5.5	5.5 4.4	Ir Ir	nstalled nstalled	00 : 00 :	:13:05 :18:33	00:13:05 00:18:33					
1.1.1.1	2.2.2	2.2	Ir	nstalled	00:	:18:34	00:18:34					
Total nu TB2-VTEP VXLAN In	mber of entrie 1#show nvo vx formation	es are 3 lan										
Codes	: NW - Networl AC - Access (u) - Untagge	k Port Port ed										
VNID	VNI-Name	VNI-Type	Туре	Interface	ESI			VLAN	DF-S	tatus Src-Addr	Dst-Addr	
101	VNI-101	L2	NW							1.1.1.1	5.5.5.5	
101	VNI-101 VNI-101	LZ L2	NW								4.4.4.4	
101	VNI-101		AC	 pol	00.00.00		2.22.00.00.00	10	DF		2.2.2.2	
201	VNI-201	L2	NW				2.22.00.00.00			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	pol	00:00:00	0:00:00:2	2:22:00:00:00	20	DF			
Total nu TB2-VTEP VXLAN AR	mber of entrie 1#show nvo vx P-CACHE Inform	es are 8 lan arp-ca nation	che									
VNID	Ip-Addr	 Mac-A	ddr	Туре	1	Age-Out	Retries-Left	t				
201	21.21.21.51	0000.	2222.	.1020 Stati	.c Local			_				
201	21.21.21.1	0000.	0000.	.1111 Stati	.c Local							
201	21.21.21.101	0000.	4444.	.1020 Stati	.c Remote	e						
101	11.11.11.51	0000.	2222.	.1010 Stati	c Local							
101	11.11.11.1	0000.	0000.	.1111 Stati	.c Local							
101	11.11.11.201	0000.	5555.	.1010 Stati	.c Remote	e						
Total nu	mber of entrie	es are 6										
TBZ-VTEP VXLAN ND	-CACHE Inform	lan nd-cac ation	che									
=======		======										
VNID	Ip-Addr				Mac-A	Addr	Туре	Age	-Out	Retries-Left		
201	21:21::21:1			0000.0	0000.1111	l Static	Local	-				
101	11:11::11:1			0000.0	000.1111	l Static	Local	-				
Total nu	mber of entrie	es are 2										
TB2-VTEP	1#show nvo vx	lan 13vni-	map									
L3VN1 =======	L2VN1	-1RB	·intei =====	riace								
1000	101	irb1	001									
1000	201	irb2	2001									
TB2-VTEP	1#show ip rout	te vrf L3V	/RF1									
Codes: K	- kernel, C ·	- connecte	ed, S	- static,	R - RIP,	, B - BGP						
0	- OSPF, IA -	OSPF inte	er are	ea								
N	1 - OSPF NSSA	external	type	1, N2 - OS	SPF NSSA	external	type 2					
E .	1 - OSPF exter	rnal type	1, E2	2 - OSPF ex	ternal t	type 2						
1	- 15-15, L1 ·	- 15-15 le	, – EZ	7DN	-is level	1-2,						
T V	- vrf leaked	er area, r		/ 1 1 ,								
*	- candidate d	default										
IP Route	Table for VR	F "L3VRF1"	,									
С	11.11.11	.0/24 is d	lirect	ly connect	ed, irbl	1001, 00:	19:26					
C	21.21.21	.0/24 is d	lirect	ly connect	ed, irb2	2001, 00:	19:26					
	12/.0.0.0	J/O IS Ulr	ecti	/ connected	ι, τΟ.Π3\	vrei, 00:	19:20					
Gateway	of last resort	t is not s	set									
TB2-VTEP	1#show ipv6 r	oute vrf L	J3VRF1	L								
IPv6 Rou	ting Table											
Codes: K	- kernel rout	te, C - co	nnect	ced, S - st	atic, R	- RIP, O	- OSPF,					
I	A - OSPF inte:	r area, El	- 05	SPF externa	al type 1	1,						
E	2 - OSPF exter	rnal type	2, E	- EVPN N1	OSPF	NSSA ext	ernai type 1,					
N	2 - USPE NSSA	external	суре	2, I - IS-	тэ, в -	שטע						

```
Timers: Uptime
IP Route Table for VRF "L3VRF1"
    ::1/128 via ::, lo.L3VRF1, 00:19:28
С
С
      11:11::/48 via ::, irb1001, 00:19:26
С
     21:21::/48 via ::, irb2001, 00:19:26
С
     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
FTB
             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
Route Source Networks
connected
             2
Total
            2
             2
FTB
ECMP statistics (active in ASIC):
Total number of IPv6 ECMP routes : 0
Total number of IPv6 ECMP paths : 0
TB2-VTEP1#show bgp 12vpn 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
                                  Metric LocPrf
   Network
                  Next Hop
                                                       Weight Path Peer
                                                                                   Encap
RD[21000:11]
*>i [5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]
                                                        0 ? 2.2.2.2
                    2.2.2.2 0 100
                                                                           VXLAN
*>i [5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]
                    2.2.2.2
                                                            ? 2.2.2.2
                                      0
                                            100
                                                        0
                                                                             VXLAN
RD[41000:11]
*>i [5]:[0]:[1000]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]
                                                            ? 4.4.4.4
                                                                             VXLAN
                    4.4.4.4
                                  0
                                           100
                                                        0
*>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]
                                                       0
                                                            ? 5.5.5.5
                                                                             VXLAN
                    5.5.5.5
                                   0
                                            100
*>i [5]:[0]:[1000]:[24]:[21.21.21.0]:[0.0.0.0]:[1000]
```

VXLAN-EVPN with IRB

		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]:[4	294967295]]:[0]				
*>	[4]:[00:00:00:00:	1.1.1.1 00:22:22:00:00:001:[3]	0 2,1.1.1.1	100	32768	-	1	VXLAN
		1.1.1.1	0	100	32768	:	i	VXLAN
* i	[4]:[00:00:00:00:	00:22:22:00:00:00]:[3	2,2.2.2.2]	<u>_</u>			
		2.2.2.2	0	100	0	l	2.2.2.2	VXLAN
RD[1.	1.1.1:11] VRF[L2V	RF1]:						
*>	[1]:[00:00:00:00:	00:22:22:00:00:00]:[1	01]:[101]	100	22760			17VT 7 11
* 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]:[4	294967295]:[0]				
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
* 1	[2]:[0]:[101]:[48	,0000:0000:1111]:[32,1	11.11.11.1	L]:[101] 100	0	i	5 5 5 5	VYLAN
* i		4.4.4.4	0	100	0	ı i	4.4.4.4	VXLAN
* i		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>		1.1.1.1	0	100	32768	1	i	VXLAN
* i	[2]:[0]:[101]:[48	,0000:0000:1111]:[128	,11:11::11	1:1]:[101]				
		5.5.5.5	0	100	0	i	5.5.5.5	VXLAN
* 1		4.4.4.4	0	100	0	1	4.4.4.4	VXLAN
"⊥ *>		2.2.2.2	0	100	32768	± .	2.2.2.2 i	VALAN VXI.AN
*>	[2]:[00:00:00:00:	00:22:22:00:00:00]:[1	011:[48,00	000:2222:10)10]:[32	,11.11.11.51]:[1	01]
		1.1.1.1	0	100	32768		i	VXLAN
* i		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
* i	[2]:[0]:[101]:[48	,0000:5555:1010]:[32,	11.11.11.2	201]:[101]				
* \	(2), (101), (20, 1, 1	5.5.5.5	0	100	0	i	5.5.5.5	VXLAN
^ /	[3]:[101]:[32,1.1	· L · L J 1 1 1 1 1	0	100	32768			VXT.AN
* i	[3]:[101]:[32,2.2	.2.21	0	100	52700	-	-	VADAN
		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]	0	100	0			5757T 75 51
		5.5.5.5	0	100	0	T	5.5.5.5	VALAN
RD[1.	1.1.1:21] VRF[L2V	RF2]:						
*>	[1]:[00:00:00:00:	00:22:22:00:00:00]:[2	01]:[201]					
		1.1.1.1	0	100	32768	1	i	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]:[4	294967295]]:[0]				
* :	121.101.12011.100	2.2.2.2	U 21 21 21 1	100	0	1	2.2.2.2	VXLAN
~ <u>T</u>	[2];[0];[201];[40	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		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>		1.1.1.1	0	100	32768	-	i	VXLAN
* i	[2]:[0]:[201]:[48	,0000:0000:1111]:[128	,21:21::21	1:1]:[201]				
		5.5.5.5	0	100	0	i	5.5.5.5	VXLAN
* :		4.4.4.4	0	100	0	1	4.4.4.4	VXLAN
~⊥ *>		1 1 1 1	0	100	32768	± .	2.2.2.2 i	VXLAN VXLAN
*>	[2]:[00:00:00:00:	00:22:22:00:00:00]:[2	011:[48,00	000:2222:10)201:[32	21.21.21.51]:[2	011
		1.1.1.1	0	100	32768		i	VXLAN
* i		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
* i	[2]:[0]:[201]:[48	,0000:4444:1020]:[32,	21.21.21.1	101]:[201]				
		4.4.4.4	0	100	0	i	4.4.4.4	VXLAN
*>	[3]:[201]:[32,1.1	.L.L] 1 1 1 1	0	100	30760			WVT AN
* i	[3]:[201]:[32.2.2	.2.21	0	100	52700	-	L	VALAN
-		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[?	2.2.2:11							
*>i	[1]:[00:00:00:00:	00:22:22:00:00:00]:[4	294967295]:[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. 0	2] 100	0	i	2.2.2.2	VXLAN
RD[2.	2.2.2:11]	~~ ~~ ~~ ~~							
*>1	[1]:[00:00:00:00:	2 2 2 2 2	:00:00]:[10	01]:[101 0	J 100	0	i	2222	VXLAN
*>i	[2]:[0]:[101]:[48	,0000:0000:1	[111]:[32,	11.11.11	.1]:[101]	-	_		
		2.2.2.2		0	100	0	i	2.2.2.2	VXLAN
*>i	[2]:[0]:[101]:[48	,0000:0000:1	[111]:[128,	,11:11:: 0	11:1]:[101]	0	i	2 2 2 2	VXT.AN
*>i	[2]:[00:00:00:00:	00:22:22:00:	:00:00]:[10	01]:[48,	0000:2222:10	010]:	[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]		0	100	0	i	2 2 2 2	VXT.AN
				0	200	0	-		******
RD[2.	2.2.2:21]	~~ ~~ ~~ ~~	~~ ~~ ~~ ~~						
*>1	[1]:[00:00:00:00:	2 2 2 2 2	:00:00]:[20	01]:[201	J 100	0	i	2222	VXLAN
*>i	[2]:[0]:[201]:[48	,0000:0000:1	1111]:[32,2	21.21.21	.1]:[201]	0	-		******
		2.2.2.2		0	100	0	i	2.2.2.2	VXLAN
*>i	[2]:[0]:[201]:[48	,0000:0000:1	[111]:[128,	,21:21:: 0	21:1]:[201]	0	i	2 2 2 2	VXT.AN
*>i	[2]:[00:00:00:00:	00:22:22:00:	:00:00]:[20	01]:[48,	0000:2222:10	020]:	[32,	21.21.21.	51]:[201]
		2.2.2.2		0	100	0	i	2.2.2.2	VXLAN
*>1	[3]:[201]:[32,2.2	.2.2]		0	100	0	i	2.2.2.2	VXLAN
				0	200	0	-		******
RD[4.	4.4.4:11]								
*>1	[2]:[0]:[101]:[48	,0000:0000:1	[111]:[32,1	11.11.11 0	.1]:[101]	0	i	4 4 4 4	VXLAN
*>i	[2]:[0]:[101]:[48	,0000:0000:1	L111]:[128,	,11:11::	11:1]:[101]	0	-		******
		4.4.4.4		0	100	0	i	4.4.4.4	VXLAN
*>1	[3]:[101]:[32,4.4	4.4.4		0	100	0	i	4.4.4.4	VXLAN
				0	200	0	-		******
RD[4.	4.4.4:21]								
*>1	[2]:[0]:[201]:[48	4.4.4.4	[]]]:[32,2	0	100	0	i	4.4.4.4	VXLAN
*>i	[2]:[0]:[201]:[48	,0000:0000:1	L111]:[128,	,21:21::	21:1]:[201]				
		4.4.4.4	0001 100 1	0	100	0	i	4.4.4.4	VXLAN
*>1	[2]:[0]:[201]:[48	4.4.4.4	1020]:[32,2	21.21.21 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	,0000:0000:1	L111]:[32,3	11.11.11	.1]:[101]				
*<:	[2].[0].[10]].[49	5.5.5.5	1111.110	0	100	0	i	5.5.5.5	VXLAN
	[2].[0].[101].[40	5.5.5.5		0	100	0	i	5.5.5.5	VXLAN
*>i	[2]:[0]:[101]:[48	,0000:5555:1	L010]:[32,3	11.11.11	.201]:[101]				
*\;	[3].[10]].[32 5 5	5.5.5.5		0	100	0	i	5.5.5.5	VXLAN
~ / I	[5]:[101]:[32,3.3	5.5.5.5		0	100	0	i	5.5.5.5	VXLAN
RD[5.	.5.5.5:21]	0000.0000.1	11111.132	21 21 21	11.[201]				
	[2].[0].[201].[40	5.5.5.5		0	100	0	i	5.5.5.5	VXLAN
*>i	[2]:[0]:[201]:[48	,0000:0000:1	L111]:[128,	,21:21::	21:1]:[201]				
*<:	121.12011.122 5 5	5.5.5.5		0	100	0	i	5.5.5.5	VXLAN
~ >1	[5]:[201]:[32,3.3	5.5.5.5		0	100	0	i	5.5.5.5	VXLAN
Total TB2-V	number of prefix /TEP1#	es 55							
TB2-1	TEP2#show nvo vyl	an tunnel							
VXLAN	Network tunnel E	ntries							
Sourc	ce Desti	nation	Status		Up/Down	UI	pdat	ie	
2.2.2	2.2 4.4 4	. 4	Installed			===== ۱۱		===== 3:42	
2.2.2	2.2 1.1.1	1	Installed		00:18:43	0.0):18	3:43	

00:18:42 00:18:42 00:18:43 00:18:43

1.1.1.1

Installed

2.2.2.2 2.2.2.2

VXLAN-EVPN with IRB

2.2.2.2	5.5.	5.5	Installe	d 00:13:14	00:13:14			
Total nu TB2-VTEE VXLAN Ir	umber of entri 22#show nvo vx nformation	es are 3 lan						
Codes	S: NW - Networ AC - Access (u) - Untagg	k Port Port red						
VNID	VNI-Name	VNI-Type 7	Type Interf	ace ESI		VLAN DF-Status	Src-Addr	Dst-Addr
101 101 101 201 201 201 201 201	VNI-101 VNI-101 VNI-101 VNI-201 VNI-201 VNI-201 VNI-201 VNI-201	L2 1 L2 1 L2 1 L2 1 L2 1 L2 1 L2 1 L2 1	NW NW AC pol NW NW NW AC pol	 00:00:00:00:00:22 00:00:00:00:00:22	:22:00:00:00 :22:00:00:00	10 NON-DF 20 NON-DF	2.2.2.2 2.2.2.2 2.2.2.2 2.2.2.2 2.2.2.2 2.2.2.2 2.2.2.2 2.2.2.2	4.4.4.4 1.1.1.1 5.5.5.5 4.4.4.4 1.1.1.1 5.5.5.5
TB2-VTEP VXLAN AF	2#show nvo vx RP-CACHE Infor	lan arp-cae mation	che					
VNID	Ip-Addr	====== Mac-Ad	ddr T	ype Age-Out	Retries-Left			
201 201 201 101 101 101 Total nu TB2-VTEF VXLAN NE	21.21.21.51 21.21.21.1 21.21.21.101 11.11.11.51 11.11.11.1 11.11.11.201 Imber of entri 22#show nvo vx D-CACHE Inform	0000. 0000. 0000. 0000. 0000. 0000. es are 6 lan nd-cach	2222.1020 s 0000.1111 s 4444.1020 s 2222.1010 s 0000.1111 s 5555.1010 s	tatic Local catic Local catic Remote catic Local catic Local catic Remote				
VNID	Ip-Addr			Mac-Addr	Туре	Age-Out Re	tries-Left	
201 101 Total nu TB2-VTEF L3VNI 	21:21::21:1 11:11::11:1 nmber of entri 22#show nvo vx L2VNI 101 201	es are 2 Ian 13vni-r IRB-: irb1(irb2(00 00 interface ==== 001 001	00.0000.1111 Static L 00.0000.1111 Static L	ocal ocal			
TB2-VTEF Codes: F C C S C S C S S S S S S S S S S S S S	22#show ip rou (- kernel, C) - OSPF, IA - 11 - OSPF NSSA 21 - OSPF exte - IS-IS, L1 .a - IS-IS int 7 - vrf leaked 5 - candidate	te vrf L3VI - connecte OSPF inte: external type : - IS-IS le er area, E default	RF1 d, S - stat r area type 1, N2 1, E2 - OSP vel-1, L2 - - EVPN,	ic, R - RIP, B - BGP - OSPF NSSA external f F external type 2 IS-IS level-2,	type 2			
IP Route C C C	e Table for VR 11.11.11 21.21.21 127.0.0.	EF "L3VRF1" .0/24 is d: .0/24 is d: 0/8 is dire	irectly con irectly con ectly conne	nected, irb1001, 00:1 nected, irb2001, 00:1 cted, lo.L3VRF1, 00:1	9:37 9:37 9:40			
Gateway TB2-VTEF IPv6 Rou Codes: F I E N Timers:	of last resor 22#show ipv6 r ating Table K - kernel rou A - OSPF inte 22 - OSPF exte 22 - OSPF NSSA Uptime	t is not se route vrf L te, C - con or area, El ornal type 2 c external t	et 3VRF1 - OSPF ext. 2, E - EVPN type 2, i -	- static, R - RIP, O ernal type 1, N1 - OSPF NSSA exte IS-IS, B - BGP	- OSPF, rnal type 1,			

```
IP Route Table for VRF "L3VRF1"
     ::1/128 via ::, lo.L3VRF1, 00:19:40
С
      11:11::/48 via ::, irb1001, 00:19:37
С
    21:21::/48 via ::, irb2001, 00:19:37
fe80::/64 via ::, irb2001, 00:19:36
С
С
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
              9
ospf
Total
              12
FTB
              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
Total
              2
FTB
              2
ECMP statistics (active in ASIC):
Total number of IPv6 ECMP routes
                                : 0
Total number of IPv6 ECMP paths : 0
TB2-VTEP2#show bgp 12vpn evpn
BGP table version is 6, local router ID is 2.2.2.2
Status codes: s suppressed, d damped, h history, \star 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
                               Metric LocPrf
   Network
                 Next Hop
                                                         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
                    1.1.1.1
                                       0
                                                100
                                                         0
                                                                                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
                                                100
                                                              ? 4.4.4.4
                                       0
                                                          0
                                                                                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
                                                100
                                                         0
                                                              ? 5.5.5.5
                                                                                VXLAN
                                       0
```

*>1[1]:[00:00:00:00:00:	:00:22:22:00:00:00]	:[429496729	5]:[0]	0		1 1 1 1	1717T 3 31
*>i[/1.00.00.00.00.	1.1.1.1	0	11	0	T	1.1.1.1	VALAN
~/1[4].[00.00.00.00.00.	1 1 1 1	.[32,1.1.1.	100	0	i	1 1 1 1	VXT.AN
	1.1.1.1	0	100	0	-	1.1.1.1	VILLIN
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	8,0000:0000:1111]:[3	32,11.11.11	.1]:[101]				
	1.1.1.1	0	100	0	i	1.1.1.1	VXLAN
*>i[2]:[0]:[101]:[48	3,0000:0000:1111]:[3	128,11:11::	11:1]:[101]			
	1.1.1.1	0	100	0	i	1.1.1.1	VXLAN
*>1[2]:[00:00:00:00:00:	:00:22:22:00:00:00]	:[101]:[48,	0000:2222:	1010]:[3	2,1	1.11.11.51]:[:	101]
+>:::::::::::::::::::::::::::::::::::::	1.1.1.1	0	100	0	1	1.1.1.1	VXLAN
"/1[3]:[101]:[32,1.1	1 1 1 1	0	100	0	i	1 1 1 1	VYLAN
	1.1.1.1	0	100	0	Ŧ	1.1.1.1	VALM
RD[1.1.1.1:21]							
*>i[1]:[00:00:00:00:	00:22:22:00:00:00]	:[201]:[201	1				
	1.1.1.1	0	100	0	i	1.1.1.1	VXLAN
*>i[2]:[0]:[201]:[48	8,0000:0000:1111]:[3	32,21.21.21	.1]:[201]				
	1.1.1.1	0	100	0	i	1.1.1.1	VXLAN
*>i[2]:[0]:[201]:[48	3,0000:0000:1111]:[3	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]:[3	2,2	1.21.21.51]:[2	201]
	1.1.1.1	0	100	0	i	1.1.1.1	VXLAN
*>1[3]:[201]:[32,1.1	.1.1]	0	100	0			
	1.1.1.1	0	100	0	1	1.1.1.1	VXLAN
2 2 2 11 TELOT	mn-gurf-11.						
*> [1].[00.00.00.00.	00.22.22.00.00.001	. 1429496729	51 • [0]				
/ [1].[00.00.00.00.00.	2.2.2.2	0	100	3276	8	i	VXLAN
* i[4]:[00:00:00:00:	00:22:22:00:00:001	:[32,1.1.1.	11	0270	0	-	******
	1.1.1.1	0	100	0	i	1.1.1.1	VXLAN
*> [4]:[00:00:00:00:	00:22:22:00:00:00]	:[32,2.2.2.	2]				
	2 2 2 2	0	100	2076	~		VXT.AN
	2.2.2.2	0	100	3276	8	1	V 2110111V
	2.2.2.2	U	100	3276	8	1	VILLIIN
RD[2.2.2.2:11] VRF[I	2.2.2.2	0	100	3276	8	1	V TILLI IIV
RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00:00:	2VRF1]: 00:22:22:00:00:00]	:[101]:[101]	3276	8	1	VALLIN
RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00:	2.2.2.2 2VRF1]: 00:22:22:00:00:00]	0 :[101]:[101 0	100] 100	0	8 i	1.1.1.1	VXLAN
RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00: *>	2.2.2.2 22VRF1]: 00:22:22:00:00:00] 1.1.1.1 2.2.2.2	0 : [101] : [101 0	100 100	0 32768	i i	1.1.1.1	VXLAN VXLAN
<pre>RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00: *> * i[1]:[00:00:00:00:00:</pre>	2.2.2.2 22VRF1]: 00:22:22:00:00:00] 1.1.1.1 2.2.2.2 00:22:22:00:00:00]	0 :[101]:[101 0 :[429496729	100 100 5]:[0]	0 32768	i i	1.1.1.1	VXLAN VXLAN
RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00: *> * i[1]:[00:00:00:00: * ; i[2]:[0]:[10]]:[40]	2:2:2:2 22VRF1]: 100:22:22:00:00:00] 1.1.1.1 2.2.2.2 00:22:22:00:00:00] 1.1.1.1 0000:0000.11111.0	0 :[101]:[101 0 :[429496729 0 32.11.11.1	100 100 5]:[0] 100	0 32768 0	i i	1.1.1.1 1.1.1.1 1.1.1.1	VXLAN VXLAN VXLAN
<pre>RD[2.2.2.2:11] VRF[I] * i[1]:[00:00:00:00: *> * i[1]:[00:00:00:00:00: * i[2]:[0]:[101]:[48</pre>	2:2:2:2 22VRF1]: 100:22:22:00:00:00] 1.1.1.1 2.2.2.2 00:22:22:00:00:00] 1.1.1.1 8,0000:0000:1111]:[[0 :[101]:[101 0 :[429496729 0 32,11.11.11 0	100 100 5]:[0] 100 .1]:[101] 100	0 32768 0	8 i i	1.1.1.1 1.1.1.1 1.1.1.1	VXLAN VXLAN VXLAN
<pre>RD[2.2.2.2:11] VRF[I] * i[1]:[00:00:00:00: *> * i[1]:[00:00:00:00:00: * i[2]:[0]:[101]:[48 * i</pre>	2:2:2:2 22VRF1]: 100:22:22:00:00:00] 1.1.1.1 2.2.2.2 1.1.1.1 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4	0 : [101] : [101 0 : [429496729 0 32,11.11.11 0 0	100 100 5]:[0] 100 .1]:[101] 100 100	0 32768 0 0 0 i	8 i i i	1.1.1.1 1.1.1.1 1.1.1.1 5.5.5.5 .4.4.4	VXLAN VXLAN VXLAN VXLAN VXLAN
<pre>RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00: *> * i[1]:[00:00:00:00:00: * i[2]:[0]:[101]:[48 * i * i</pre>	2:2:2:2 22VRF1]: 100:22:22:00:00:00] 1.1.1.1 2.2.2.2 1.1.1.1 3,0000:0000:1111]:[(5.5.5.5 4.4.4.4 1.1.1.1	0 : [101] : [101 0 : [429496729 0 32,11.11.11 0 0 0	100 100 5]:[0] 100 .1]:[101] 100 100 100	0 32768 0 0 0 0 1 0	8 i i 4 1	1.1.1.1 1.1.1.1 5.5.5.5 .4.4.4 1.1.1	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
<pre>RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00: *> * i[1]:[00:00:00:00:00: * i[2]:[0]:[101]:[48 * i * i * i * ></pre>	2.2.2.2 22VRF1]: 1.1.1.1 2.2.2.2 1.1.1.1 3,0000:0000:1111]:[(5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2	0 : [101] : [101 0 : [429496729 0 32,11.11.11 0 0 0 0	100 100 5]:[0] 100 .1]:[101] 100 100 100	0 32768 0 0 0 1 32768	8 i i 4 1 i	1.1.1.1 1.1.1.1 5.5.5.5 .4.4.4 .1.1.1	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
<pre>RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00: *> * i[1]:[00:00:00:00:00: * i[2]:[0]:[101]:[48 * i * i * i * i * i * i</pre>	2:2:2:2 22VRF1]: 100:22:22:00:00:00] 1.1.1.1 2.2.2.2 1.1.1.1 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:0000:1111]:[3	0 : [101] : [101 0 : [429496729 0 32,11.11.11 0 0 0 128,11:11::	100 100 100 5]:[0] 100 .1]:[101] 100 100 100 11:1]:[101]	0 32768 0 0 i 32768 32768	i i 4 1	1.1.1.1 1.1.1.1 5.5.5.5 .4.4.4 .1.1.1	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
<pre>RD[2.2.2.2:11] VRF[I] * i[1]:[00:00:00:00: *> * i[1]:[00:00:00:00:00: * i[2]:[0]:[101]:[48 * i * i * i * i * i</pre>	2:2:2:2 22VRF1]: 100:22:22:00:00:00] 1.1.1.1 2.2.2.2 1.1.1.1 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:0000:1111]:[3 5.5.5.5	0 : [101] : [101 0 : [429496729 0 32,11.11.11 0 0 0 128,11:11:1 0	100 100 100 5]:[0] 100 100 100 100 11:1]:[101 100	0 32768 0 0 i 32768 32768	i i i 1 i i	1.1.1.1 1.1.1.1 5.5.5.5 .4.4.4 .1.1.1 5.5.5.5	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
<pre>RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00: *> * i[1]:[00:00:00:00:00: * i[2]:[0]:[101]:[48 * i * i * i * i[2]:[0]:[101]:[48 * i</pre>	2:2:2:2 22VRF1]: 100:22:22:00:00:00] 1.1.1.1 2.2.2.2 1.1.1.1 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4	0 : [101] : [101 0 : [429496729 0 32,11.11.11 0 0 128,11:11:: 0 0 0	100 100 100 5]:[0] 100 100 100 100 11:1]:[101 100 100 100	0 32768 0 0 i 32768 32768] 0 i 0 i	8 i i 1 i 1 i 4 1	1.1.1.1 1.1.1.1 5.5.5.5 4.4.4 1.1.1 5.5.5.5 5.5.5 4.4.4	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
<pre>RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00: *> * i[1]:[00:00:00:00:00: * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i * i</pre>	2:2:2:2 22VRF1]: 100:22:22:00:00:00] 1.1.1.1 2.2.2.2 1.1.1.1 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:00000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1	0 : [101] : [101 0 : [429496729 0 32,11.11.11 0 0 128,11:11:: 0 0 0 0 0 0 0 0 0 0 0 0 0	100 100 100 5]:[0] 100 .1]:[101] 100 100 11:1]:[101 100 100 100 100	0 32768 0 0 0 i 32768 32768] 0 0 0 i 0 0 i	8 i i 4 1 i 4 1	1.1.1.1 1.1.1.1 5.5.5.5 .4.4.4 .1.1.1 5.5.5.5 .4.4.4 .1.1.1 5.5.5.5 .4.4.4 .1.1.1	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
<pre>RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00: *> * i[1]:[00:00:00:00:00: * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i * i</pre>	222VRF1]: 22VRF1]: 1.1.1.1 2.2.2.2 200:22:22:00:00:00] 1.1.1.1 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4 1.1.1.1 2.2.2.2 4.4.4.4.	0 : [101] : [101 0 : [429496729 0 32,11.11.11 0 0 128,11:11:1 0 0 0 0 0 0 0 0 0 0 0 0 0	100 100 100 5]:[0] 100 .1]:[101] 100 100 11:1]:[101 100 100 100 100 100	0 32768 0 0 0 i 32768] 0 0 i 32768	8 i i 1 i 1 i 1 i 1	1.1.1.1 1.1.1.1 5.5.5.5 4.4.4 1.1.1.1 5.5.5.5 4.4.4 1.1.1 	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
<pre>RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00: *> * i[1]:[00:00:00:00:00: * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i * i * i * i * i * i * i * i * i</pre>	222VRF1]: 22VRF1]: 1.1.1.1 2.2.2.2 200:22:22:00:00:00] 1.1.1.1 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 0.0000:0000:000] 1.1.1.1 2.2.2.2 0.0000:0000:000] 1.1.1.1 2.2.2.2 0.0000:0000:0000:00] 1.1.1.1 2.2.2.2 0.0000:0000:0000:000] 1.1.1.1 2.2.2.2 0.0000:0000:0000:000] 1.1.1.1 2.2.2.2 0.0000:0000:0000:000] 1.1.1.1 2.2.2.2 0.0000:0000:0000:0000:000] 1.1.1.1 2.2.2.2 0.0000:0000:0000:0000:0000 1.1.1.1 2.2.2.2 3.2.2.2.2 3.2.2.2.2 3.2.2.2.2 3.2.2.2.2 3.2.2.2.2.2 3.2.2.2.2.2 3.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2	0 : [101] : [101 0 : [429496729 0 32,11.11.11 0 0 128,11:11:: 0 0 0 : [101] : [48,	100 100 100 5]:[0] 100 100 100 100 11:1]:[101 100 100 100 100 100 100 100	0 32768 0 0 0 32768 0 0 1 32768 1000:[3	8 i i 1 i 1 i 1 2,1	1.1.1.1 1.1.1.1 5.5.5.5 .4.4.4 .1.1.1 5.5.5.5 .4.4.4 .1.1.1 	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
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<pre>RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00; * * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i[2]:[0]:[101]:[48 * i * i[2]:[0]:[101]:[32,1.1] *> [3]:[101]:[32,2.2]</pre>	222VRF1]: 22VRF1]: 200:22:22:00:00:00] 1.1.1.1 2.2.2.2 200:22:22:00:00:00] 1.1.1.1 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:5555:1010]:[3 5.5.5.5 1.1.1] 1.1.1.1 2.2.2] 2.2.2 1.4.4]	0 : [101] : [101 0 : [429496729 0 32,11.11.11 0 0 128,11:11:1 0 0 128,11:11:1 0 0 128,11:11:1 0 0 0 32,11.11.11 0 0 0 0 0 0 0 0 0 0 0 0 0	100 100 100 5]:[0] 100 100 100 100 100 100 100 1	0 32768 0 0 1 32768 0 1 32768 1010]:[3 32768 0 32768 0 0 32768	8 i i 1 i 1 i 1 i 2,1 i i 8	1.1.1.1 1.1.1.1 5.5.5.5 4.4.4 1.1.1 5.5.5.5 4.4.4 1.1.1 5.5.5.5 1.1.1.1 5.5.5.5 1.1.1.1 i 	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
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<pre>RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00: * * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i[2]:[0]:[101]:[48 * i[3]:[101]:[32,1.1] *> [3]:[101]:[32,2.2]</pre>	2:2:2:2 22VRF1]: 100:22:22:00:00:00] 1.1.1.1 2.2.2.2 1.1.1.1 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:22:22:00:00:00] 1.1.1.1 2.2.2.2 3,0000:5555:1010]:[3 5.5.5.5 1.1.1] 1.1.1.1 2.2.22 3,0000:5555:1010]:[3 5.5.5.5 1.1.1] 1.1.1.1 2.2.22 2.2.22 1.4.4] 4.4.4.4 5.5.5]	0 : [101] : [101 0 : [429496729 0 32,11.11.11 0 0 128,11:11:1 0 0 128,11:11:1 0 0 128,11:11:1 0 0 0 32,11.11.11 0 0 0 0 0 0 0 0 0 0 0 0 0	100 100 100 5]:[0] 100 100 100 100 100 100 100 1	0 32768 0 0 i 32768 0 i 32768 0 i 32768 0 32768 0 0 32768 0 0 3276 0 0	8 i i 1 1 i 4 1 2,1 i i 8 i 8	1.1.1.1 1.1.1.1 5.5.5.5 4.4.4 1.1.1 5.5.5.5 4.4.4 1.1.1 5.5.5.5 1.1.1.1 5.5.5.5 1.1.1.1 i 4.4.4.4	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
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<pre>RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00; *> * i[2]:[0]:[101]:[48 * i * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i[2]:[0]:[101]:[48 * i[3]:[101]:[32,1.1 *> [3]:[101]:[32,2.2 * i[3]:[101]:[32,4.4 * i[3]:[101]:[32,5.5]</pre>	222VRF1]: 22VRF1]: 200:22:22:00:00:00] 1.1.1.1 2.2.2.2 200:22:22:00:00:00] 1.1.1.1 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:5555:1010]:[3 5.5.5.5 1.1.1] 1.1.1.1 2.2.2.2 3,0000:5555:1010]:[3 5.5.5.5 1.1.1] 1.1.1.1 2.2.2.2 3,0000:5555:1010]:[3 5.5.5.5 1.1.1] 1.1.1.1 2.2.2.2 3,0000:5555:1010]:[3 5.5.5.5 1.1.1] 1.1.1.1 2.2.2.2 3,0000:5555:1010]:[3 5.5.5.5 1.1.1] 1.1.1.1 2.2.2.2 3,0000:5555:1010]:[3 5.5.5.5 1.1.1] 1.1.1.1 2.2.2.2 2.2.2.2 1.2.2.2 2.2.	0 : [101] : [101 0 : [429496729 0 32,11.11.11 0 0 128,11:11:1 0 0 128,11:11:1 0 0 0 : [101] : [48, 0 32,11.11.11 0 0 0 0 0 0 0 0 0 0 0 0 0	100 100 100 5]:[0] 100 100 100 100 100 100 100 1	0 32768 0 0 i 32768 0 i 32768 1010]:[3 0 32768 100 32768 0 0 3276 0 0 3276 0 0	8 i i 1 i 4 1 i 2,1 i i 8 i i	1.1.1.1 1.1.1.1 5.5.5.5 4.4.4 1.1.1 5.5.5.5 4.4.4 1.1.1 5.5.5.5 4.4.4 1.1.1 1.11.11.51]:[1 1.1.1.1] 5.5.5.5 1.1.1.1 i 4.4.4.4 5.5.5.5	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
<pre>RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00; * * i[2]:[0]:[101]:[48 * i * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i[2]:[0]:[101]:[48 * i[3]:[101]:[32,1.1 *> [3]:[101]:[32,2.2 * i[3]:[101]:[32,4.4 * i[3]:[101]:[32,5.5]</pre>	2:2:2:2 22VRF1]: :00:22:22:00:00:00] 1.1.1.1 2.2.2.2 :00:22:22:00:00:00] 1.1.1.1 3,0000:0000:1111]:[: 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:0000:1111]:[: 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:5555:1010]:[: 5.5.5.5 1.1.1] 1.1.1.1 2.2.2.2 3,0000:5555:1010]:[: 5.5.5.5 1.1.1] 1.1.1.1 2.2.2.2 3,0000:5555:1010]:[: 5.5.5.5 1.1.1] 1.1.1.1 2.2.2.2 3,0000:5555:1010]:[: 5.5.5.5 1.1.1] 1.1.1.1 2.2.2.2 2.2.2.2 1.4.4] 4.4.4.4 3.5.5] 5.5.5.5 22VRF2]: :00:22:22:00:00:00]	0 : [101]: [101 0 : [429496729 0 32,11.11.11 0 0 128,11:11:: 0 0 128,11:11:1 0 0 0 : [101]: [48, 0 32,11.11.11 0 0 0 0 0 0 0 0 0 0 0 0 0	100 100 100 5]:[0] 100 100 100 100 100 100 100 1	0 32768 0 0 i 32768 0 0 i 32768 1010]:[3 0 32768 0 0 3276 0 0 3276 0 0 0	8 i i i i i i i i i i i i i i i i i i i	1.1.1.1 1.1.1.1 5.5.5.5 4.4.4 1.1.1 5.5.5.5 4.4.4 1.1.1 5.5.5.5 4.4.4 1.1.1 1.11.11.51]:[1 1.1.1.1 5.5.5.5 1.1.1.1 i 4.4.4.4 5.5.5.5	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
<pre>RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00; * * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i * i * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i[2]:[0]:[101]:[48 * i[3]:[101]:[32,1.1 *> [3]:[101]:[32,2.2 * i[3]:[101]:[32,4.4 * i[3]:[101]:[32,5.5] RD[2.2.2.2:21] VRF[I * i[1]:[00:00:00:00;</pre>	22222 22VRF1]: 300:22:22:00:00:00] 1.1.1.1 2.2.2.2 300:22:22:00:00:00] 1.1.1.1 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:555:1010]:[3 5.5.5.5 1.1.1] 1.1.1.1 2.2.2] 2.2.2.2 3,0000:555:1010]:[3 5.5.5.5 1.1.1] 1.1.1.1 2.2.2] 2.2.2.2 3,000:555:5 2.2VRF2]: 3,000:22:22:00:00:00] 1.1.1.1 2.2.2.2 2.2.2.2 3,000:22:22:00:00:00] 1.1.1.1 3,000:22:22:00:00:00] 1.1.1.1 3,000:22:22:00:00:00] 1.1.1.1 3,000:22:22:00:00:00] 1.1.1.1 3,000:22:22:00:00:00] 1.1.1.1 3,000:22:22:00:00:00] 1.1.1.1 3,000:22:22:00:00:00] 1.1.1.1 3,000:22:22:00:00:00] 1.1.1.1 3,000:22:22:00:00:00] 1.1.1.1 3,000:20:22:22:00:00:00] 1.1.1.1 3,000:20:22:22:00:00:00] 1.1.1.1 3,000:20:22:22:00:00:00] 1.1.1.1 3,000:22:22:00:00:00] 3,000:20:22:22:00:00:00] 3,000:20:22:22:00:00:00] 3,000:20:22:22:00:00:00] 3,000:20:22:22:00:00:00] 3,000:20:22:22:00:00:00] 3,000:20:22:22:00:00:00] 3,000:20:20:20:20:00:00] 3,000:20:20:20:20:20:00:00:00] 3,000:20:20:20:20:20:20:00:00:00] 3,000:20:20:20:20:20:20:20:00:00:00] 3,000:20:20:20:20:20:20:20:20:20:20:20:20:	0 : [101] : [101 0 : [429496729 0 32,11.11.11 0 0 128,11:11:1 0 0 0 : [101] : [48, 0 32,11.11.11 0 0 0 0 0 0 0 0 0 0 0 0 0	100 100 100 5]:[0] 100 100 100 100 100 100 100 1	0 32768 0 0 i 32768 0 0 i 32768 1010]:[3 0 32768 0 0 32768 0 0 3276 0 0 0 3276	8 i i 4 i 4 i 2,1 i i 8 i i 1	1.1.1.1 1.1.1.1 5.5.5.5 4.4.4 1.1.1 5.5.5.5 4.4.4 1.1.1 5.5.5.5 4.4.4 1.1.1 1.1.1.1 5.5.5.5 1.1.1.1 i 4.4.4.4 5.5.5.5 1.1.1.1	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN
<pre>RD[2.2.2.2:11] VRF[I * i[1]:[00:00:00:00; * * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i * i * i[2]:[0]:[101]:[48 * i * i * i[2]:[0]:[101]:[48 * i * i[2]:[0]:[101]:[48 * i[3]:[101]:[32,1.1] *> [3]:[101]:[32,2.2] * i[3]:[101]:[32,4.4] * i[3]:[101]:[32,5.5] RD[2.2.2.2:21] VRF[I * i[1]:[00:00:00:00; *> * i[1]:[00:00:00:00;</pre>	22222 22VRF1]: 00:22:22:00:00:00] 1.1.1.1 2.2.2.2 00:22:22:00:00:00] 1.1.1.1 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 3,0000:0000:1111]:[3 5.5.5.5 4.4.4.4 1.1.1.1 2.2.2.2 00:22:22:00:00:00] 1.1.1.1 2.2.2.2 3,0000:5555:1010]:[3 5.5.5.5 1.1.1] 1.1.1.1 2.2.2.2 2.2.2.2 1.4.4] 4.4.4.4 5.5.5] 5.5.5.5 22VRF2]: 00:22:22:00:00:00] 1.1.1.1 2.2.2.2 1.1.1 2.2.2.2 1.1.1 2.2.2.2 1.1.1 2.2.2.2 2.2	0 : [101]: [101 0 : [429496729 0 32, 11.11.11 0 0 128, 11:11:1 0 0 128, 11:11:1 0 0 0 32, 11.11.11 0 0 0 0 32, 11.11.11 0 0 0 0 0 128, 11:12:1 0 0 0 0 0 0 0 0 0 0 0 0 0	100 100 100 5]:[0] 100 100 100 100 100 100 100 1	0 32768 0 0 i 32768 0 0 i 32768 1010]:[3 0 32768 0 0 3276 0 0 3276	8 i i 4 1 i 4 1 2,1 i i 8 i i 1 i 1	1.1.1.1 1.1.1.1 5.5.5.5 4.4.4 1.1.1 5.5.5.5 4.4.4 1.1.1 5.5.5.5 4.4.4 1.1.1 1.1.1.1 5.5.5.5 1.1.1.1 i 4.4.4.4 5.5.5.5 1.1.1.1 i	VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN VXLAN

	1.1.1.1	0	100	0	i	1.1.1.1	VXLAN
* i[2]:[0]:[201]:[48,	0000:0000:1111]:[32,2	1.21.21.1]:[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
* 1[2]:[00:00:00:00:0	0:22:22:00:00:00]:[20	1]:[48,00	00:2222:1	020]:[3	2,2	1.21.21.51]:[20)1]
	1.1.1.1	0	100	0	1	1.1.1.1	VXLAN
*>	2.2.2.2	0	100	32768	1		VXLAN
* 1[2]:[0]:[201]:[48,	0000:4444:1020]:[32,2	1.21.21.1	01]:[201]	0			
* :::::::::::::::::::::::::::::::::::::	4.4.4.4	0	100	0	1	4.4.4.4	VXLAN
* 1[3]:[201]:[32,1.1.	1.1.1	0	100	0	2		5757T 7 NI
*>	2 21	0	100	0	Ţ	1.1.1.1	VALAN
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* ; [2]. [201]. [20 4 4	2.2.2.2	0	100	3270	0	1	VALAN
. 1[3]:[201]:[32,4.4.	4.4]	0	100	0	÷		VVT AN
* ;[3],[201],[32 5 5	4.4.4.4 5 51	0	100	0	Ŧ	4.4.4.4	VALAN
1[3].[201].[32,3.3.	5555	0	100	0	÷	5 5 5 5	UVT AN
	3.3.3.3	0	100	0	Ŧ	5.5.5.5	VALAN
RD[4 4 4 4·11]							
*>i[2] • [0] • [101] • [48.	0000.0000.11111	1 11 11 1	1.[101]				
, 1[2] . [0] . [101] . [10,	4.4.4.4	0	100	0	i	4.4.4.4	VXLAN
*>i[2]:[0]:[101]:[48.	0000:0000:11111:[128.	11:11:11	:11:[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]:[32,2	1.21.21.1]:[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]:[32,2	1.21.21.1	01]:[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]:[32,1	1.11.11.1]:[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]:[32,1	1.11.11.2	01]:[101]				
	5.5.5.5	0	100	0	1	5.5.5.5	VXLAN
*>1[3]:[101]:[32,5.5.	5.5]	0	1.0.0	0			
	5.5.5.5	0	100	0	1	5.5.5.5	VXLAN
x,;[2],[0],[201],[40	0000.0000.11111	1 01 01 1	1.[201]				
·/·[2]:[U]:[2U1]:[48,	5 5 5 5		100	0	÷	5 5 5 5	17VT 7 NT
*>i[2].[0].[201].[49	0.0.0.000.11111.0000	0 21•21••21	•11•[201]	0	1	J.J.J.J	VIAUN
/_[2].[0]:[201]:[48,	5 5 5 5	د	100	0	i	5 5 5 5	VYT AN
*>i[3].[201].[32 5 5	5 51	U	TOO	0	+	5.5.5.5	A VITUIN
, _ [J] . [ZVI] . [JZ, J.J.	5555	0	100	0	i	5 5 5 5	VXT.AN
	0.0.0.0	0	100	0	-	0.0.0.0	A 3771L/11A

Total number of prefixes 55 TB2-VTEP2#

TB2-VTEP4#show n	32-VTEP4#show nvo vxlan tunnel									
VXLAN Network tu	nnel Entries									
Source	Destination	Status	Up/Down	Update						
4.4.4.4	2.2.2.2	Installed	00:18:55	00:18:55						

	1 1	1 1	Tractor	11-1	0.0.1	10.55	00.10.55				
4.4.4.4	5.5.	5.5	Insta Insta	lled	00:1	18:55 13:27	00:18:55				
Total nu TB2-VTEH VXLAN Ir	umber of entric 24#show nvo vx. nformation	es are 3 lan									
Codes	s: NW - Networ AC - Access	k Port Port									
	(u) - Untagge	ed									
VNID	VNI-Name	VNI-Type	Type Inte	erface ES	I			VLAN	DF-Sta	tus Src-Addr	Dst-Addr
	VNT-101	т.2	NW								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 sal		- Singl	le Homed	d Port	20			
Total nu TB2-VTEH VXLAN AH	umber of entrie 24#show nvo vx. RP-CACHE Inform	es are 7 lan arp-ca mation	che								
VNID	Ip-Addr	Mac-A	.ddr	Туре	Aq	ge-Out	Retries-Lef	t			
201	21.21.21.51	0000.	2222.102) Static	Remote						
201	21.21.21.1	0000.	0000.1111	l Static	Local						
201	21.21.21.101	0000.	4444.102) Static	Local						
101	11.11.11.51	0000.	2222.101) Static	Remote						
101	11.11.11.1	0000.	0000.111.	l Static	Local						
Total nu TB2-VTEP	umber of entrie 24#show nvo vx	es are 6 lan nd-cac	he	JULIC	Keliloce						
	Ip-Addr				Mac-Ac	ldr	Tvpe	Aae-	Out	Retries-Left	
					0 1111						
201	21:21:21:1			0000.000	0.1111	Static	Local	-			
Total n	mber of entri	as are 2		0000.000		SLALIC	LOCAL	-			
TB2-VTER	P4#show nyo vy	lan 13vni-	man								
L3VNI	L2VNI	IRB-	interface	Э							
1000	1.01	======= irb1	001								
1000	201	irb1	001								
TB2-VTE	24#show ip rou	te vrf L3V	RF1								
codes: H	л - кernel, С	- connecte	a, 5 - st	latic, R	- KIP,	в - BGI	r				
()	J - USPE, IA -	ovtornal	tuno 1 1	12 _ OSDE	NCCA	ovtorno.	1 ± mo 2				
I F	E1 - OSPF RUSA	rnal type	1 E2 - (NZ - USFF NSPF evte	rnal tu	me 2	r cype z				
1	i - IS-IS, L1	- IS-IS le	vel-1. L	2 - IS-IS	level-	-2.					
i	ia - IS-IS inte	er area, E	- EVPN,			-,					
7	v - vrf leaked	,	,								
,	* - candidate (default									
IP Route C	e Table for VR 11.11.11	F "L3VRF1" .0/24 is d	irectly o	connected	l, irb10	001, 00	:19:46				
C C	21.21.21 127.0.0.	.0/24 is d 0/8 is dir	ectly con	connected	l, irb20 lo.L3VH	001, 00 RF1, 00	:19:46 :19:49				
Gateway	of last resor	t is not s	et 3VBF1								
IPv6 Rou	uting Table	1									
Codes: H	K - kernel rou	te, C - co	nnected,	S - stat	ic, R -	- RIP, () – OSPF,				
1	IA - OSPF inte	r area, El	- OSPF (external	type 1,	,					
E	E2 - OSPF exte	rnal type	2, E - E	/PN N1 -	OSPF 1	NSSA ext	ternal type 1,				
1	N2 - OSPF NSSA	external	type 2, i	i - IS-IS	с, в – в	BGP					
Timers:	Uptime										

```
IP Route Table for VRF "L3VRF1"
     ::1/128 via ::, lo.L3VRF1, 00:19:49
С
     11:11::/48 via ::, irb1001, 00:19:46
С
    21:21::/48 via ::, irb2001, 00:19:46
fe80::/64 via ::, irb2001, 00:19:46
С
С
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
             9
ospf
Total
             12
FTB
              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
Total
              2
FTB
              2
ECMP statistics (active in ASIC):
                               : 0
Total number of IPv6 ECMP routes
Total number of IPv6 ECMP paths : 0
TB2-VTEP4#show bgp 12vpn evpn
BGP table version is 4, local router ID is 4.4.4.4
Status codes: s suppressed, d damped, h history, \star 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
                              Metric LocPrf
   Network
                Next Hop
                                                       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]
                                                        0 ? 1.1.1.1
                                            100
                    1.1.1.1
                                    0
                                                                              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
                                                           ? 2.2.2.2
                                      0
                                            100
                                                                              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
                                                             2 5.5.5.5
                                                                              VXLAN
```

RD[1.	1.1.1:1]								
*>i	[1]:[00:00:00:00:	00:22:22:00:00:00]:[42	294967295]	:[0]					
		1.1.1.1	0	100	0	i	1.1.1.1	7	VXLAN
*>i	[4]:[00:00:00:00:	00:22:22:00:00:00]:[32	2,1.1.1.1]						
		1.1.1.1	0	100	0	1	1.1.1.1		VXLAN
PD[1	1 1 1.111								
*>i	111.1.1.1.1	00.22.22.00.00.001.[1(11011.						
~ 1	[1].[00.00.00.00.00.	1 1 1 1	0	100	0	i	1 1 1 1	7	UXT.AN
*>i	[2]:[0]:[101]:[48	,0000:0000:11111:[32,]	11.11.11.1	1:[101]	0	-			
		1.1.1.1	0	100	0	i	1.1.1.1	7	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	7	VXLAN
*>i	[2]:[00:00:00:00:	00:22:22:00:00:00]:[10	01]:[48,00	00:2222:10	010]:[32,	11.11.1	1.51]:[10]	1]
		1.1.1.1	0	100	0	i	1.1.1.1	7	VXLAN
*>i	[3]:[101]:[32,1.1	.1.1]							
		1.1.1.1	0	100	0	1	1.1.1.1		VXLAN
1100	1 1 1.011								
KD[1. *>i	[1].[00.00.00.00.00.	00.22.22.00.00.00.001.020	111.[2011						
~ 1	[1].[00.00.00.00.00.	1 1 1 1	0	100	0	i	1 1 1 1	7	VXT.AN
*>i	[2]:[0]:[201]:[48	,0000:0000:11111:[32,2	21.21.21.1	1:[201]	0	-			
		1.1.1.1	0	100	0	i	1.1.1.1	7	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	7	VXLAN
*>i	[2]:[00:00:00:00:	00:22:22:00:00:00]:[20	01]:[48,00	00:2222:10)20]:[32,	21.21.2	1.51]:[20]	1]
		1.1.1.1	0	100	0	i	1.1.1.1	7	VXLAN
*>i	[3]:[201]:[32,1.1	.1.1]							
		1.1.1.1	0	100	0	i	1.1.1.1	1	VXLAN
2100	2 2 2.11								
KD[2.	[1].[00.00.00.00.00.	00.22.22.00.00.001.14	049672951	• [0]					
~ 1	[1].[00.00.00.00.00.	2 2 2 2	0	100	0	i	2222	7	VXT.AN
*>i	[4]:[00:00:00:00:	00:22:22:00:00:001:[32	2,2.2.2.21	100	0	-			
		2.2.2.2	0	100	0	i	2.2.2.2	7	VXLAN
RD[2.	2.2.2:11]								
*>i	[1]:[00:00:00:00:	00:22:22:00:00:00]:[10	01]:[101]						
		2.2.2.2	0	100	0	i	2.2.2.2	7	VXLAN
*>i	[2]:[0]:[101]:[48	,0000:0000:1111]:[32,3	11.11.11.1]:[101]	0				
* > 2	041-101-1011-101	2.2.2.2	0	100	0	1	2.2.2.2	`	VXLAN
^>1	[2]:[0]:[101]:[48	,0000:0000:1111]:[128,	0	100	0	4		7	UVT AN
*>i	[2].00.00.00.00.00.	00.22.2.2	0 011•[48.00	100	0 101•1	± 32.	11 11 1	1 511 • [10]	11
, <u>+</u>	[2].[00.00.00.00.00.	2.2.2.2	0	100	0	i.	2.2.2.2	1.01].[10]	VXLAN
*>i	[3]:[101]:[32,2.2	.2.21	-		-	-			
		2.2.2.2	0	100	0	i	2.2.2.2	7	VXLAN
RD[2.	2.2.2:21]								
*>i	[1]:[00:00:00:00:	00:22:22:00:00:00]:[20	01]:[201]						
		2.2.2.2	0	100	0	i	2.2.2.2	7	VXLAN
*>i	[2]:[0]:[201]:[48	,0000:0000:1111]:[32,2	21.21.21.1]:[201]					
*~ '	101.101.1001.1	2.2.2.2	U 01.01 01	11.0013	U	l	2.2.2.2	7	VXLAN
*>1	[2]:[0]:[201]:[48	,0000:0000:1111]:[128,	,21:21::21	100	0				
*>i	[2].00.00.00.00.	2.2.2.2	0 011.118 00	100	001.0	± 1	21 21 21 2	1 511.[20]	VALAN 11
~	[2].[00.00.00.00.00.	2 2 2 2	0	100.2222.10	0	з ∠, i	2 2 2 2 2	1.01].[20.	⊥ J VXT.AN
*>i	[3]:[201]:[32,2.2	.2.21	0	100	0	-			
	,,,,	2.2.2.2	0	100	0	i	2.2.2.2	7	VXLAN
RD[4.	4.4.4:11] VRF[L2V	RF1]:							
* i	[1]:[00:00:00:00:	00:22:22:00:00:00]:[10	01]:[101]						
		1.1.1.1	0	100	0	i	1.1.1.1	7	VXLAN
* i		2.2.2.2	0	100	0	i	2.2.2.2	7	VXLAN
* i	[1]:[00:00:00:00:	00:22:22:00:00:00]:[42	294967295]	:[0]	<u>_</u>				
. .		1.1.1.1	U	100	0	i	1.1.1.1	-	VXLAN
^ l * :	[2].[0].[10].[40	2.2.2.2	U 	1.1011	U	l	2.2.2.2	1	VХЦАŃ
·. T	[2]:[U]:[IUI]:[48	,		100	0	i	5555	7	UXT.AN
* i		1.1.1.1	0	100	0	∸ i	1.1.1 1	7	VXLAN
* i		2.2.2.2	0	100	0	i	2.2.2.2	7	VXLAN
*>		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		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
*>		4 . 4 . 4 . 4	0	100	32768	-		VXLAN
* i	121.00.00.00.00.00.	00.22.22.00.00.00.001.[1(- 	00.2222.10	101.1	32	- .11 11 11 511•[10)11
-	[2].[00.00.00.00.00.	1 1 1 1	0	100	0	i.	1 1 1 1	VXT.AN
* i		2 2 2 2	0	100	0	i	2 2 2 2 2	VXI.AN
* i	811.11011.1011.101	0000.5555.10101.132	11 11 11 2	011.011	0	-	2.2.2.2	V 71 111 11V
-	[2].[0].[101].[10	5 5 5 5	0	100	0	;	5 5 5 5	WYT AN
* :	1 1 223 - 11011 - 122 1 1	1 11	0	100	0	+	5.5.5.5	VADAN
T	[3]:[101]:[32,1.1	• - • - •	0	100	0		1 1 1 1	5757T 7 51
. ·		1.1.1.1	0	100	0	T	1.1.1.1	VALAN
^ 1	[3]:[101]:[32,2.2	.2.2]	0	100	0			
		2.2.2.2	0	100	0	1	2.2.2.2	VXLAN
*>	[3]:[101]:[32,4.4	.4.4]						
		4.4.4.4	0	100	32768	-		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[L2V	RF2]:						
* i	[1]:[00:00:00:00:	00:22:22:00:00:00]:[20	01]:[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]:[42	294967295]	:[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]:[0]:[201]:[48	,0000:0000:11111:[32,2	21.21.21.1	1:[201]				
		5.5.5.5	0	100	0	i	5.5.5.5	VXLAN
* i		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 2	VXI.AN
*\			0	100	32769	÷.	2.2.2.2	UVT AN
* :	101.101.10011.100	0000.0000.11111	21.21.21	.11.[201]	52700	-	L	VALAN
T	[2]:[0]:[201]:[40	,0000:0000:1111]:[128,	, 21; 21; 21	100	0			5757T 7 NT
. ·		5.5.5.5	0	100	0	1	5.5.5.5	VALAN
* 1		1.1.1.1	0	100	0	1	1.1.1.1	VXLAN
* 1		2.2.2.2	0	100	0	1	2.2.2.2	VXLAN
*>		4.4.4.4	0	100	32768	-	L	VXLAN
* i	[2]:[00:00:00:00:	00:22:22:00:00:00]:[20	01]:[48,00	00:2222:10)20]:[32,	,21.21.21.51]:[20)1]
		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]:[32,2	21.21.21.1	01]:[201]				
		4.4.4.4	0	100	32768	-	L	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			VXLAN
* i	[3]:[201]:[32.5.5	.5.51						
-	[0].[201].[02/0.0	5 5 5 5	0	100	0	i	5 5 5 5	VXT.AN
		0.0.0.0	0	200	0	-	0.0.0.0	*****
RD[5	5 5 5.111							
*>;	[2].[0].[10]].[0]	0000.0000.11111	1 1 1 1 1 1 1	1.1011				
~ × 1	[2].[0].[101].[40	,0000.0000.1111].[32,		100	0	4	5 5 5 5	VVT AN
* > 2	101.101.1011.10	0.000.0000.11111.111.110	0	111.11011	0	T	J.J.J.J	VALAN
^>1	[2]:[U]:[101]:[48	,0000:0000:1111]:[128,	, 11:11::11	:1]:[101]	~			
		5.5.5.5	0	100	0	1	5.5.5.5	VXLAN
*>1	[2]:[0]:[101]:[48	,0000:5555:1010]:[32,1	11.11.11.2	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]:[32,2	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 prefixe	es 57						
TB2-1	/TEP4#							
V								

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 VNI-Type Type Interface ESI Dst-Addr VNTD VNI-Name VLAN DF-Status Src-Addr VNI-101 L2 NW ----VNI-101 L2 NW ----VNI-101 L2 NW ----101 5.5.5.5 2.2.2.2 ____ ----5.5.5.5 ____ _ 101 ____ 4.4.4.4 -----101 ____ 5.5.5.5 1.1.1.1 -- AC xe48 L2 NW ----VNI-101 --VNI-201 L2 VNI-201 L2 10 ------- Single Homed Port ---101 ____ ____ 201 ____ -----5.5.5.5 2.2.2.2 NW ---------5.5.5.5 ____ 4.4.4.4 201 201 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 Age-Out Retries-Left Type Mac-Addr 21.21.21.51 0000.2222.1020 Static Remote ----21.21.21.1 0000.0000.1111 Static Local ----201 201 21.21.21.101 0000.4444.1020 Static Remote ----201
 11.11.11.51
 0000.2222.1010
 Static
 Remote

 11.11.11.1
 0000.0000.1111
 Static
 Local

 11.11.11.201
 0000.5555.1010
 Static
 Local
 --- 101 101 101 Total number of entries are 6 TB2-VTEP5#show nvo vxlan nd-cache VXLAN ND-CACHE Information _____ VNID Ip-Addr Mac-Addr Age-Out Retries-Left Tvpe 201 21:21::21:1 0000.0000.1111 Static Local ____ 0000.0000.1111 Static Local 101 11:11:11:1 ____ Total number of entries are 2 TB2-VTEP5#show nvo vxlan 13vni-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" 11.11.11.0/24 is directly connected, irb1001, 00:14:07 С С 21.21.21.0/24 is directly connected, irb2001, 00:14:05 127.0.0.0/8 is directly connected, lo.L3VRF1, 00:20:00 С

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"
     ::1/128 via ::, lo.L3VRF1, 00:20:00
С
      11:11::/48 via ::, irb1001, 00:14:07
С
    21:21::/48 via ::, irb2001, 00:14:05
fe80::/64 via ::, irb2001, 00:14:05
С
С
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
              9
ospf
Total
              12
FTB
              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
FTB
              2
ECMP statistics (active in ASIC):
                               : 0
Total number of IPv6 ECMP routes
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]
                                             100
                    1.1.1.1
                                                            ? 1.1.1.1
                                                         0
                                                                               VXLAN
                                      0
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]
                                                       0 ? 2.2.2.2
                     2.2.2.2
                                             100
                                                                               VXLAN
                                       0
```

RD[4]	L000:11]							
*>i	[5]:[0]:[1000]:[2	4]:[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]:[2	4]:[21.21.21.0]:[0.0.	0.0]:[1000	0]				
		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]:[4	294967295]:[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]:[3	2,1.1.1.1]				
		1.1.1.1	0	100	0	i	1.1.1.1	VXLAN
RD[1	1.1.1:111							
*>i	:00:00:00:00]:[1]	00:22:22:00:00:001:[1	011:[101]					
, <u>-</u>	[1].[00.00.00.00.00.	1 1 1 1	0	100	0	i	1 1 1 1	VXLAN
*>i	121.101.1011.101	0000.0000.11111.0132	11 11 11 .	11.1011	0	-		****
^ <u>+</u>	[2].[0].[101].[10	1 1 1 1	0	100	0	÷	1 1 1 1	VYLAN
* \ i	9111101111011	0000.0000.11111.0128	11.111	1.11.11011	0	-	1.1.1.1	VINDIN
	[2]:[0]:[101]:[40	,0000:0000:1111]:[128	, 11; 11; ; 1	100	0	2	1 1 1 1	5757T 7 NT
		1.1.1.1	0	100	0	1	1.1.1.1	VALAN
^>1	[2]:[00:00:00:00:	00:22:22:00:00:00]:[1	01]:[48,00	JUU:2222:11)IU]:	[32,	11.11.11.51]:[10	11]
		1.1.1.1	0	100	0	l	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]:[2	01]:[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::22	1:1]:[201]				
		1.1.1.1	0	100	0	i	1.1.1.1	VXLAN
*>i	[2]:[00:00:00:00:	00:22:22:00:00:001:[2	011:[48.00	000:2222:1	0201:	[32.	21.21.21.511:[20	11
. –	[_].[1 1 1 1	0	100	0	i	1 1 1 1	VXLAN
*>i	[3].[20]].[32]1]	1 11	0	200	0	-		****
~1	[5].[201].[52,1.1	· ± · ± J 1 1 1 1	0	100	0	÷	1 1 1 1	VVT AN
		1.1.1.1	0	100	0	Ŧ	1.1.1.1	VALAN
DD [0	0 0 0 11							
RD[Z	.2.2.2:1]	~~ ~~ ~~ ~~ ~~ ~~ ~~						
*>1	[1]:[00:00:00:00:	00:22:22:00:00:00]:[4	294967295]:[0]				
		2.2.2.2	0	100	0	1	2.2.2.2	VXLAN
*>i	[4]:[00:00:00:00:	00:22:22:00:00:00]:[3	2,2.2.2.2]				
		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]:[1	01]:[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::1	1:1]:[101]				
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>i	[21:[00:00:00:00:	00:22:22:00:00:00]:[1	011:[48,00	000:2222:1	0101:	[32,	11.11.11.511:[10	11
		2.2.2.2	0	100	0	i,	2.2.2.2	VXLAN
*>i	[3].[10]].[32 2 2	2 21	-		-	_		
, <u>+</u>	[3].[101].[3272.2		0	100	0	÷	2 2 2 2	VVT AN
		2.2.2.2	0	100	0	Ŧ	2.2.2.2	VALAN
DD [0	0 0 0 011							
RD[Z	.2.2.2:21]	~~ ~~ ~~ ~~ ~~ ~~ ~~						
*>1	[1]:[00:00:00:00:	00:22:22:00:00:00]:[2	01]:[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::22	1:1]:[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]:[2	01]:[48,00	000:2222:1	20]:	[32,	21.21.21.51]:[20	1]
		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	.4.4.4:111							
*>i	[2]:[0]:[101].[48	.0000:0000:11111:132	11.11.11	11:[101]				
· ±		4 4 4 4	0	100	0	i	4 4 4 4	VXT.AN
*>i	[2] • [0] • [1011 • [49	.0000.0000.111111.0000	.11.11	1.11.11011	Ŭ	-		
~ ±		A A A A	,	100	0	÷	4 4 4 4	VXLAN
		4 4 4 4	11	1 1 1 1 1				
*>i	[3].[101].[32 4 4	4 41	0	100	0	+		V 21122 11V

		4.4.4.4	0	100	0	i	4.4.4.4	VXLAN
RD[4.	4.4.4:21]							
*>1	[2]:[0]:[201]:[48	,0000:0000:1111]:[32,2	21.21.21.1]:[201]	0			171/T 7 NI
*>;	2N1 • 1 1 0 1 • 1 2 0 1 1 • 1 4 9	4.4.4.4	0	.11. [201]	0	1	4.4.4.4	VXLAN
> 1	[2]:[0]:[201]:[40		0	100	0	i	A A A A	VYLAN
*>i	[2] • [0] • [201] • [48	0000.4444.10201.132	0 21 21 21 1	011.00	0	T	4.4.4.4	VALIAN
· ±	[2].[0].[201].[10	4 4 4 4	0	100	0	i	4 4 4 4	VXI.AN
*>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[L2V	RF1]:						
* i	[1]:[00:00:00:00:	00:22:22:00:00:00]:[10	01]:[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
* i	[1]:[00:00:00:00:	00:22:22:00:00:00]:[42	294967295]	:[0]	~			
+		1.1.1.1	0	100	0	1	1.1.1.1	VXLAN
^ * \	941.1011.1011.101	2.2.2.2	U 1 11 11 1	1.1011	0	T	2.2.2.2	VALAN
^ /	[2]:[0]:[101]:[48	5 5 5 5	0	100	32760			WVT AN
* ;			0	100	0		 Л Л Л Л	VALAN
* i		······	0	100	0	- -	2 2 2 2 2	VALAN
⊥ * i		1 1 1 1	0	100	0	i	1 1 1 1	VYLAN
*>	811.11011.101.101	0000.0000.11111.0128	11.1111	•11•[101]	0	-	1.1.1.1	VZYLIZYN
	[2],[0],[101],[40	5 5 5 5	0	100	32769	2 -		VYLAN
* ;			0	100	0		 Л Л Л Л	VALAN
* i		······	0	100	0	- -	2 2 2 2 2	VALAN
* i		2.2.2.2	0	100	0	- -	1 1 1 1	VALAN
* i	[2].00.00.00.00.00.00.00.00.00.00.00.00.00	1.1.1.1.1 00.22.22.00.00.001.[1(0	00.2222.10	101.	132	11 11 11 511.11	011
-	[2].[00.00.00.00.00.	1 1 1 1	0	100.2222.10	0	i i	1 1 1 1	VXT.AN
* i		2 2 2 2 2	0	100	0	i	2 2 2 2 2	VXLAN
*>	121.01.01.011.011.048	0000.5555.10101.132	11 11 11 2	011.011	0	-	2.2.2.2	VILLIN
ŕ	[2].[0].[101].[10	5 5 5 5	0	100	32768	3 -		VXI.AN
* i	[3]:[101]:[32,1.1	.1.11	-				-	
		1.1.1.1	0	100	0	i	1.1.1.1	VXLAN
* i	[3]:[101]:[32,2.2	.2.21						
		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	3 i	L	VXLAN
RD[5.	5.5.5:21] VRF[L2V	RF2]:						
* i	[1]:[00:00:00:00:	00:22:22:00:00:00]:[20	01]:[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]:[42	294967295]	:[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
*>	[2]:[0]:[201]:[48	,0000:0000:1111]:[32,2	21.21.21.1]:[201]				
		5.5.5.5	0	100	32768	3 i	L	VXLAN
* i		4.4.4.4	0	100	0	i	4.4.4.4	VXLAN
* i		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
*>	[2]:[0]:[201]:[48	,0000:0000:1111]:[128,	21:21::21	:1]:[201]				
		5.5.5.5	0	100	32768	3 i	L	VXLAN
* i		4.4.4.4	0	100	0	i	4.4.4.4	VXLAN
* i		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	[2]:[00:00:00:00:	00:22:22:00:00:00]:[20	01]:[48,00	00:2222:10	20]:	[32,	21.21.21.51]:[2	01]
		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]:[32,2	21.21.21.1	01]:[201]				
	101 10011 100	4.4.4.4	U	T00	U	1	4.4.4.4	VXLAN
* i	[3]:[201]:[32,1.1	.1.1]	<u>^</u>	1.0.0	~			
		1.1.1.1	U	TOO	U	1	1.1.1.1	VXLAN
* i		0.01						
-	[3]:[201]:[32,2.2	.2.2]	0	100	0		0 0 0 0	
	[3]:[201]:[32,2.2	.2.2] 2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
* i	<pre>[3]:[201]:[32,2.2 [3]:[201]:[32,4.4</pre>	.2.2] 2.2.2.2 .4.4]	0	100	0	i	2.2.2.2	VXLAN
* i	[3]:[201]:[32,2.2 [3]:[201]:[32,4.4	.2.2] 2.2.2.2 .4.4] 4.4.4.4	0	100 100	0 0	i i	2.2.2.2 4.4.4.4	VXLAN VXLAN
* i *>	<pre>[3]:[201]:[32,2.2 [3]:[201]:[32,4.4 [3]:[201]:[32,5.5</pre>	.2.2] 2.2.2.2 4.4] 4.4.4.4 5.5]	0	100	0	i	2.2.2.2	VXLAN 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.

(config)#nvo vxlan irb	Enable VXLAN irb
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board
(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)# 13vni 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 and save config and reload board
(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 and save config and reload board

Unconfigure vnid 201 from nvo vxlan.

(config)#nvo vxlan irb	Enable VXLAN IRB
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board
(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)# 13vni 1000	Configure L3VNI as 1000 for L3VRF1
(config-vrf) #exit	Exit from VRF mode
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board
(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) #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 and save config and reload board

Validations

VTEP4

IB2-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	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
         VNI-201
                                                                               ____ ___
201
                     T.2
                               NW
                                    ____
                                                ____
                                                                                               4.4.4.4
                                                                                                                2.2.2.2
        VNI-201
                    L2
201
                               NW ----
                                               ----
                                                                               -----
                                                                                             4.4.4.4
                                                                                                               1.1.1.1
201
         VNI-201
                      ___
                               AC
                                    sa1
----
                                               --- Single Homed Port ---
                                                                               20 ----
                                                                                              ____
                                                                               ----
1000
         ____
                      ъ3
                               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 13vni-map
        L2VNI IRB-interface
L3VNI
------
                          _____
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"
             5.5.5.5/32 [0/0] is directly connected, tunvxlan2, 00:02:23
В
В
             11.11.11.0/24 [200/0] via 5.5.5.5 (recursive is directly connected, tunvxlan2), 00:01:26
С
             21.21.21.0/24 is directly connected, irb2001, 00:01:18
С
             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.
Total number of IPv4 routes : 12
IP routing table maximum-paths : 8
Pending routes (due to route max reached): 0
Route Source Networks
connected
                3
                9
ospf
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 12vpn 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

1	Network	Next Hop	Metric	LocPrf	Weig	ght	Path	Peer	Encap
RD [5	1000:11]								
*>i	[5]:[0]:[1000]:	[24]:[11.11.11.0]:[0	.0.0]:[1	L000]					
		5.5.5.5	0	100	0	? 5.	5.5.5	VXLAN	
RD[1	.1.1.1:1]								
*>i	[1]:[00:00:00:0	0:00:22:22:00:00:00]	: [42949672	2951:[0]					
		1.1.1.1	0	100	0	i 1.	1.1.1	VXLAN	
*>i	[4]:[00:00:00:00]	0:00:22:22:00:00:001	:[32.1.1.1						
· -	[1].[00.00.00.00.00	1 1 1 1	0	100	0	i 1	1 1 1	VXT.AN	
			0	200	0			*****	
RD[1	1 1 1.111								
*>i	11.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1	0.00.22.22.00.00.001	• [1 0 1 1 • [1 0	111					
× ±	[1].[00.00.00.00	1 1 1 1	.[101].[10	100	0	; 1	1 1 1	VYLAN	
*>;	0.00.00.001.121	0.00.22.22.00.00.001		100	.10101.1	1 I I I I I I I I I I I I I I I I I I I	11 11	511.1011	
~1	[2].[00.00.00.00	1 1 1 1	.[101].[40	100	.1010].	; 1	1 1 1	UVT AN	
* \ :	121.11011.122 1	1 1 11	0	100	0	т т .	1.1.1	VALAN	
	[]].[101].[J2,1	1 1 1 1	0	100	0	; 1	1 1 1	17VT 7 M	
		1.1.1.1	0	100	0	т т.	1.1.1	VALAN	
DDII	1 1 1.011								
KD[I	.1.1.1.21]	0.00.00.00.00.00.00.001		111					
^ >1	[1]:[00:00:00:00		:[201]:[20	100	0				
		1.1.1.1	0	100	0	1 1.	1.1.1	VXLAN	
^>1	[2]:[00:00:00:0	0:00:22:22:00:00:00]	:[201]:[48	3,0000:2222	:1020]:	[32,21	.21.21.	51]:[201]	
		1.1.1.1	0	100	0	ı 1.	1.1.1	VXLAN	
*>1	[3]:[201]:[32,1	.1.1.1]							
		1.1.1.1	0	100	0	ı 1.	1.1.1	VXLAN	
RD [2	.2.2.2:1]								
*>i	[1]:[00:00:00:0	0:00:22:22:00:00:00]	:[42949672	295]:[0]					
		2.2.2.2	0	100	0	i 2.	2.2.2	VXLAN	
*>i	[4]:[00:00:00:0	0:00:22:22:00:00:00]	:[32,2.2.2	2.2]					
		2.2.2.2	0	100	0	i 2.	2.2.2	VXLAN	
RD [2	.2.2.2:11]								
*>i	[1]:[00:00:00:0	0:00:22:22:00:00:00]	:[101]:[10	01]					
		2.2.2.2	0	100	0	i 2.	2.2.2	VXLAN	
*>i	[2]:[00:00:00:0	0:00:22:22:00:00:00]	:[101]:[48	3,0000:2222	: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]:[00:00:00:0	0:00:22:22:00:00:00]	:[201]:[20	011					
		2.2.2.2	0	100	0	i 2.	2.2.2	VXLAN	
*>i	[2]:[00:00:00:00	0:00:22:22:00:00:001	:[201]:[48	3,0000:2222	:10201:1	[32,21	.21.21.	511:[201]	
		2.2.2.2	0	100	0	i 2.	2.2.2	VXLAN	
*>i	[31:[2011:[32.2	.2.2.21							
· -	[0].[201].[02/2	2 2 2 2	0	100	0	i 2	222	VXT.AN	
			0	200	0			*****	
PD[4		2000011.							
* ;		0.00.22.22.00.00.001	. [1011. [10	111					
. 1	[1].[00.00.00.00	1 1 1 1	.[IUI].[IU	100	0	; 1	1 1 1	17VT 7 M	
+		1.1.1.1	0	100	0	· · ·	1.1.1	VALAN	
^	111 100 00 00 0	2.2.2.2	0	100	0	1 2.	2.2.2	VALAN	
^ 1	[1]:[00:00:00:0	0:00:22:22:00:00:00]	:[429496/2	295]:[0]	0				
		1.1.1.1	0	100	0	1 1.	1.1.1	VXLAN	
* 1		2.2.2.2	0	100	0	1 2.	2.2.2	VXLAN	
* i	[2]:[00:00:00:0	0:00:22:22:00:00:00]	:[101]:[48	3,0000:2222	: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	
* i	[2]:[0]:[101]:[4	48,0000:5555:1010]:[32,11.11.1	11.201]:[10	1]				
		5.5.5.5	0	100	0	i 5.	5.5.5	VXLAN	
* i	[2]:[0]:[101]:[4	48,3c2c:99d6:167a]:[32,11.11.1	L1.1]:[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]:[10	1]				
		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.	4.4.4:211 VRF[L2V	RF21:						
* i	:00:00:00:00]:[1]	00:22:22:00:00:001:[20	011:[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]:[42	294967295	1:[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]:[20	01]:[48,0	000:2222:10	20]:	[32	,21.21.21.51]:[2	01]
		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]:[32,3	21.21.21.	101]:[201]				
		4.4.4.4	0	100	32768	3	i	VXLAN
*>	[2]:[0]:[201]:[48	,3c2c:99c7:077a]:[32,2	21.21.21.	1]:[201]				
		4.4.4.4	0	100	32768	3	i	VXLAN
*>	[2]:[0]:[201]:[48	,3c2c:99c7:077a]:[128,	,21:21::2	1:1]:[201]				
		4.4.4.4	0	100	32768	3	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	3	i	VXLAN
RD[5.	.5.5.5:11]							
*>i	[2]:[0]:[101]:[48	,0000:5555:1010]:[32,3	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]:[32,3	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::1	1:1]:[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#

TB2-VTH VXLAN N Source	EP5#show nvo Network tunne De	vxlan tunnel l Entries stination	L S	tatus		Up/Down	Update				
5.5.5.5	5 2.	2.2.2	I	nstalled		00:34:13	00:34:13				
5.5.5.5	5 4.	4.4.4	I	nstalled		00:01:26	00:01:26				
5.5.5.5	5 1.	1.1.1	I	nstalled		00:34:13	00:34:13				
Total m TB2-VTF VXLAN 1 Code	number of ent. EP5#show nvo Information	ries are 3 vxlan									
COUR	AC - Acce (u) - Unta	ss Port gged									
VNID	VNI-Name	VNI-Type	Туре	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		Single Homed	Port	10			
1000		L3	NW							5.5.5.5	4.4.4.4
Total 1 TB2-VTH VXLAN 2	number of ent. EP5#show nvo - ARP-CACHE Infe	ries are 4 vxlan arp-ca ormation	ache								
VNID	Ip-Addr	 Mac-/	Addr	Туре		Age-Out	Retries-Lef	it			
101	11.11.11.5	1 0000.	.2222	.1010 Stat	ic Re	mote		_			
```
11.11.11.1 3c2c.99d6.167a Static Local ----
11.11.11.201 0000.5555.1010 Static Local ----
101
101
Total number of entries are 3
Total number of entries are 1
TB2-VTEP5#show nvo vxlan 13vni-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"
           4.4.4.4/32 [0/0] is directly connected, tunvxlan2, 00:01:26
В
            11.11.11.0/24 is directly connected, irb1001, 00:34:43
С
            21.21.21.0/24 [200/0] via 4.4.4.4 (recursive is directly connected, tunvxlan2), 00:01:26
В
С
            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
              9
ospf
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 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
                                                 100
                                                           0
                                                              ? 4.4.4.4
                                                                                 VXLAN
                                        0
RD[1.1.1.1:1]
*>i [1]:[00:00:00:00:22:22:00:00]:[4294967295]:[0]
                                        0 100
                     1.1.1.1
                                                           0
                                                               i 1.1.1.1
                                                                                  VXLAN
*>i [4]:[00:00:00:00:22:22:00:00]:[32,1.1.1.1]
                     1.1.1.1
                                         0
                                                100
                                                         0
                                                              i 1.1.1.1
                                                                                 VXLAN
RD[1.1.1:11]
*>i [1]:[00:00:00:00:22:22:00:00]:[101]:[101]
                                              100
                                                          0 i 1.1.1.1
                                                                                 VXLAN
                     1.1.1.1
                                        0
*>i [2]:[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]	0	100	0			
		1.1.1.1	0	100	0	1	1.1.1.1	VXLAN
RD[1.	1.1.1:21]							
*>i	[1]:[00:00:00:00:	00:22:22:00:00:00]:[20	01]:[201]					
		1.1.1.1	0	100	0	i	1.1.1.1	VXLAN
*>1	[2]:[00:00:00:00:	00:22:22:00:00:00]:[20 1 1 1 1	011]:[48,UU	100:2222:10	020]:	.32, i	21.21.21.51]:[20	L J VYLAN
*>i	[3]:[201]:[32,1.1	.1.1]	0	100	0	-		V /11//11V
		1.1.1.1	0	100	0	i	1.1.1.1	VXLAN
RD[2.	2.2.2:1]		2010672051	• [0]				
~ / 1	[1].[00.00.00.00.	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]:[33	2,2.2.2.2]					
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
2100	2 2 2.111							
*>i	[1]:[00:00:00:00:00:	00:22:22:00:00:001:[10	011:[101]					
, <u>-</u>	[2].[00.00.00.00.00.	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]:[10	01]:[48,00	00:2222:10)10]:	[32,	11.11.11.51]:[10	1]
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>i	[3]:[101]:[32,2.2	.2.2]	0	100	0			1717T 7 NT
		2.2.2	0	100	0	1	2.2.2.2	VXLAN
RD[2.	2.2.2:21]							
*>i	[1]:[00:00:00:00:	00:22:22:00:00:00]:[20	01]:[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]:[20	01]:[48,00	00:2222:10	20]:	[32,	21.21.21.51]:[20	1]
*>i	[3].[20]].[32 2 2	2.2.2.2	0	100	0	1	2.2.2.2	VXLAN
~1	[3].[201].[32,2.2	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]:[32,2	21.21.21.1	101]:[201]	<u> </u>			
*>i	[2] • [0] • [201] • [48	4.4.4.4 3c2c+99c7+077al+[32]	0 21 21 21 1	1.00	0	T	4.4.4.4	VALAN
, <u>T</u>	[2].[0].[201].[10	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]	<u>^</u>	1.0.0	<u> </u>			
		4.4.4.4	0	100	0	1	4.4.4.4	VXLAN
RD[5.	5.5.5:111 VRF[L2V	RF11:						
* i	[1]:[00:00:00:00:	00:22:22:00:00:00]:[10	01]:[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
* i	[1]:[00:00:00:00:	00:22:22:00:00:00]:[42	294967295]	:[0]	0		1 1 1 1	1717T 7 11
* i		2 2 2 2 2	0	100	0	1 i	2 2 2 2 2	VXLAN VXLAN
* i	[2]:[00:00:00:00:	00:22:22:00:00:00]:[10	0 01]:[48,00	00:2222:10) 10]:	32,	11.11.11.51]:[10	1]
		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]:[32,1	11.11.11.2	201]:[101]	22766			1717T 7 11
*>	[2] • [0] • [10] 1 • [48	.3c2c·99d6·167al·[32.]	0 11 11 11 1	1.00	32/00	1		VALAN
		5.5.5.5	0	100	32768	3 i		VXLAN
*>	[2]:[0]:[101]:[48	,3c2c:99d6:167a]:[128	,11:11::11	:1]:[101]				
		5.5.5.5	0	100	32768	3 i		VXLAN
* i	[3]:[101]:[32,1.1	.1.1]	0	100	0	4	1 1 1 1	VVT AN
* i	[3].[10]].[32.2.2	2 21	0	100	0	Ţ	1.1.1.1	VALAN
-	[0].[101].[01/1.1	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	3 i		VXLAN
DDIE	E E E.013 *******							
ки[5. * i	5.5.5:21] VRE[L2V	₭₽∠]: 00•22•22•00•00•001•720	111.12011					
-	.=].[00.00.00.00.	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]:[42	294967295]	:[0]				
		1.1.1.1	0	100	0	i	1.1.1.1	VXLAN

* ;	2 2 2 2	0	100	0	÷		VVT AN
		0 1 1 0 0 1 1 1 4	100	10001	1 2 0	2.2.2.2	1 LOOT 1
^ l	[2]:[00:00:00:00:22:22:00:00:0	0]:[201]:[4	8,0000:2222	2:1020]	:[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]:[20	01]			
	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]	1			
	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]:[20	01]			
	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
Tota	l number of prefixes 39						
тв2-	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.

#configure terminal	Enter Configure 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)#max-paths ibgp 2	Configure BGP max-path
(config-router-af) #redistribute connected	Redistribute connected
(config-router-af)#exit-address-family	Exit from address-family
(config-router-af) #commit	Commit the transaction

VTEP1 IRB configuration

(config)#nvo vxlan irb	Enable VXLAN IRB
(config) #commit	Commit the transaction and save config and reload board
(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
<pre>(config-vrf) # route-target both 100:100</pre>	Assign route-target value for same for import and export.
(config-vrf) # 13vni 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 transaction
(config) # interface irb1001	Configure IRV interface 1001
(config-if)ip vrf forwarding L3VRF1	Configure L3VRF1
(config-if)ip address 11.11.11.1/24 anycast	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 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 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) #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 transaction

VTEP2

Configure max-path ibgp 2 on VTEP1 under BGP IPv4 VRF address family.

#configure terminal	Enter Configure 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)#max-paths ibgp 2	Configure BGP max-path
(config-router-af) #redistribute connected	Redistribute connected
(config-router-af)#exit-address-family	Exit from address-family
(config-router-af) #commit	Commit the transaction

VTEP2 IRB configuration

(config)#nvo vxlan irb	Enable VXLAN irb
(config) #commit	Commit the transaction and save config and reload board
(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
<pre>(config-vrf) # route-target both 100:100</pre>	Assign route-target value for same for import and export.
(config-vrf) # 13vni 1000	Configure L3VNI as 1000 for L3VRF1
(config-vrf) #exit	Exit from VRF mode
<pre>(config) # evpn irb-forwarding anycast- gateway-mac 0000.0000.1111</pre>	Configure anycast MAC address
(config) #commit	Commit the transaction
(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 anycast	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 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 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) #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 transaction

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 Multihhoming on VTEP5 and reboot the node to apply the Multihoming configuration to hardware.

<pre>#configure terminal</pre>	Enter Configure mode.
(config) #evpn vxlan multihoming enable	Enable Multihoming, save configs and reboot the board for multihoming to be effective
(config) #commit	Commit the transaction and save config and reload board
(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
<pre>(config-vrf) # route-target both 100:100</pre>	Assign route-target value for same for import and export.
(config-vrf)# 13vni 1000	Configure L3VNI as 1000 for L3VRF1
(config-vrf) #commit	Commit the transaction
<pre>(config) # no evpn irb-forwarding anycast- gateway-mac</pre>	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 from 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 IRB 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 loadshared between the Multihome VTEPs.

VTEP5

TB2-V VXLAN	TEP5#show Network	nvo vx tunnel	lan Enti	tunnel ries	9+2+118		IIn / Down	Indate	
=====	c =========	=======	====	========	===========		===================		=
5.5.5	.5	2.2.	2.2		Instal	led	00:34:13	00:34:13	
5.5.5	.5	4.4.	4.4		Instal	led	00:01:26	00:01:26	
5.5.5	.5	1.1.	1.1		Instal	led	00:34:13	00:34:13	
Total	number c	of entri	es a	are 3					
TB2-VTE VXLAN I	P5#show nvo v nformation	vxlan							
Code	s: NW - Netwo AC - Acces (u) - Untag	ork Port ss Port gged							
VNID	VNI-Name	VNI-Type	Туре	Interface	ESI		VLAN DF-Status	s Src-Addr	Dst-Addr
101 101	VNI-101 VNI-101	L2 L2	NW NW					5.5.5.5 5.5.5.5	2.2.2.2 1.1.1.1
101 1000	VNI-101	 L3	AC NW	xe48	Single H	lomed Port	10	 5.5.5.5	4.4.4.4
Total n	umber of entr	ies are 4							
TB2-V VXLAN	TEP5#show ARP-CACH	nvo vx IE Infor	lan mat:	arp-cac ion	che				
===== VNID	======== Ip-Ad	ldr		Mac-Ac	ldr	Туре	Age-Out	Retries-Lef	Ĩt
101	11.11	.11.1		0000.0	0000.1111	Static	Remote		
101	01 101.11.11.1 3c2c.99		99d6.168a	Static	Local				
101 11.11.1201 0000.55		5555.1010	Static	Local					
Total	number c	of entri	es a	are 3					
Total	number c	of entri	es a	are 1					
TB2-V L3VN	TEP5#show I	nvo vx L2VNI	lan	l3vni-n IRB-i	nap 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"
             101.11.11.0/24 is directly connected, irb1001, 00:34:43
С
В
             11.11.11.0/24 [200/0] via 1.1.1.1 (recursive is directly connected, tunvxlan2), 00:01:26
                            \ensuremath{\left[200/0\right]} via 2.2.2.2 (recursive is directly connected, tunvxlan2), 00:01:26
С
             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
pol	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

+	+ Rx mbps +	+ Rx pps +	+ Tx mbps +	++ Tx pps ++
роЗ	62.75	5000	0.01	8
pol	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 2 EVPN IRB - Anycast Support for Multiple Subnets

Overview

An EVPN-based Integrated Routing and Bridging solution enables communication between two Layer-2 Virtual Network Identifiers (VNIDs) using IP-based Virtual Routing and Forwarding (IP-VRF). This enhancement provides Anycast Gateway Routing support for multiple subnets under the IRB interface (per VNID).

Feature Characteristics

- · Connects primary or secondary subnets with either router MAC or anycast MAC address.
- Supports Anycast Gateway for multiple subnets under the layer-2 VNID's.
- Subnets A, B, and C can have Anycast Gateway support, while subnet D is reserved for BGP.
- Supports the Interfacefull model for ARP/ND requests and the interfaceless model using the kernel interface with a unique MAC per interface (Router MAC or Anycast MAC) for all subnets.

ARP/ND replies come from the ARP/ND cache table for host requests. Hosts can send Layer-3 packets with either Anycast MAC or Router MAC, and Layer-3 termination in the VTEP happens for both. By default, each subnet uses the Router MAC in ARP/ND cache. When the anycast argument is configured, it updates the ARP cache with the Anycast MAC. BGP withdraws the Route-Type 2 and update with Anycast/Router MAC to inform the configured gateway for the layer-2 VNID to non-default gateway nodes.

Topology

The procedures in this section use the topology in Figure 2-11.



Figure 2-11: EVPN IRB for Multiple Subnets

Note: In the above topology TS1, and TS2 are the tenant systems.

VTEP1: L2 VXLAN configuration

(config)#nvo vxlan enable	Enable VXLAN
(config)#nvo vxlan irb	Enable VXLAN IRB
(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) #evpn vxlan multihoming enable	Enable Multihoming, save configs and reboot the board for multihoming to be effective
(config)#mac vrf L2VRF2	Create mac routing/forwarding instance with L2VRF2 name and enter into vrf mode
(config-vrf)#description MAC VRF BLUE	Give description to L2VRF2 as Blue
(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. Should be same on all node for L2VRF2
(config-vrf) #exit	Exit from vrf mode
(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. Should be same on all node for L2VRF1
(config-vrf)# 13vni 1000	Configure L3VNI as 1000 for L3VRF1
(config-vrf) #exit	Exit from vrf mode
(config)#mac vrf L2VRF1	Create mac routing/forwarding instance with L2VRF2 name and enter into vrf mode
(config-vrf)#description MAC VRF RED	Give description to L2VRF1 as Red
(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 L2VRF1
(config-nvo-acc-if) #commit	Commit the candidate configuration to the running configuration
<pre>(config)# evpn irb-forwarding anycast- gateway-mac</pre>	Add evpn irb-forwarding anycast-gateway-mac address
(config)#nvo vxlan vtep-ip-global 1.1.1.1	Assign a global IP to the VTEP
(config)#nvo vxlan id 101 ingress- replication inner-vid-disabled	Configure VXLAN Network identifier with/without inner- viddisabled configure and enter into VXLAN tenant mode
(config)#vxlan host-reachability-protocol evpn-bgp L2VRF1	Assign vrf for evpn-bgp to carry EVPN rout
(config-nvo)# evpn irb1001	Configure irb1001 under vxlan id 101
(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- viddisabled 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)# vni-name VNI-201	Configure VNI name as VNI-201
(config) #qos enable	Enabling QoS
(config) #hostname VTEP1	Configure hostname

VTEP1: Interface and Loopback configuration

(config)#interface pol	Enter Interface mode for po1 (MH2)
(config-if)#switchport	Make it L2 interface
<pre>(config-if)# evpn multi-homed system-mac 0000.0000.2222</pre>	Configure system mac as ESI value for Lag (po1) interface. VTEP1 and VTEP2 should have same ESI value
(config)#interface po100	Enter Interface mode for po100
(config-if)#load-interval 30	Make it member port of po1
(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)#interface ce49	Enter Interface mode for ce49
(config-if)#channel-group 100 mode active	Map the interface ce49 to po1
(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)#channel-group 1 mode active	Map the ce52 interface to po100
(config-if) #exit	Exit Interface mode and return to Configure mode.
(config) # interface irb1001	Configure IRB interface 1001
(config-if)#ip vrf forwarding L3VRF1	Configure L3VRF1
<pre>(config-if)#evpn irb-if-forwarding anycast- gateway-mac</pre>	Enable an IRB interface to use the global anycast IRB mac- address.
<pre>(config-irb-if)# ip address 11.11.11.1/24 anycast</pre>	Configure the IPv4 primary address as anycast
<pre>(config-irb-if)# ip address 12.11.11.1/24 secondary anycast</pre>	Configure secondary IPv4 secondary address as anycast
<pre>(config-irb-if)# ip address 13.11.11.1/16 secondary</pre>	Configure secondary IPv4 secondary address as anycast
<pre>(config-irb-if)# ip address 14.11.11.1/24 secondary</pre>	Configure secondary IPv4 secondary address as anycast
<pre>(config-irb-if)# ip address 15.11.11.1/16 secondary anycast</pre>	Configure secondary IPv4 secondary address as anycast
<pre>(config-irb-if)# ip address 16.11.11.1/8 secondary anycast</pre>	Configure secondary IPv4 secondary address as anycast
<pre>(config-irb-if)# ip address 17.11.11.1/24 secondary anycast</pre>	Configure secondary IPv4 secondary address as anycast

<pre>(config-irb-if)# ip address 18.11.11.1/16 secondary anycast</pre>	Configure secondary IPv4 secondary address as anycast
(config-irb-if)# ip address 19.11.11.1/8 secondary	Configure secondary IPv4 secondary address as anycast
(config-irb-if)# ip address 20.11.11.1/24 secondary anycast	Configure secondary IPv4 secondary address as anycast
<pre>(config-irb-if)# ip address 21.11.11.1/8 secondary anycast</pre>	Configure secondary IPv4 secondary address as anycast
<pre>(config-irb-if)# ip address 22.11.11.1/24 secondary anycast</pre>	Configure secondary IPv4 secondary address as anycast
<pre>(config-irb-if)# ip address 25.11.11.1/16 secondary anycast</pre>	Configure secondary IPv4 secondary address as anycast
<pre>(config-irb-if)# ipv6 address 11:11::11:1/48 anycast</pre>	Configure secondary IPv6 primary address as anycast
(config-irb-if) # ipv6 address 12:11::11:1/64	Configure secondary IPv6 address
<pre>(config-irb-if)# ipv6 address 13:11::11:1/48 anycast</pre>	Configure secondary IPv6 secondary address as anycast
<pre>(config-irb-if)# ipv6 address 14:11::11:1/50 anycast</pre>	Configure secondary IPv6 secondary address as anycast

VTEP1: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.

VTEP1: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 12vpn evpn	Enter into I2vpn EVPN address family mode
(config-router-af) #neighbor 2.2.2.2 activate	Activate 2.2.2.2(VTEP2) into I2vpn evpn address family mode
(config-router-af) #neighbor 4.4.4.4 activate	Activate 3.3.3.3(VTEP4) into I2vpn evpn address family mode
(config-router-af)#neighbor 5.5.5.5 activate	Activate 5.5.5.5(VTEP5) into I2vpn evpn address family mode
(config-router-af)#exit-address-family	Exit from I2vpn address family mode
(config-router) #exit	Exit from Router BGP mode and enter into config mode

VTEP1: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

VTEP1:L2 VXLAN configuration

(config)#nvo vxlan access-if port-vlan pol 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 pol 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 L2 VXLAN configuration:

(config)#nvo vxlan enable	Enable VXLAN
(config)#nvo vxlan irb	Enable VXLAN IRB
(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)#evpn vxlan multihoming enable	Enable Multihoming
(config)#mac vrf L2VRF2	Create mac routing/forwarding instance with L2VRF2 name and enter into vrf mode
(config-vrf)#description MAC VRF BLUE	Give description to L2VRF2 as Blue
(config-vrf) #rd 1.1.1.1:21	Assign RD value
<pre>(config-vrf)#route-target both 90.90.90.90:100</pre>	Assign route-target value for same for import and export. Should be same on all node for L2VRF2
(config-vrf) #exit	Exit from vrf mode
(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. Should be same on all node for L2VRF1
(config-vrf) # 13vni 1000	Configure L3VNI as 1000 for L3VRF1
(config-vrf) #exit	Exit from vrf mode
(config)#mac vrf L2VRF1	Create mac routing/forwarding instance with L2VRF2 name and enter into vrf mode
(config-vrf) #description MAC VRF RED	Give description to L2VRF1 as Red
(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 L2VRF1
(config-nvo-acc-if) #commit	Commit the candidate configuration to the running configuration
<pre>(config)# evpn irb-forwarding anycast- gateway-mac</pre>	Add evpn irb-forwarding anycast-gateway-mac address
(config)#nvo vxlan vtep-ip-global 1.1.1.1	Assign a global IP to the VTEP
(config)#nvo vxlan id 101 ingress- replication inner-vid-disabled	Configure VXLAN Network identifier with/without inner- viddisabled configure and enter into VXLAN tenant mode
(config)#vxlan host-reachability-protocol evpn-bgp L2VRF1	Assign vrf for evpn-bgp to carry EVPN rout
(config-nvo) # evpn irb1001	Configure irb1001 under vxlan id 101
(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- viddisabled 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) # vni-name VNI-201	Configure VNI name as VNI-201
(config) #qos enable	Enabling QoS
VTEP1(config)#hostname VTEP2	Configure hostname
VTEP2(config)#exit	Exit from VTEP1

VTEP2:Interface and loopback configuration

(config) #interface pol	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 po100	Enter Interface mode for xe3
(config-if)#load-interval 30	Make it member port of po1
(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) #interface ce49	Enter Interface mode for ce49
(config-if)#channel-group 100 mode active	Map the ce49 interface to po100
(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)#channel-group 1 mode active	Map the ce52 interface to po1
(config-if) #exit	Exit Interface mode and return to Configure mode.
(config) # interface irb1001	Configure IRB interface 1001
(config-if)#ip vrf forwarding L3VRF1	Configure L3VRF1
(config-if)#evpn irb-if-forwarding anycast- gateway-mac	Enable an IRB interface to use the global anycast IRB mac- address.
<pre>(config-irb-if)# ip address 11.11.11.1/24 anycast</pre>	Configure primary IPv4 address as anycast
<pre>(config-irb-if)# ip address 12.11.11.1/24 secondary anycast</pre>	Configure primary IPv4 address as anycast
<pre>(config-irb-if)# ip address 13.11.11.1/16 secondary</pre>	Configure primary IPv4 address as anycast
<pre>(config-irb-if)# ip address 14.11.11.1/24 secondary</pre>	Configure primary IPv4 address as anycast
<pre>(config-irb-if)# ip address 15.11.11.1/16 secondary anycast</pre>	Configure primary IPv4 address as anycast

Configure primary IPv4 address as anycast
Configure primary IPv4 address as anycast
Configure the IPv6 address
Configure the IPv6 address as primary anycast
Configure the IPv6 address as anycast

VTEP2: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.

VTEP2: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 I2vpn EVPN address family mode
(config-router-af) #neighbor 2.2.2.2 activate	Activate 2.2.2.2(VTEP2) into I2vpn evpn address family mode
(config-router-af) #neighbor 4.4.4.4 activate	Activate 3.3.3.3(VTEP4) into I2vpn evpn address family mode
(config-router-af)#neighbor 5.5.5.5 activate	Activate 5.5.5.5(VTEP5) into I2vpn evpn address family mode
(config-router-af)#exit-address-family	Exit from I2vpn address family mode
(config-router) #exit	Exit from Router BGP mode and enter into config mode

VTEP2: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

VTEP2:L2 VXLAN configuration

(config)#nvo vxlan access-if port-vlan pol 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 pol 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

VTEP3:L2 VXLAN configuration

(config)#nvo vxlan enable	Enable VXLAN
(config)#nvo vxlan irb	Enable VXLAN IRB
(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) #evpn vxlan multihoming enable	Enable Multihoming
(config) #mac vrf L2VRF2	Create mac routing/forwarding instance with L2VRF2 name and enter into vrf mode
(config-vrf)#description MAC VRF BLUE	Give description to L2VRF2 as Blue
(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. Should be same on all node for L2VRF2
(config-vrf)#exit	Exit from vrf mode
(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. Should be same on all node for L2VRF1
(config-vrf)# 13vni 1000	Configure L3VNI as 1000 for L3VRF1
(config-vrf)#exit	Exit from vrf mode
(config) #mac vrf L2VRF1	Create mac routing/forwarding instance with L2VRF2 name and enter into vrf mode
(config-vrf)#description MAC VRF RED	Give description to L2VRF1 as Red
(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 L2VRF1
(config-nvo-acc-if)#commit	Commit the candidate configuration to the running configuration
<pre>(config) # evpn irb-forwarding anycast- gateway-mac</pre>	Add evpn irb-forwarding anycast-gateway-mac address
(config)#nvo vxlan vtep-ip-global 1.1.1.1	Assign a global IP to the VTEP
(config)#nvo vxlan id 101 ingress- replication inner-vid-disabled	Configure VXLAN Network identifier with/without inner- viddisabled configure and enter into VXLAN tenant mode

(config)#vxlan host-reachability-protocol evpn-bgp L2VRF1	Assign vrf for evpn-bgp to carry EVPN rout
(config-nvo)# evpn irb1001	Configure irb1001 under vxlan id 101
(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- viddisabled 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)# vni-name VNI-201	Configure VNI name as VNI-201
(config)#qos enable	Enabling QoS
VTEP3(config)#hostname VTEP3	Configure hostname

VTEP3:Interface and loopback configuration

(config)#interface pol	Enter Interface mode for po1 (MH2)
(config-if)#switchport	Make it L2 interface
<pre>(config-if)# evpn multi-homed system-mac 0000.0000.2222</pre>	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 po100	Enter Interface mode for xe3
(config-if)#load-interval 30	Make it member port of po1
(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)#interface ce49	Enter Interface mode for ce49
(config-if)#channel-group 100 mode active	Map the interface ce49 to po100
(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)#channel-group 1 mode active	Map the interface ce52 to po1
(config-if) #exit	Exit Interface mode and return to Configure mode.
(config) # interface irb1001	Configure IRB interface 1001
(config-if)#ip vrf forwarding L3VRF1	Configure L3VRF1
<pre>(config-if)#evpn irb-if-forwarding anycast- gateway-mac</pre>	Enable an IRB interface to use the global anycast IRB mac- address.
<pre>(config-irb-if)# ip address 11.11.11.1/24 anycast</pre>	Configure the IPv4 address
<pre>(config-irb-if)# ip address 12.11.11.1/24 secondary anycast</pre>	Configure secondary IPv4 address as anycast
<pre>(config-irb-if)# ip address 13.11.11.1/16 secondary</pre>	Configure secondary IPv4 address as anycast

<pre>(config-irb-if) # ip address 14.11.11.1/24 secondary</pre>	Configure secondary IPv4 address as anycast
<pre>(config-irb-if)# ip address 15.11.11.1/16 secondary anycast</pre>	Configure secondary IPv4 address as anycast
<pre>(config-irb-if)# ip address 16.11.11.1/8 secondary anycast</pre>	Configure secondary IPv4 address as anycast
<pre>(config-irb-if)# ip address 17.11.11.1/24 secondary anycast</pre>	Configure secondary IPv4 address as anycast
<pre>(config-irb-if)# ip address 18.11.11.1/16 secondary anycast</pre>	Configure secondary IPv4 address as anycast
<pre>(config-irb-if) # ip address 19.11.11.1/8 secondary</pre>	Configure secondary IPv4 address as anycast
<pre>(config-irb-if)# ip address 20.11.11.1/24 secondary anycast</pre>	Configure secondary IPv4 address as anycast
<pre>(config-irb-if)# ip address 21.11.11.1/8 secondary anycast</pre>	Configure secondary IPv4 address as anycast
<pre>(config-irb-if)# ip address 22.11.11.1/24 secondary anycast</pre>	Configure secondary IPv4 address as anycast
<pre>(config-irb-if)# ip address 25.11.11.1/16 secondary anycast</pre>	Configure secondary IPv4 address as anycast
<pre>(config-irb-if) # ipv6 address 11:11::11:1/48 anycast</pre>	Configure the IPv6 as primary anycast
(config-irb-if) # ipv6 address 12:11::11:1/64	Configure the IPv6 address
<pre>(config-irb-if) # ipv6 address 13:11::11:1/48 anycast</pre>	Configure the IPv6 address as anycast
<pre>(config-irb-if) # ipv6 address 14:11::11:1/50 anycast</pre>	Configure the IPv6 address as anycast

VTEP3: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.

VTEP3: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
<pre>(config-router)#neighbor 2.2.2.2 update- source lo</pre>	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 I2vpn EVPN address family mode
<pre>(config-router-af)#neighbor 2.2.2.2 activate</pre>	Activate 2.2.2.2(VTEP2) into I2vpn evpn address family mode
(config-router-af)#neighbor 4.4.4.4 activate	Activate 3.3.3.3(VTEP4) into I2vpn evpn address family mode
(config-router-af)#neighbor 5.5.5.5 activate	Activate 5.5.5.5(VTEP5) into I2vpn evpn address family mode
(config-router-af) #exit-address-family	Exit from I2vpn address family mode
(config-router) #exit	Exit from Router BGP mode and enter into config mode

VTEP3: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
<pre>(config-vrf)#route-target both 9.9.9.9:100</pre>	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

VTEP3:L2 VXLAN configuration

(config)#nvo vxlan access-if port-vlan pol 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 pol 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:L2 VXLAN configuration

(config)#nvo vxlan enable	Enable VXLAN
(config)#nvo vxlan irb	Enable VXLAN IRB
(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) #evpn vxlan multihoming enable	Enable Multihoming
(config) #mac vrf L2VRF2	Create mac routing/forwarding instance with L2VRF2 name and enter into vrf mode
(config-vrf)#description MAC VRF BLUE	Give description to L2VRF2 as Blue
(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. Should be same on all node for L2VRF2
(config-vrf) #exit	Exit from vrf mode
(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. Should be same on all node for L2VRF1
(config-vrf)# 13vni 1000	Configure L3VNI as 1000 for L3VRF1
(config-vrf) #exit	Exit from vrf mode
(config) #mac vrf L2VRF1	Create mac routing/forwarding instance with L2VRF2 name and enter into vrf mode
(config-vrf)#description MAC VRF RED	Give description to L2VRF1 as Red
(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 L2VRF1
(config-nvo-acc-if)#commit	Commit the candidate configuration to the running configuration
<pre>(config) # evpn irb-forwarding anycast- gateway-mac</pre>	Add evpn irb-forwarding anycast-gateway-mac address
(config)#nvo vxlan vtep-ip-global 1.1.1.1	Assign a global IP to the VTEP

(config)#nvo vxlan id 101 ingress- replication inner-vid-disabled	Configure VXLAN Network identifier with/without inner- viddisabled configure and enter into VXLAN tenant mode
(config)#vxlan host-reachability-protocol evpn-bgp L2VRF1	Assign vrf for evpn-bgp to carry EVPN rout
(config-nvo)# evpn irb1001	Configure irb1001 under vxlan id 101
(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- viddisabled 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) # vni-name VNI-201	Configure VNI name as VNI-201
(config)#qos enable	Enabling QoS
VTEP4(config)#hostname VTEP4	Configure hostname

VTEP4:Interface and loopback configuration

(config)#interface pol	Enter Interface mode for po1 (MH2)
(config-if)#switchport	Make it L2 interface
<pre>(config-if)# evpn multi-homed system-mac 0000.0000.2222</pre>	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 po100	Enter Interface mode for xe3
(config-if)#load-interval 30	Make it member port of po1
(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)#interface ce49	Enter Interface mode for ce49
(config-if)#channel-group 100 mode active	Map the ce49 interface to po100
(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)#channel-group 1 mode active	Map the ce52 interface to po01
(config-if) #exit	Exit Interface mode and return to Configure mode.
(config) # interface irb1001	Configure IRB interface 1001
(config-if)#ip vrf forwarding L3VRF1	Configure L3VRF1
<pre>(config-if)#evpn irb-if-forwarding anycast- gateway-mac</pre>	Enable an IRB interface to use the global anycast IRB mac- address.
<pre>(config-irb-if)# ip address 11.11.11.1/24 anycast</pre>	Configure the IPv4 address anycast gateway
<pre>(config-irb-if)# ip address 12.11.11.1/24 secondary anycast</pre>	Configure the IPv4 address anycast gateway

<pre>(config-irb-if)# ip address 13.11.11.1/16 secondary</pre>	Configure the IPv4 address as anycast
<pre>(config-irb-if)# ip address 14.11.11.1/24 secondary</pre>	Configure the IPv4 address as anycast
<pre>(config-irb-if)# ip address 15.11.11.1/16 secondary anycast</pre>	Configure the IPv4 address as anycast
<pre>(config-irb-if)# ip address 16.11.11.1/8 secondary anycast</pre>	Configure the IPv4 address as anycast
<pre>(config-irb-if)# ip address 17.11.11.1/24 secondary anycast</pre>	Configure the IPv4 address as anycast
<pre>(config-irb-if)# ip address 18.11.11.1/16 secondary anycast</pre>	Configure the IPv4 address as anycast
<pre>(config-irb-if)# ip address 19.11.11.1/8 secondary</pre>	Configure the IPv4 address as anycast
<pre>(config-irb-if)# ip address 20.11.11.1/24 secondary anycast</pre>	Configure the IPv4 address as anycast
<pre>(config-irb-if)# ip address 21.11.11.1/8 secondary anycast</pre>	Configure the IPv4 address as anycast
<pre>(config-irb-if)# ip address 22.11.11.1/24 secondary anycast</pre>	Configure the IPv4 address as anycast
<pre>(config-irb-if)# ip address 25.11.11.1/16 secondary anycast</pre>	Configure the IPv4 address as anycast
<pre>(config-irb-if) # ipv6 address 11:11::11:1/48 anycast</pre>	Configure the IPv4 address as anycast
(config-irb-if)# ipv6 address 12:11::11:1/64	Configure the IPv6 address as anycast
<pre>(config-irb-if) # ipv6 address 13:11::11:1/48 anycast</pre>	Configure the IPv6 address as anycast
<pre>(config-irb-if)# ipv6 address 14:11::11:1/50 anycast</pre>	Configure the IPv6 address as anycast

VTEP4: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.

VTEP4: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 I2vpn EVPN address family mode
(config-router-af) #neighbor 2.2.2.2 activate	Activate 2.2.2.2(VTEP2) into I2vpn evpn address family mode
(config-router-af) #neighbor 4.4.4.4 activate	Activate 3.3.3.3(VTEP4) into I2vpn evpn address family mode
(config-router-af) #neighbor 5.5.5.5 activate	Activate 5.5.5.5(VTEP5) into I2vpn evpn address family mode
(config-router-af)#exit-address-family	Exit from I2vpn address family mode
(config-router) #exit	Exit from Router BGP mode and enter into config mode

VTEP4:L2 MAC VRF Configuration

(config) #mac vrf L2VRF1	Create mac routing/forwarding instance with L2VRF1 name and enter into vrf mode
(config-vrf)#rd 1.1.1:11	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

VTEP4:L2 VXLAN configuration

(config)#nvo vxlan access-if port-vlan pol 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

Spine1

Spine node where all VTEPs are connected.

Generic configuration:

#configure terminal	Enter Configure mode.
(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 pol	Enter Interface mode for po1 (MH2)
(config-if) #switchport	Make it L2 interface
<pre>(config-if)# bridge-group 1</pre>	Configure system mac as ESI value for Lag (po1) interface. VTEP1 and VTEP2 should have same ESI value
(config-if)#switchport mode trunk	Exit Interface mode and return to Configure mode.
(config-if)#switchport trunk allowed vlan add 2	Configure the VLANs that should be allowed through this interface
(config)#interface po4	Enter Interface mode for xe3
(config-if)#load-interval 30	Make it member port of po1
(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)#interface po25	Enter Interface mode for lo
(config-if)#load-interval 30	Make it member port of po1
(config-if)#ip address 100.11.11.1/24	Configure ip address as 100.11.11.1 on network side of Spine- P1
(config-if) #exit	Exit Interface mode and return to Configure mode.
(config)#interface po100	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.

Enter Interface mode for network side port
Map the ce1 interface to po1
Exit Interface mode and return to Configure mode.
Enter Interface mode for network side port
Map the ce2 interface to po2
Exit Interface mode and return to Configure mode.
Exit Interface mode and return to Configure mode.
Enter Interface mode for network side port
Map the ce3 interface to po1
Exit Interface mode and return to Configure mode.
Enter Interface mode for network side port
Map the ce4 interface to po1
Configure IRB interface 1001
Configure the IPv4 address
Configure the IPv4 address
Configure the IPv6 address
Configure IRB interface 1001
Configure the Ip address
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.

Switch1

Interface and loopback configuration:

(config)#interface pol	Enter Interface mode for po1 (MH2)
(config-if) #switchport	Enable switch port under po1
(config-if)# bridge-group 1	Map the bridge group
(config-if)#switchport mode trunk	Configure switch port as trunk

(config-if)#switchport trunk allowed vlan add 2,10,20	Add the vlan for the trunk
(config-if)#switchport trunk allowed vlan add 2	Add the vlan for the trunk
(config)#interface ce56	Enter Interface mode for network side port
<pre>(config-if)#channel-group 1 mode active</pre>	Map interface ce56 for channel group
(config)#interface vlan1.20	Configure the vlan
(config)#ip address 21.21.21.2/24	Configure the IPv4 address for vlan1.20
(config)#ipv6 address 21:21::21:2/48	Configure the IPv6 address for vlan1.20
<pre>(config) # interface vlan1.2</pre>	Configure the interface Vlan1.2
(config)# ip adress100.12.12.2/24	Configure the IP address for vlan1.2 interface.
(config) #exit	Exit Interface mode and return to Configure mode.
(config) #interface xel	Enter Interface mode for xe1
(config-if) #switchport	Enable switch port under xe1
(config-if)# bridge-group 1	Map the bridge group
(config-if)#switchport mode trunk	Configure switch port as trunk
(config-if)#switchport trunk allowed vlan add 2,10,20	Add the vlan for the trunk
(config) #exit	Exit Interface mode and return to Configure mode.

Switch2

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 5.5.5.5/32 (lo ip address) network into area 0
(config-router)#network 100.14.14.0/24 .0/24 area 0.0.0.0	Add 100.14.14.0/24 (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.

Validation

VTEP1:

Leafl#shc VXLAN ARE	ow nvo vxlan arp-o P-CACHE Informatio	cache on ==			
VNID	Ip-Addr	Mac-Addr	Туре	Age-Out	Retries-Left
101 101	11.11.11.1 11.11.11.51	0000.0000.1111 0000.2222.1010	Static Loca Static Loca	L L	

101	11.11.11.201	0000.4444.1010 S	tatic Remote	
101	12.11.11.1	0000.0000.1111 s	tatic Local	
101	13.11.11.1	1444.8f10.d8c9 S	tatic Local	
101	14.11.11.1	1444.8f10.d8c9 S	tatic Local	
101	15.11.11.1	0000.0000.1111 s	tatic Local	
101	16.11.11.1	0000.0000.1111 s	tatic Local	
101	17.11.11.1	0000.0000.1111 S	tatic Local	
101	18.11.11.1	0000.0000.1111 S	tatic Local	
101	19.11.11.1	1444.8f10.d8c9 S	tatic Local	
101	20.11.11.1	0000.0000.1111 s	tatic Local	
201	21.21.21.1	0000.0000.1111 s	tatic Local	
201	21.21.21.51	0000.2222.1020 s	tatic Local	
201	22.22.22.1	1444.8f10.d8c9 S	tatic Local	
201	23.23.23.1	0000.0000.1111 S	tatic Local	
201	24.24.24.1	0000.0000.1111 S	tatic Local	
201	25.25.25.1	1444.8f10.d8c9 S	tatic Local	
201	26.26.26.1	0000.0000.1111 S	tatic Local	
201	27.27.27.1	1444.8f10.d8c9 S	tatic Local	
201	28.28.28.1	0000.0000.1111 S	tatic Local	
201	29.29.29.1	1444.8f10.d8c9 S	tatic Local	
201	30.30.30.1	0000.0000.1111 S	tatic Local	
201	192.85.1.2	0039.4400.0020 D	ynamic Local	
Total	number of entries	are 24		

Leaf1#sh nvo vxlan nd-cache VXLAN ND-CACHE Information

VALAN ND-CACHE INIOIMACION

VNID	Ip-Addr	Mac-Ad	ldr	Туре	Age
-Out	Retries-Left				
101	11:11::11:1	0000.0000.1111	Static	Local	
101	12:11::11:1	1444.8f10.d8c9	Static	Local	
101	13:11::11:1	0000.0000.1111	Static	Local	
101	14:11::11:1	0000.0000.1111	Static	Local	
101	15:11::11:1	0000.0000.1111	Static	Local	
101	16:11::11:1	1444.8f10.d8c9	Static	Local	
101	17:11::11:1	0000.0000.1111	Static	Local	
101	18:11::11:1	1444.8f10.d8c9	Static	Local	
101	19:11::11:1	1444.8f10.d8c9	Static	Local	
101	20:20::20:1	1444.8f10.d8c9	Static	Local	
201	21:21::21:1	1444.8f10.d8c9	Static	Local	
201	22:22::22:1	0000.0000.1111	Static	Local	
201	23:23::23:1	1444.8f10.d8c9	Static	Local	
201	24:24::24:1	1444.8f10.d8c9	Static	Local	
201	25:25::25:1	0000.0000.1111	Static	Local	
201	26:26::26:1	0000.0000.1111	Static	Local	
201	27:27::27:1	1444.8f10.d8c9	Static	Local	
201	28:28::28:1	0000.0000.1111	Static	Local	
201	29:29::29:1	1444.8f10.d8c9	Static	Local	
201	30:30::30:1	0000.0000.1111	Static	Local	
Total	number of entries are 20				
Leaf1#					

VTEP2:

Leaf2#show int counters rate mbps

+	+	+	+	++
Interface	Rx mbps	Rx pps	Tx mbps	Tx pps
ce49	1099.23	771933	0.00	1
ce50	0.00	0	0.00	0
ce51	0.00	0	0.00	0
ce52	0.00	0	0.00	0
ce53	0.00	0	0.00	0
ce54	0.00	0	0.00	0
ce55	0.00	0	0.00	0
ce56	0.00	0	0.00	0
роЗ	1099.23	771934	0.00	1
xe3	0.00	0	0.00	0
xe5	0.00	0	0.00	0

Leaf2#	show	nvo	vxlan	arp-cache
VXLAN	ARP-C	CACHE	E Infoi	rmation

VNID	Ip-Addr	Mac-Addr	Туре	Age	e-Out	Retries-Left
101	11.11.11.1	0000.0000.1111	Static	Local		
101	11.11.11.51	0000.2222.1010	Static	Remote		
101	11.11.11.201	0000.4444.1010	Static	Remote		
101	12.11.11.1	0000.0000.1111	Static	Local		
101	13.11.11.1	b86a.979c.1669	Static	Local		
101	14.11.11.1	b86a.979c.1669	Static	Local		
101	15.11.11.1	0000.0000.1111	Static	Local		
101	16.11.11.1	0000.0000.1111	Static	Local		
101	17.11.11.1	0000.0000.1111	Static	Local		
101	18.11.11.1	0000.0000.1111	Static	Local		
101	19.11.11.1	b86a.979c.1669	Static	Local		
101	20.11.11.1	0000.0000.1111	Static	Local		
201	21.21.21.1	0000.0000.1111	Static	Local		
201	21.21.21.51	0000.2222.1020	Static	Remote		
201	22.22.22.1	b86a.979c.1669	Static	Local		
201	23.23.23.1	0000.0000.1111	Static	Local		
201	24.24.24.1	0000.0000.1111	Static	Local		
201	25.25.25.1	b86a.979c.1669	Static	Local		
201	26.26.26.1	0000.0000.1111	Static	Local		
201	27.27.27.1	b86a.979c.1669	Static	Local		
201	28.28.28.1	0000.0000.1111	Static	Local		
201	29.29.29.1	b86a.979c.1669	Static	Local		
201	30.30.30.1	0000.0000.1111	Static	Local		
201	192.85.1.2	0039.4400.0020	Dynamic	Remote		
Total	number of entries	are 24	-			

Leaf2# show nvo vxlan nd-cache

VXLAN ND-CACHE Information

======				
VNID	Ip-Addr	Mac-Addr	Type	Age
-Out	Retries-Left			
101	11:11::11:1	0000.0000.1111 Sta	tic Local	
101	12:11::11:1	b86a.979c.1669 Sta	tic Local	
101	13:11::11:1	0000.0000.1111 Sta	tic Local	
101	14:11::11:1	0000.0000.1111 Sta	tic Local	
101	15:11::11:1	0000.0000.1111 Sta	tic Local	
101	16:11::11:1	b86a.979c.1669 Sta	tic Local	
101	17:11::11:1	0000.0000.1111 Sta	tic Local	
101	18:11::11:1	b86a.979c.1669 Sta	tic Local	
101	19:11::11:1	b86a.979c.1669 Sta	tic Local	
101	20:20::20:1	b86a.979c.1669 Sta	tic Local	
201	21:21::21:1	b86a.979c.1669 Sta	tic Local	
201	22:22::22:1	0000.0000.1111 Sta	tic Local	
201	23:23::23:1	b86a.979c.1669 Sta	tic Local	
201	24:24::24:1	b86a.979c.1669 Sta	tic Local	
201	25:25::25:1	0000.0000.1111 Sta	tic Local	
201	26:26::26:1	0000.0000.1111 Sta	tic Local	
201	27:27::27:1	b86a.979c.1669 Sta	tic Local	
201	28:28::28:1	0000.0000.1111 Sta	tic Local	
201	29:29::29:1	b86a.979c.1669 Sta	tic Local	
201	30:30::30:1	0000.0000.1111 Sta	tic Local	
Total :	number of entries are 20			
Leaf2#				

VTEP4:

Leaf3#show interface counters rate mbps

Interface	Rx mbps	Rx pps	Tx mbps	Tx pps
ce49	0.00	1	0.00	0
ce51	0.00	0	0.00	0
ce52	0.00	0	0.00	0

ce54	0.00	0	0.00	0
ce55	0.00	0	0.00	0
ce56	1175.78	844671	0.00	1
po4	1175.78	844671	0.00	1
xe4	0.00	0	0.00	0
xe5	0.00	0	0.00	0
xe7	0.00	0	0.00	0
xe8	0.00	0	0.00	0
xe9	0.00	0	0.00	0
xel0	0.00	0	0.00	0
xell	0.00	0	0.00	0
xe30	0.00	0	0.00	0
xe31	0.00	0	0.00	0
xe32	0.00	0	0.00	0
Leaf3#				
Leaf3#				

Leaf3#show nvo vxlan arp-cache

VXLAN ARP-CACHE Information

		==					
VNID	Ip-Addr	Mac-Addr	Туре	Aq	ge-Out	Retries	s-Left
101	11.11.11.1	0000.0000.1111	Static	Local			
101	11.11.11.51	0000.2222.1010	Static	Remote			
101	11.11.11.201	0000.4444.1010	Static	Remote			
101	12.11.11.1	0000.0000.1111	Static	Local			
101	13.11.11.1	b86a.9735.d79d	Static	Local			
101	14.11.11.1	b86a.9735.d79d	Static	Local			
101	15.11.11.1	0000.0000.1111	Static	Local			
101	16.11.11.1	0000.0000.1111	Static	Local			
101	17.11.11.1	0000.0000.1111	Static	Local			
101	18.11.11.1	0000.0000.1111	Static	Local			
101	19.11.11.1	b86a.9735.d79d	Static	Local			
101	20.11.11.1	0000.0000.1111	Static	Local			
201	21.21.21.1	0000.0000.1111	Static	Local			
201	21.21.21.51	0000.2222.1020	Static	Remote			
201	22.22.22.1	b86a.9735.d79d	Static	Local			
201	23.23.23.1	0000.0000.1111	Static	Local			
201	24.24.24.1	0000.0000.1111	Static	Local			
201	25.25.25.1	b86a.9735.d79d	Static	Local			
201	26.26.26.1	0000.0000.1111	Static	Local			
201	27.27.27.1	b86a.9735.d79d	Static	Local			
201	28.28.28.1	0000.0000.1111	Static	Local			
201	29.29.29.1	b86a.9735.d79d	Static	Local			
201	30.30.30.1	0000.0000.1111	Static	Local			
201	192.85.1.2	0039.4400.0020	Dynami	c Remote	9		
Total num	mber of entries a	re 24					
Leaf3#sh	ow nvo vxlan nd-c	ache					
VXLAN ND	-CACHE Informatio	n 					
VNTD	Tp-Addr			Mac-Ac	ddr	Type	Age
-0ut. 1	Retries-Left			1100 110		1100	1190
040							
101	11:11::11:1		0000.000	0.1111	Static	Local	
101	12:11::11:1		b86a.97	35.d79d	Static	Local	
101	13:11::11:1		0000.000	0.1111	Static	Local	
101	14:11::11:1		0000.000	0.1111	Static	Local	
101	15:11::11:1		0000.000	0.1111	Static	Local	
101	16:11::11:1		b86a.973	35.d79d	Static	Local	
101	17:11::11:1		0000.000	0.1111	Static	Local	
101	18:11::11:1		b86a.973	35.d79d	Static	Local	
101	19:11::11:1		b86a.973	35.d79d	Static	Local	
101	20:20::20:1		b86a.973	35.d79d	Static	Local	
201	21:21::21:1		b86a.973	35.d79d	Static	Local	
201	22:22::22:1		0000.000	0.1111	Static	Local	
201	23:23::23:1		b86a.973	35.d79d	Static	Local	
201	24:24::24:1		b86a.973	35.d79d	Static	Local	
201	25.2525.1		0000 000	10 1111	Static	Local	
0.01	23.2323.1		0000.000				
201	26:26:26:1		0000.000	00.1111	Static	Local	
201 201	26:26::26:1 27:27::27:1	:	0000.000 0000.000 b86a.973	00.1111 00.1111 35.d79d	Static Static	Local Local	

201	28:28::28:1	0000.0000.1111	Static	Local -	
201	29:29::29:1	b86a.9735.d79d	Static	Local -	
201	30:30::30:1	0000.0000.1111	Static	Local -	
Total nur	nber of entries are 20				
Leaf3#					

VTEP5:

Leaf4#show interface counters rate mbps

Interface	Rx mbps	Rx pps	Tx mbps	Tx pps
ce49	0.00	0	0.00	0
ce50	0.00	0	0.00	0
ce52	0.00	0	0.00	0
ce53	0.00	0	0.00	0
ce54	1175.70	844612	0.00	1
ce55	0.00	0	0.00	0
po25	1175.70	844612	0.00	1
xe7	0.00	0	0.00	0
xel2	0.00	0	0.00	0
xe13	0.00	0	0.00	0
xel4	0.00	0	0.00	0
xe15	0.00	0	0.00	0
xel6	0.00	0	0.00	0
xe17	0.00	0	0.00	0
xe18	0.00	0	0.00	0
xe30	0.00	0	0.00	0
xe31	0.00	0	0.00	0
xe32	0.00	0	0.00	0

Leaf4#show nvo vxlan arp-cache

VXLAN ARP-CACHE Information

101

12:11::11:1

VNID	Ip-Addr	Mac-Addr	Туре	Age	e-Out	Retries-	Left
101	11.11.11.1	0000.0000.1111	Static	Local			
101	11.11.11.51	0000.2222.1010	Static	Remote			
101	11.11.11.201	0000.4444.1010	Static	Local			
101	12.11.11.1	0000.0000.1111	Static	Local			
101	13.11.11.1	1444.8f45.8dc9	Static	Local			
101	14.11.11.1	1444.8f45.8dc9	Static	Local			
101	15.11.11.1	0000.0000.1111	Static	Local			
101	16.11.11.1	0000.0000.1111	Static	Local			
101	17.11.11.1	0000.0000.1111	Static	Local			
101	18.11.11.1	0000.0000.1111	Static	Local			
101	19.11.11.1	1444.8f45.8dc9	Static	Local			
101	20.11.11.1	0000.0000.1111	Static	Local			
201	21.21.21.1	0000.0000.1111	Static	Local			
201	21.21.21.51	0000.2222.1020	Static	Remote			
201	22.22.22.1	1444.8f45.8dc9	Static	Local			
201	23.23.23.1	0000.0000.1111	Static	Local			
201	24.24.24.1	0000.0000.1111	Static	Local			
201	25.25.25.1	1444.8f45.8dc9	Static	Local			
201	26.26.26.1	0000.0000.1111	Static	Local			
201	27.27.27.1	1444.8f45.8dc9	Static	Local			
201	28.28.28.1	0000.0000.1111	Static	Local			
201	29.29.29.1	1444.8f45.8dc9	Static	Local			
201	30.30.30.1	0000.0000.1111	Static	Local			
201	192.85.1.2	0039.4400.0020	Dynamio	c Remote			
Total	number of entries	are 24					
Leaf4#	show nvo vxlan nd	l-cache					
VXLAN	ND-CACHE Informat	:10n					
====== VNTD	Tp-Addr			Mac-Add	dr	Type	Aa
-Out	Retries-Left			1140 1140	~-	1100	лу
101	11.1111.1		0000 000	0 1111 4	Static	Local	

1444.8f45.8dc9 Static Local ----

101	13:11::11:1	0000.0000.1111 Static Local -	
101	14:11::11:1	0000.0000.1111 Static Local -	
101	15:11::11:1	0000.0000.1111 Static Local -	
101	16:11::11:1	1444.8f45.8dc9 Static Local -	
101	17:11::11:1	0000.0000.1111 Static Local -	
101	18:11::11:1	1444.8f45.8dc9 Static Local -	
101	19:11::11:1	1444.8f45.8dc9 Static Local -	
101	20:20::20:1	1444.8f45.8dc9 Static Local -	
201	21:21::21:1	1444.8f45.8dc9 Static Local -	
201	22:22::22:1	0000.0000.1111 Static Local -	
201	23:23::23:1	1444.8f45.8dc9 Static Local -	
201	24:24::24:1	1444.8f45.8dc9 Static Local -	
201	25:25::25:1	0000.0000.1111 Static Local -	
201	26:26::26:1	0000.0000.1111 Static Local -	
201	27:27::27:1	1444.8f45.8dc9 Static Local -	
201	28:28::28:1	0000.0000.1111 Static Local -	
201	29:29::29:1	1444.8f45.8dc9 Static Local -	
201	30:30::30:1	0000.0000.1111 Static Local -	
Total	number of entries are 20		

Leaf4#

CHAPTER 3 VxLAN-EVPN Symmetric IRB Support with Connected host

Overview

EVPN-IRB enables communication between two L2VNI's by employing Routing through IP-VRF. This functionality offers Host (/32) based Symmetric IRB support, directing inter-subnet traffic directly to the Host attached VTEP. To implement this, configure "evpn irb-advertise-host-route" within VNID (BGP type 2) settings, or "redistribute connected-host-routes" under BGP (BGP type 5) configurations.

Note:

- In VxLAN-EVPN Interface-less mode, only the 'redistribute connected-host-routes' command is supported. However, in Interface-full mode, both commands are supported.
- It is advisable to configure a route map in ESI configured Multi-Homed (MH) nodes to block Hosts from peer MH. This configuration is not required in non-ESI MH VTEPs.

Feature Characteristics

The preferred and recommended approach for AOS-CX VXLAN/EVPN Distributed L3 Gateways is Symmetric IRB. This implementation offers superior scalability by eliminating the need to manage MAC/ARP entries for both source and destination hosts, and it doesn't require configuring the same VLAN/VNI as in the case of Asymmetric IRB. These advantages facilitate simpler and more scalable deployments in both Data Center and Campus networks.

Benefits

The advantages of utilizing a VxLAN-EVPN Symmetric IRB Support:

- Routing is employed on both ingress and egress VTEPs.
- Bi-directional traffic follows a symmetric path, such as utilizing an L3 VNI per VRF.
- VTEPs are relieved from holding unnecessary ARP/MAC resources.
- Configuration of the destination VLAN/VNI on the source VTEP is unnecessary.

Configuration

Ensure that the VTEPs have a base configuration with Symmetric IRB settings. Then, initiate dynamic traffic from VTEP4 originating from the same subnet (53.1.X.XX/XXXX::XX) as the IRB interface. Typically, in EVPN, a single IP-VRF can accommodate multiple IRB interfaces. Each IRB interface corresponds to a VNI, and multiple VNIs can be associated with a MAC-VRF.

Topology

The procedures in this section use the topology in Figure 3-1




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

Begin with a basic configuration that includes Symmetric IRB configurations on VTEPs, then initiate dynamic traffic transmission from VTEP4 within the same subnet (53.1.1.40/5301::40) as the 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 13 elan mhsh"
             2.2.2/32 [0/0] is directly connected, tunvxlan3, 00:21:33
В
             5.5.5.5/32 [0/0] is directly connected, tunvxlan3, 00:21:33
R
В
             6.6.6.6/32 [0/0] is directly connected, tunvxlan3, 00:21:33
             53.1.1.0/24 [200/0] via 6.6.6.6 (recursive is directly connected,
В
tunvxlan3), 00:21:34
                                 [200/0] via 5.5.5.5 (recursive is directly connected,
tunvxlan3)
             127.0.0.0/8 is directly connected, lo.vxlan 13 elan mhsh, 07:17:43
С
С
             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 13 elan mhsh
IPv6 Routing Table
IP Route Table for VRF "vxlan 13 elan mhsh"
        ::1/128 via ::, lo.vxlan 13 elan mhsh, 07:18:01
С
В
        ::ffff:202:202/128 [0/0] via ::, tunvxlan3, 00:21:51
        ::ffff:505:505/128 [0/0] via ::, tunvxlan3, 00:21:51
В
В
        ::ffff:606:606/128 [0/0] via ::, tunvxlan3, 00:21:51
        2000::/48 via ::, irb1604, 07:17:59
С
В
        5301::/48 [200/0] via ::ffff:606:606 (recursive via ::, tunvxlan3), 00:21:52
                  [200/0] via ::ffff:505:505 (recursive via ::, tunvxlan3)
        fe80::/64 via ::, irb1604, 07:17:59
С
VTEP1#
```

In VTEP2:

VTEP2#show ip route vrf vxlan 13 elan mhsh IP Route Table for VRF "vxlan 13 elan mhsh" 1.1.1.1/32 [0/0] is directly connected, tunvxlan3, 00:22:50 В 5.5.5.5/32 [0/0] is directly connected, tunvxlan3, 00:22:50 В 6.6.6.6/32 [0/0] is directly connected, tunvxlan3, 00:22:50 R 53.1.1.0/24 [200/0] via 6.6.6.6 (recursive is directly connected, В tunvxlan3), 00:22:51 [200/0] via 5.5.5.5 (recursive is directly connected, tunvxlan3) С 127.0.0.0/8 is directly connected, lo.vxlan 13 elan mhsh, 07:19:21 С 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 13 elan mhsh IPv6 Routing Table IP Route Table for VRF "vxlan 13 elan mhsh" ::1/128 via ::, lo.vxlan 13 elan mhsh, 07:19:22 С

В	::ffff:1	.01:101/12	8 [0/0]	via ::,	tunvxlan3,	00:22:51		
В	::ffff:5	05:505/12	8 [0/0]	via ::,	tunvxlan3,	00:22:51		
В	::ffff:6	506 : 606/12	8 [0/0]	via ::,	tunvxlan3,	00:22:51		
С	2000::/4	8 via ::,	irb1604	1, 07:19:	:20			
В	5301::/4	8 [200/0]	via :::	Efff:606:	:606 (recurs	sive via ::,	tunvxlan3),	00:22:51
		[200/0]	via :::	Efff:505:	505 (recurs	sive via ::,	tunvxlan3)	
С	fe80::/6	54 via ::,	irb1604	1, 07:19:	:20			
VTEP2#								
VTEP2#sh	low bgp l	2vpn evpr	mac-ip	grep (0000:0053:00	040		
0			605	0000:	0053:0040 -	-		
605	C)	6.6.6.6			VxLAN		
0			605	0000	0:0053:0040	53.1.1.40		
605	С)	6.6.6.6			VxLAN		
0			605	0000	0:0053:0040	5301::40		
605	С)	6.6.6.6			VxLAN		
VTEP2#								

In VTEP4:

VTEP4#show	bgp	12vpn	evpn mac-ip	grep 0000:0053:00	040
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

- To enable the EVPN irb-advertise-host-route, execute the following command in the config mode. (config) #nvo vxlan id 605 ingress-replication inner-vid-disabled (config-nvo) #vxlan host-reachability-protocol evpn-bgp vxlan_l2_elan_sh2 (config-nvo) #evpn irb605 (config-nvo) #evpn irb-advertise-host-route
- 2. To redistributed connected-host-routes, execute the following command. (config) #nvo vxlan id 605 ingress-replication inner-vid-disabled (config) #router bgp 1 (config-router) #address-family ipv4 vrf vxlan_13_elan_sh VTEP4 (config-router-af) #redistribute connected-host-routes
- 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

Use this command to validate the VxLAN-EVPN Symmetric IRB.

In VTEP1:

VTEP1#show ip route vrf vxlan 13 elan mhsh IP Route Table for VRF "vxlan 13 elan mhsh" 2.2.2/32 [0/0] is directly connected, tunvxlan3, 00:37:03 В В 5.5.5.5/32 [0/0] is directly connected, tunvxlan3, 00:37:03 В 6.6.6.6/32 [0/0] is directly connected, tunvxlan3, 00:37:03 В 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) 53.1.1.40/32 [200/0] via 6.6.6.6 (recursive is directly connected, В tunvxlan3), 00:05:49 127.0.0.0/8 is directly connected, lo.vxlan 13 elan mhsh, 07:33:13 С 200.1.1.0/24 is directly connected, irb1604, 07:33:11 С Gateway of last resort is not set VTEP1# VTEP1#show ipv6 route vrf vxlan 13 elan mhsh IPv6 Routing Table IP Route Table for VRF "vxlan 13 elan mhsh" ::1/128 via ::, lo.vxlan 13 elan mhsh, 07:33:21 С ::ffff:202:202/128 [0/0] via ::, tunvxlan3, 00:37:11 В ::ffff:505:505/128 [0/0] via ::, tunvxlan3, 00:37:11 В В ::ffff:606:606/128 [0/0] via ::, tunvxlan3, 00:37:11 2000::/48 via ::, irb1604, 07:33:19 С В 5301::/48 [200/0] via ::ffff:606:606 (recursive via ::, tunvxlan3), 00:37:12 [200/0] via ::ffff:505:505 (recursive via ::, tunvxlan3) 5301::40/128 [200/0] via ::ffff:606:606 (recursive via ::, tunvxlan3), 00:05:57 В fe80::/64 via ::, irb1604, 07:33:19 С VTEP1# VTEP1#show bqp 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 \cap 605 0000:0053:0040 5301::40 605 1604 6.6.6.6 ___ VxLAN VTEP1# In VTEP2: VTEP2#show ip route vrf vxlan 13 elan mhsh IP Route Table for VRF "vxlan 13 elan mhsh" В 1.1.1.1/32 [0/0] is directly connected, tunvxlan3, 00:31:16 5.5.5.5/32 [0/0] is directly connected, tunvxlan3, 00:31:16 В 6.6.6.6/32 [0/0] is directly connected, tunvxlan3, 00:31:16 В 53.1.1.0/24 [200/0] via 6.6.6.6 (recursive is directly connected, В

```
С
             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 13 elan mhsh
IPv6 Routing Table
IP Route Table for VRF "vxlan 13 elan mhsh"
С
        ::1/128 via ::, lo.vxlan 13 elan mhsh, 07:27:54
        ::ffff:101:101/128 [0/0] via ::, tunvxlan3, 00:31:23
В
В
        ::ffff:505:505/128 [0/0] via ::, tunvxlan3, 00:31:23
В
        ::ffff:606:606/128 [0/0] via ::, tunvxlan3, 00:31:23
С
        2000::/48 via ::, irb1604, 07:27:52
В
        5301::/48 [200/0] via ::ffff:606:606 (recursive via ::, tunvxlan3), 00:31:23
                  [200/0] via ::ffff:505:505 (recursive via ::, tunvxlan3)
        5301::40/128 [200/0] via ::ffff:606:606 (recursive via ::, tunvxlan3), 00:00:10
В
С
        fe80::/64 via ::, irb1604, 07:27:52
VTEP2#
VTEP2#show bgp l2vpn evpn mac-ip | grep 0000:0053:0040
                          605
                                   0000:0053:0040 --
Ο
605
               0
                         6.6.6.6
                                                          VxLAN
                          605
0
                                     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 13 elan mhsh Flags: D - Static Adjacencies attached to down interface IP ARP Table for context vxlan 13 elan mhsh Total number of entries: 1 Address Aqe 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 \cap 605 0000:0053:0040 --605 0 6.6.6.6 VxLAN 605 0 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#

Glossary

The following provides definitions for key terms or abbreviations and their meanings used throughout this document:

Key Terms/Acronym	Description
ECMP	ECMP stands for Equal-Cost Multi-Path. It's a routing technique used in computer networks, particularly in IP-based routing protocols like OSPF (Open Shortest Path First) and BGP (Border Gateway Protocol).
VTEPs	VTEP stands for VXLAN Tunnel Endpoint. It's a crucial component in network virtualization architectures, particularly in overlay networks using VXLAN (Virtual Extensible LAN) technology.
ARP/MAC	ARP (Address Resolution Protocol) and MAC (Media Access Control) address are both essential components of networking, particularly in Ethernet-based networks.
VLAN/VNI	VLAN (Virtual Local Area Network) and VNI (Virtual Network Identifier) are both technologies used in networking to segment and manage traffic within a larger network infrastructure.

CHAPTER 4 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 4-2.



Figure 4-2: 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)#nvo vxlan enable	Enable VXLAN
(config)#nvo vxlan irb	Enable VXLAN irb
(Config)#qos enable	Enabling qos
(Config) # bfd interval 3 minrx 3 multiplier 3	Configure bfd
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board

Interface and loopback configuration:

(config)#interface ce50	Enter Interface mode for ce50 (SH1)
<pre>(config-if)# description ***Connected to TOR1***</pre>	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
<pre>(config-if)# description ***Connected to Spine2***</pre>	Interface description
(config-if)# ip address 10.10.10.1/31	Configure ip address on network side of Spine1
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board
(config-if)#exit	Exit Interface mode and return to Configure mode.

OSPF configuration:

Enter into router OSPF mode
Configure router-id as lo ip address
Add lo ip address network into area 0
Add Spine-connected network into area 0
Enabling bfd on all ospf interface for fast convergence
Exit Interface mode and return to Configure mode.
Commit the candidate configuration to running configuration and save config and reload board

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
<pre>(config-router)# address-family ipv4 unicast</pre>	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 12vpn evpn	Enter into I2vpn EVPN address family mode
(config-router-af)#neighbor 66.66.66.66 activate	Activate BorderVTEP1 into I2vpn evpn address family mode
(config-router-af)#exit-address-family	Exit from I2vpn 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 and save config and reload board

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
<pre>(config-vrf)# route-target both 6000:6000</pre>	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 and save config and reload board

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
<pre>(config-vrf) # route-target both 1050:1050</pre>	Assign route-target value for same for import and export.
(config-vrf) # 13vni 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 and save config and reload board
(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) #commit	Commit the candidate configuration to running configuration and save config and reload board

VXLAN configuration:

(config)#nvo vxlan enable	Enable VXLAN
(config)#nvo vxlan vtep-ip-global 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
<pre>(config) # nvo vxlan access-if port-vlan ce50 1050</pre>	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 and save config and reload board

VTEP2

(Multi-homed group) - Part of both Multi-homed with po1000(MH).

Hardware profile and generic configuration:

#configure terminal	Enter Configure mode.
(config)#nvo vxlan enable	Enable VXLAN
(config)#nvo vxlan irb	Enable VXLAN irb
<pre>(config) # evpn irb-forwarding anycast- gateway-mac 0000.2222.3333</pre>	Configure Anycast gateway mac
(Config)#qos enable	Enabling qos
(Config) # bfd interval 3 minrx 3 multiplier 3	Configure bfd
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board

Interface and loopback configuration:

(config)#interface xe4	Enter Interface mode for xe4(MH)
<pre>(config-if)# description ***Connected to TOR2***</pre>	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
<pre>(config-if)# description ***Connected to Spine1***</pre>	Interface description
<pre>(config-if)# ip address ip address 10.10.12.1/31</pre>	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 and save config and reload board

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	Add lo ip address network into area 0
(config-router)#network 10.10.12.0/24 area 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 and save config and reload board

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
<pre>(config-router)#neighbor 66.66.66.66 update- source lo</pre>	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
<pre>(config-router)# address-family ipv4 unicast</pre>	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 12vpn evpn	Enter into I2vpn EVPN address family mode
(config-router-af)#neighbor 66.66.66.66 activate	Activate BorderVTEP1 into I2vpn 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 I2vpn 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 and save config and reload board

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
<pre>(config-vrf)# route-target both 6000:6000</pre>	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 and save config and reload board

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)# 13vni 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 and save config and reload board
(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 and save config and reload board

VXLAN configuration:

(config)#nvo vxlan enable	Enable VXLAN
(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 and save config and reload board

VTEP3

(Multi-homed group) - Part of both Multi-homed with po1000(MH).

Hardware profile and generic configuration:

#configure terminal	Enter Configure mode.
(config)#nvo vxlan enable	Enable VXLAN
(config)#nvo vxlan irb	Enable VXLAN irb
<pre>(config)# evpn irb-forwarding anycast- gateway-mac 0000.2222.3333</pre>	Configure Anycast gateway mac
(Config)#qos enable	Enabling qos
(Config) # bfd interval 3 minrx 3 multiplier 3	Configure bfd
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board

Interface and loopback configuration:

(config)#interface xel0	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
<pre>(config-if)#ip address 76.76.76.76/32 secondary</pre>	Configure loopback ip address
(config-if) #exit	Exit Interface mode and return to Configure mode.
(config) interface xe27	Enter interface mode
<pre>(config-if)# description ***Connected to Spine1***</pre>	Interface description
<pre>(config-if)# ip address ip address 10.10.24.1/31</pre>	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 and save config and reload board

OSPF configuration:

(config) #router ospf 100	Enter into router OSPF mode
(config-router)#ospf router-id 76.76.76	Configure router-id as lo ip address
(config-router)#network 76.76.76.76/32 area 0.0.0	Add lo ip address network into area 0
(config-router)#network 10.10.24.0/24 area 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 and save config and reload board

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
<pre>(config-router)#neighbor 66.66.66.66 update- source lo</pre>	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
<pre>(config-router)# address-family ipv4 unicast</pre>	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 12vpn evpn	Enter into I2vpn EVPN address family mode
(config-router-af)#neighbor 66.66.66.66 activate	Activate BorderVTEP1 into I2vpn evpn address family mode
(config-router-af)#neighbor 60.60.60.60 activate	Activate VTEP2 into I2vpn evpn address family mode
(config-router-af)#exit-address-family	Exit from I2vpn 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 and save config and reload board

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
<pre>(config-vrf)# route-target both 6000:6000</pre>	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 and save config and reload board

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)# 13vni 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 and save config and reload board
(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 and save config and reload board

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 and save config and reload board

BorderVTEP1

Hardware profile and generic configuration:

#configure terminal	Enter Configure mode.
(config)#nvo vxlan enable	Enable VXLAN
(config)#nvo vxlan irb	Enable VXLAN irb
(Config)#qos enable	Enabling qos
(Config) # bfd interval 3 minrx 3 multiplier 3	Configure bfd
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board

Interface and loopback configuration:

(config)#interface ce50	Enter Interface mode
<pre>(config-if)# description ***Connected to FW***</pre>	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
<pre>(config-if)# description ***Connected to Spine1***</pre>	Interface description
<pre>(config-if)# ip address ip address 10.10.14.1/31</pre>	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 and save config and reload board

OSPF configuration:

(config) #router ospf 100	Enter into router OSPF mode
(config-router) #ospf router-id 66.66.66	Configure router-id as lo ip address
(config-router)#network 66.66.66.66/32 area 0.0.0	Add lo ip address network into area 0
(config-router)#network 10.10.14.0/24 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 and save config and reload board

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
(config-router)#neighbor 51.51.51.51 remote- as 500	Specify a VTEP1 loopback ip address and remote-as defined
<pre>(config-router)#neighbor 51.51.51.51 update- source lo</pre>	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
<pre>(config-router)#neighbor 60.60.60.60 update- source lo</pre>	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
<pre>(config-router)# address-family ipv4 unicast</pre>	Enter into IPV4 unicast address family mode
<pre>(config-router-af)# neighbor 51.51.51.51 activate</pre>	Activate VTEP1 into ipv4 unicast family
<pre>(config-router-af)# neighbor 60.60.60.60 activate</pre>	Activate VTEP2 into ipv4 unicast family
<pre>(config-router-af)# neighbor 76.76.76.76 activate</pre>	Activate VTEP3 into ipv4 unicast family
<pre>(config-router-af)# exit-address-family</pre>	Exit from IPV4 unicast address family
(config-router)#address-family 12vpn evpn	Enter into I2vpn EVPN address family mode
(config-router-af)#neighbor 51.51.51.51 activate	Activate VTEP1 into I2vpn evpn address family mode
(config-router-af)#neighbor 60.60.60.60 activate	Activate VTEP2 into I2vpn evpn address family mode
(config-router-af)#neighbor 76.76.76.76 activate	Activate VTEP3 into I2vpn evpn address family mode
(config-router-af)#exit-address-family	Exit from I2vpn 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 and save config and reload board

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
<pre>(config-vrf)# route-target both 6000:6000</pre>	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 and save config and reload board

L3 VRF and BGP Configuration:

<pre>(config) # ip vrf gvrf</pre>	Create mac routing/forwarding instance with gvrf name and enter into vrf mode
(config-vrf)# rd 4.5.6.8:6	Assign RD value
<pre>(config-vrf)# route-target import 100:100</pre>	Assign route-target value for import from FAX vrf
<pre>(config-vrf)# route-target import 300:300</pre>	Assign route-target value for import from SMS vrf
<pre>(config-vrf)# route-target export 1000:1000</pre>	Assign route-target value for export from gvrf
(config-vrf)# 13vni 500	Configure L3VNI as 500 for gvrf vrf

(config-vrf) #exit	Exit from vrf mode
(config)# interface irb 1067	Configure irb interface 1060
(config-if) ip vrf forwarding gvrf	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
<pre>(config-vrf) # route-target both 1050:1050</pre>	Assign route-target value for same for import and export.
<pre>(config-vrf) # route-target export 100:100</pre>	Assign route-target value export from FAX
<pre>(config-vrf) # route-target import 1000:1000</pre>	Assign route-target value for import from gvrf
(config-vrf) # 13vni 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
<pre>(config-vrf) # route-target both 1040:1040</pre>	Assign route-target value for same for import and export.
<pre>(config-vrf) # route-target export 300:300</pre>	Assign route-target value export from SMS
<pre>(config-vrf) # route-target import 1000:1000</pre>	Assign route-target value for import from gvrf
(config-vrf) # 13vni 10402	Configure L3VNI as 10402 for SMS vrf
(config-vrf) #exit	Exit from vrf mode
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board
(config)router bgp 500	Enter into bgp router mode
<pre>(config-router)#address-family ipv4 vrf gvrf</pre>	Enter into address-family mode for gvrf
(config-router-af) #redistribute connected	Redistribute connected
<pre>(config-router-af)# neighbor 10.10.18.2 remote-as 64603</pre>	Add Firewall as neighbor
<pre>(config-router-af)# neighbor 10.10.18.2 fall-over bfd</pre>	Configure bfd for better convergence
<pre>(config-router-af)# neighbor 10.10.18.2 activate</pre>	Activate the neighbor
<pre>(config-router-af) # neighbor 10.10.18.2 advertisement-interval 0</pre>	Configure interval 0 for better convergence
(config-router-af)#exit-address-family	Exit form address-family
(config) #commit	Commit the candidate configuration to running configuration and save config and reload board

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-	Configure VXLAN Network identifier with/without inner-vid-
replication inner-vid-disabled	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 and save config and reload board

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 and save config and reload board

Interface and loopback configuration:

#configure terminal	Enter Configure mode.
<pre>(config) # bridge 1 protocol rstp vlan-bridge</pre>	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
<pre>(config-if)# description ***Connected to BorderVTEP1***</pre>	Interface description
(config-if)#bridge-group 1	Associate to bridge 1
<pre>(config-if)# bridge-group 1 spanning-tree disable</pre>	Configure stp disable
(config-if)# switchport mode trunk	Mode as trunk
<pre>(config-if)# switchport trunk allowed vlan add 1067</pre>	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 and save config and reload board

BGP configuration:

(Config) #router bgp 64603	Enter into Router BGP mode
<pre>(config-router)# neighbor 10.10.18.1 remote- as 500</pre>	Specify a BorderVTEP1 gvrf ip address and remote-as defined
<pre>(config-router)# neighbor 10.10.18.1 fall- over bfd</pre>	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
<pre>(config-router)# address-family ipv4 unicast</pre>	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
<pre>(config-router-af)# neighbor 10.10.18.1 activate</pre>	Activate the neighbor
(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) #commit	Commit the candidate configuration to running configuration and save config and reload board

TOR1 (SH)

#configure terminal	Enter Configure mode.
<pre>(config)# bridge 1 protocol rstp vlan-bridge</pre>	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
<pre>(config-if)# bridge-group 1 spanning-tree disable</pre>	Configure stp disable
<pre>(config-if)# switchport mode trunk</pre>	Mode as trunk
<pre>(config-if)# switchport trunk allowed vlan add 1050</pre>	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
<pre>(config-if)# bridge-group 1 spanning-tree disable</pre>	Configure stp disable
(config-if)# switchport mode trunk	Mode as trunk
<pre>(config-if)# switchport trunk allowed vlan add 1050</pre>	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 and save config and reload board

TOR2 (MH)

Multihomed to 2-VTEPs (VTEP2 and VTEP3).

#configure terminal	Enter Configure mode.
<pre>(config) # bridge 1 protocol rstp vlan-bridge</pre>	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
<pre>(config-if)# bridge-group 1 spanning-tree disable</pre>	Configure stp disable
(config-if)# switchport mode trunk	Mode as trunk
<pre>(config-if)# switchport trunk allowed vlan add 1060</pre>	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
<pre>(config-if)# bridge-group 1 spanning-tree disable</pre>	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 and save config and reload board

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 and save config and reload board

Interface and loopback configuration:

(config)#interface lo	Enter Interface mode for lo
<pre>(config-if)#ip address 62.62.62.62/32 secondary</pre>	Configure loopback ip address
(config-if) #exit	Exit Interface mode and return to Configure mode.
(config) #interface xe40	Enter Interface mode
<pre>(config-if)# description ***Connected to VTEP1***</pre>	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 and save config and reload board

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
(config-router)#network 10.10.10.0/24 area 0.0.0	Add VTEP1 network into area 0

```
Add VTEP2 network into area 0
(config-router) #network 10.10.12.0/24 area
0.0.0.0
                                                        Add VTEP4 network into area 0
(config-router) #network 10.10.14.0/24 area
0.0.0.0
                                                        Add VTEP3 network into area 0
(config-router) #network 10.10.24.0/24 area
0.0.0.0
                                                        Enabling bfd on all ospf interface for fast convergence
(config-router) #bfd all-interfaces
                                                        Exit Interface mode and return to Configure mode.
(config-if) #exit
                                                        Commit the candidate configuration to running configuration
(config) #commit
                                                        and save config and reload board
```

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
  Configured ebgp ECMP multipath: Currently set at 8
8
Neighbor
                             AS
                                  MsqRcv
                                             MsqSen TblVer
                         77
                                                             InQ
                                                                   OutQ
                                                                            Up/Dow
   State/PfxRcd
n
10.10.18.1
                             500
                                   46
                                               58
                                                        3
                                                               0
                                                                          00:17:36
                         4
                                                                       0
               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"
С
             10.10.18.0/24 is directly connected, vlan1.1067, 00:19:40
С
             10.10.20.0/24 is directly connected, cel/1, 00:00:13
             10.12.32.0/24 [20/0] via 10.10.18.1, vlan1.1067, 00:17:43
В
В
             10.240.38.0/24 [20/0] via 10.10.18.1, vlan1.1067, 00:17:43
             127.0.0.0/8 is directly connected, lo, 00:52:18
С
IP Route Table for VRF "management"
             10.12.85.0/24 is directly connected, eth0, 00:52:07
С
```

```
С
            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
     VNI-Name
VNTD
                   VNI-Type Type Interface ESI
                                                                   VLAN DF-Status
Src-Addr Dst-Addr
                                        --- Single Homed Port ---
1067
       ____
                          AC ce50
                                                                   1067 ----
____
               ____
10402
       ____
                   L3
                           NW
                                ____
                                        ____
                                                                   ____ ___
              60.60.60.60
66.66.66.66
10402
     ____
                  L3
                                ____
                                         ____
                                                                   ____ ___
                           NW
66.66.66.66
               76.76.76.76
10502 ----
                   L3
                           NW
                                ____
                                                                   ____ ___
               51.51.51.51
66.66.66.66
Total number of entries are 4
BorderVTEP1#show nvo vxlan tunnel
VXLAN Network tunnel Entries
               Destination
Source
                               Status
                                               Up/Down
                                                             Update
_____
66.66.66.66
              51.51.51.51
                                               00:22:36
                                                             00:22:36
                               Installed
66.66.66.66
              60.60.60.60
                                               00:22:36
                              Installed
                                                             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"
Ο
            10.10.10.0/31 [110/2] via 10.10.14.0, xe39, 00:22:44
Ο
            10.10.12.0/31 [110/2] via 10.10.14.0, xe39, 00:22:44
С
            10.10.14.0/31 is directly connected, xe39, 00:23:29
```

10.10.24.0/31 [110/2] via 10.10.14.0, xe39, 00:22:44 0 51.51.51.51/32 [110/3] via 10.10.14.0, xe39, 00:22:44 0 60.60.60/32 [110/3] via 10.10.14.0, xe39, 00:22:44 0 С 66.66.66.66/32 is directly connected, lo, 00:23:32 0 76.76.76.76/32 [110/3] via 10.10.14.0, xe39, 00:22:44 С 127.0.0.0/8 is directly connected, lo, 00:24:12 IP Route Table for VRF "management" 10.12.86.0/24 is directly connected, eth0, 00:23:38 С С 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 10.10.18.0/24 is directly connected, irb1067, 00:23:30 С 10.10.20.0/24 [20/0] via 10.10.18.2, irb1067, 00:04:01 В R 10.12.32.0/24 [200/0] via 51.51.51.51 (recursive is directly connected, 77 tunvxlan3), 00:22:39 10.240.38.0/24 [200/0] via 60.60.60 (recursive is directly connected, В 77 tunvxlan4), 00:22:40 127.0.0.0/8 is directly connected, lo.gvrf, 00:23:36 C IP Route Table for VRF "SMS" Gateway of last resort is 10.10.18.2 to network 0.0.0.0 0.0.0.0/0 [20/0] via 10.10.18.2, irb1067, 00:21:31 В* v В 10.10.18.0/24 [20/0] is directly connected, irb1067, 00:23:30 v 10.10.20.0/24 [20/0] via 10.10.18.2, irb1067, 00:04:01 В 77 10.240.38.0/24 [200/0] via 60.60.60.60 (recursive is directly connected, В tunvxlan4), 00:22:40 60.60.60.60/32 [0/0] is directly connected, tunvxlan4, 00:22:39 В В 76.76.76.76/32 [0/0] is directly connected, tunvxlan4, 00:22:39 С 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 В* v 0.0.0.0/0 [20/0] via 10.10.18.2, irb1067, 00:21:31 10.10.18.0/24 [20/0] is directly connected, irb1067, 00:23:30 В V 10.10.20.0/24 [20/0] via 10.10.18.2, irb1067, 00:04:01 R v 10.12.32.0/24 [200/0] via 51.51.51.51 (recursive is directly connected, В tunvxlan3), 00:22:39 В 51.51.51.51/32 [0/0] is directly connected, tunvxlan3, 00:22:39 С 127.0.0.0/8 is directly connected, lo.FAX, 00:23:35 IP Route Table for VRF "SMM" 127.0.0.0/8 is directly connected, lo.SMM, 00:23:35 С Gateway of last resort is not set BorderVTEP1# show bgp 12vpn 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 T	MsgRcv ESI PRE	MsgSen EFIX-ROUTE	TblVer	InQ	Οı	ıtQ	Up/Down	State/
51.51.51.51 7 0	5	4 1	500 0	62 1	71	6	0	0	00:22:	:50	
60.60.60.60 8 2	3	4 1	500 1	65 1	71	6	0	0	00:22:	:50	
76.76.76.76 9 2	4	4 1	500 1	65 1	70	6	0	0	00:22:	:50	
Total number c	of neigh	nbors 3	3								
Total number c	of Estak	olished	d ses	ssions 3	12000 000	n					
BGP table vers	ion is	6, loo	cal 1	couter II) is 66.66	.66.66					
Status codes:	s suppr	ressed,	, d c	lamped, h	n history,	* vali	d, > bes	t,	i - in	nternal,	
Origin codes:	i - Iar i - IGE	2, e -	EGP,	? - inc	complete						
[EVPN route ty	pe]:[ES	SI]:[V1	NID]:	[relever	nt route i	nforman	tion]				
1 - Ethernet A 2 - MAC/IP Rou	uto-dis	scovery	y Roi	ite							
3 - Inclusive	Multica	ast Rou	ute								
4 - Ethernet S	egment	Route									
5 - Prefix Rou	te										
Network Encap	N∈	ext Hop	þ	Me	etric Lo	ocPrf	Weigl	nt	Pat	ch Peer	
(۱۰۸۱ C C 2 م	170 ए । एए ।	1.									
* i [1]:[00:0	0:00:44	4:44:55	5:55:	00:00:00)]:[1060]:	[1060]					
		76.76	.76.7	76	0	100	0	i	76.76	.76.76	VXLAN
* i		60.60	.60.0	50	0	100	0	i	60.60	.60.60	VXLAN
* i [1]:[00:0	0:00:44	4:44:55	5:55:	00:00:00)]:[429496	7295] : [0]				
		76.76	.76.7	76	0	100	0	i	76.76	.76.76	VXLAN
* i	10501	60.60	.60.0	50	0	100	0	i	60.60	.60.60	VXLAN
* 1 [2]:[0]:[1050]:[[48,000	JU:Ue	8d:56la]	0	100	0	2	E1 E1	E1 E1	5757T 75 81
* ; [2].[0].	10501.1	10. 000	.51.3) L . 0 d • 5 6 1 - 1	U 1 1 1 22 10 1	100 2 22 11	U 1.[1050]	1	51.51	.51.51	VXLAN
^ _ [2]:[0]:[1020]:[51 51	51 F	31 51	n	100	0	i	51 51	51 51	<u>νγτ.δ</u> Ν
* i [2]•[0]•[10501 • 1	51.51 [48.00() () - 3 - 3) () - 3 - 3	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	U•[32.10.1	2 32 10	1.[1050]	Ŧ	51.51		VIAIN
I [2]•[0]•[1000].[51 51	51 5	53 . 1030]	0	100	0	i	51 51	51 51	VXT.AN
* i [2]:[0]:[10501:	91.91 [48.3c2	2c:99) d6:167a1	:[32,10.1	2.32.11	:[1050]	-	01.01	.01.01	v / 112/ 114
_ [_].[.].		51.51	.51.5	51	0	100	0	i	51.51	.51.51	VXLAN
* i [2]:[0]:[10501:1	[48,3c2	2c:99	d6:167a1	1:[128,240	1::1]:[10501				
		51.51	.51.5	51	0	100	0	i	51.51	.51.51	VXLAN
* i [2]:[00:0	0:00:44	4:44:55	5:55:	00:00:00)]:[1060]:	[48,000	0:0e8d:5	61	9]:[0]	:[1060]	
		76.76	.76.7	76	0	100	0	i	76.76	.76.76	VXLAN
* i											
[2]:[00:00:00:	44:44:5	55:55:0	00:00	0:00]:[10	060]:[48,0	000:222	2:1060]:	[3	2,10.24	40.38.10]	:[1060]
		76.76	.76.7	76	0	100	0	i	76.76	.76.76	VXLAN
* i		60.60	.60.0	50	0	100	0	i	60.60	.60.60	VXLAN
* i [2]:[0]:[1060]:[[48,000	00:22	222:3333]	:[32,10.2	40.38.1]:[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
* i	[2]:[0]:[1060]:[48,0000:2222:333	3]:[128,16	01::1]:[1	0601			
	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:dc7	a]:[32,10.	10.18.11:	[1067]			
		0	100	[= 0 0 7]	3276	8 i	
VXLA	N	Ũ	100		02,0	0 1	
*>	[2]:[0]:[1067]:[48,a82b:b5cf:f80	6]:[32,10.	10.18.2]:	[1067]			
	66.66.66.66	0	100		3276	8 i	
VXLA	N						
* 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]	Ũ	200	Ũ	-		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
-	[0].[100,].[02,00.00.00.00]	0	100		3276	8 i	
VXLA	N	0	100		5270	0 1	
RD[2	.3.4.5:1]						
*>i	[2]:[0]:[1050]:[48,0000:0e8d:561	a]:[0]:[10	501				
	51.51.51	0	100	0	i	51.51.51.51	VXLAN
*>i	[2]:[0]:[1050]:[48.0000:0e8d:56]	al:[32,10.	12.32.111	:[1050)]		
· -	51 51 51 51	0	100	0	'' i	51 51 51 51	VXT.AN
*>i	[2] • [0] • [1050] • [48 0000 • 3333 • 105	01 • [32 10	12 32 101	• [1050	1	01.01.01.01	V 2111111
~1	[2].[0].[1000].[40,0000.0000.000.100	0].[32,10.	100	.[1030	'] ;	51 51 51 51	ττντ λη
* < :		0 1.0	10 20 11.	10501	T	JI.JI.JI.JI	VALAN
~ > 1	[2]:[0]:[1050]:[40,30220:9900:107	a]:[32,10.	100	[1030]	2	E1 E1 E1 E1	5757T 7 NT
<u>ــــــــــــــــــــــــــــــــــــ</u>		-1.[100.04	100	0	T	51.51.51.51	VALAN
^>1		a]:[128,24	100	050]			
	51.51.51.51	0	100	0	l	51.51.51.51	VXLAN
*>1	[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	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	2,10.240.38.10]	:[1060]
	60.60.60	0	100	0	i	60.60.60.60	VXLAN
*>i	[2]:[0]:[1060]:[48,0000:2222:333	3]:[32,10.	240.38.1]	:[1060)]		
	60.60.60	0	100	0	i	60.60.60.60	VXLAN
*>i	[2]:[0]:[1060]:[48,0000:2222:333	3]:[128,16	501::1]:[1	060]			
	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]:[00:00:00:4	4:44:55:55:00	:00:00]:[1	060]:[48,0000:	0e8d:	5619]:[0]:	[1060]	
		76.76.76.76	0	100	0	i	76.76.	.76.76	VXLAN
*>i		55.55.00.00.00	01.[1060].	[40 0000.2222.	10601	• ເວວ	10 24	0 20 101.	[1060]
[2]:[00:00:00:44:44:		.[1000]:	100	0001	:[32 ;	76 76	76 76	[TOOD]
* \ ;	[2].[0].[1060].	r 10 . 70 . 70 . 70	· · · · · · · · · · · · · · · · · · ·	10 240 20 11.	1060	⊥ 1	/0./0.	. /0. /0	VALAN
~	[2].[0].[1000].	76 76 76 76 76	.5555].[52]	100.240.30.1].	0000		76 76	76 76	VVT AN
*>:		[18 0000·2222		1601••11•[10	601	Ŧ	/0./0.	. /0. /0	VALAN
~	[2].[0].[1000].	76 76 76 76 76	.5555].[120	100	001	÷	76 76	76 76	VVT AN
*>;	[3] • [1060] • [32		0	100	0	Ŧ	/0./0.	. / 0 . / 0	VIAN
~1	[5].[1000].[52,	76 76 76 76 76	0	100	0	i	76 76	76 76	VXT.AN
		/0./0./0./0	0	100	0	-	, ,		V 2111211V
RD[51	.51.51.51:10501								
*>i	[5]:[0]:[10502]	:[24]:[10.12.3	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]:[00:00:00:4	4:44:55:55:00	:00:00]:[42	294967295] : [0]					
		60.60.60.60	0	100	0	i	60.60	.60.60	VXLAN
*>i	[4]:[00:00:00:4	4:44:55:55:00	:00:00]:[32	2,60.60.60.60]					
		60.60.60.60	0	100	0	i	60.60	.60.60	VXLAN
RD[60	0.60.60.60:1040]								
*>i	[5]:[0]:[10402]	:[24]:[10.240	.38.0]:[0.0	0.0.0]:[10402]					
		60.60.60.60	0	100	0	?	60.60	.60.60	VXLAN
RD[/6	./6./6./6:1]		00 001 54						
*>1	[1]:[00:00:00:4	4:44:55:55:00	:00:00]:[4.	294967295]:[U]	0				
* < :	[4].[00.00.00.4	/0./0./0./0	U · C O • C O • C O •		0	1	/0./0.	. / 6 . / 6	VALAN
~/I	[4].[00.00.00.4	76 76 76 76 76	.00.00].[3.	100	0	÷	76 76	76 76	VVT AN
		/0./0./0./0	0	100	0	T	/0./0.	. /0. /0	VALAN
RD[76	5 76 76 76 • 10401								
*>i	$[5] \cdot [0] \cdot [10402]$	·[24] · [10 240	38 01.00	0 01.104021					
~ ±	[0].[0].[10102]	76.76.76.76	0	100	0	ç	76.76	76.76	VXLAN
			J. J	200	Ū	•	,		
Total	. number of pref	ixes 41							
Borde	erVTEP1#								
Borde	erVTEP1#show bgp	12vpn evpn p:	refix-rout	Э					
RD[51	.51.51.51:1050]								
ESI		Eth-Tag Prefi	x-Length	IP-Address		_			GW-
IPAdo	iress	0.4	L3VNID	Nexthop	1	Enca	p	Router-Ma	С
U 10502	LUSUZ 2 51 51 51 5	24 IU 1 VXT.AN	3626.990	d6•167a	0.0	0.0.	0		
RD[60	.60.60.60:10401								
ESI		Eth-Tag Prefi	x-Length	IP-Address					GW-
IPAdd	lress	-	L3VNID	Nexthop]	Enca	p	Router-Ma	С

0 10402	10 60.60)402 .60.6	24 0 VXI	10.2 JAN	240.38.0 3c2c:99	d1:117a		0.0.0.0			
PD[76 76	76 76.	10401									
ESI IPAddress	, o. , o.	1040]	Eth-Tag	Prefix-	-Length L3VNID	IP-Ao Next	ldress hop	Encap	Ro	uter-Ma	GW-
0 10402	10 76.76)402 .76.7	24 6 VXI	10.2 .AN	240.38.0 3c2c:99	de:1e7a	-	0.0.0.0			
VTEP3 ======											
VTEP3#shc VXLAN Inf	ow nvo Formati	vxlan on									
Codes:	NW - AC - (u) -	== Netwo Acces Untag	rk Port s Port ged								
VNID Src-Addr	VNI-Nan	ne Dst	VNI-Type -Addr	е Туре	Interfac	e ESI			VI	AN DF-S	tatus
1060 76.76.76. 1060	76	60.	L2 60.60.60	NW - AC po			D:44:44:5	5:55:00:0		060 NON-	DF
10402 76.76.76.	 76	66.	L3 66.66.66	NW -							
Total num VTEP3#shc VXLAN Net	nber of ow nvo twork t	entr vxlan unnel	ies are 3 tunnel Entries	3			,		_		
Source		Des [.]	tination ========	S ======	tatus =======	=======	Up/Down ======	ע =======	odate ======	==	
76.76.76. 76.76.76.	76 76	66. 60.	66.66.66 60.60.60	I I	nstalled nstalled	l	00:24:35 00:54:40	00):24:35):54:40		
Total num VTEP3#shc Codes: K O N1 E1 i i i v *	aber of - kern - OSPF - OSP - OSP - IS-I - IS-I - IS- - vrf - cand	entr oute el, C , IA F NSS F ext S, L1 IS in leake idate	ies are 2 vrf all - connec - OSPF in A externa ernal typ - IS-IS ter area, d default	ted, S ater ar al type be 1, E level- E - E	- stati ea 1, N2 - 2 - OSPF 1, L2 - VPN,	.c, R - OSPF N 'extern IS-IS 1	RIP, B - SSA exter al type 2 evel-2,	BGP nal type	2		
IP Route	Table	for V	RF "defau	ılt"							

10.10.10.0/31 [110/2] via 10.10.24.1, xe27, 00:54:56 0 10.10.12.0/31 [110/2] via 10.10.24.1, xe27, 00:54:56 0 10.10.14.0/31 [110/2] via 10.10.24.1, xe27, 00:25:31 0 С 10.10.24.0/31 is directly connected, xe27, 00:55:37 0 51.51.51.51/32 [110/3] via 10.10.24.1, xe27, 00:54:47 0 60.60.60.60/32 [110/3] via 10.10.24.1, xe27, 00:54:45 0 66.66.66.66/32 [110/3] via 10.10.24.1, xe27, 00:24:46 С 76.76.76.76/32 is directly connected, lo, 00:55:38 С 127.0.0.0/8 is directly connected, lo, 00:55:39 IP Route Table for VRF "management" 10.12.20.0/24 is directly connected, eth0, 00:55:10 С С 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 R* 0.0.0.0/0 [200/0] via 66.66.66 (recursive is directly connected, tunvxlan2), 00:23:33 10.10.18.0/24 [200/0] via 66.66.66 (recursive is directly connected, В tunvxlan2), 00:24:41 10.10.20.0/24 [200/0] via 66.66.66 (recursive is directly connected, R tunvxlan2), 00:06:03 10.240.38.0/24 is directly connected, irb1060, 00:55:38 С 66.66.66.66/32 [0/0] is directly connected, tunvxlan2, 00:24:41 В 127.0.0.0/8 is directly connected, lo.SMS, 00:55:39 С VTEP3# show bgp 12vpn 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 V AS MsqRcv MsgSen TblVer InQ OutQ Up/Down State/ PfxRcd MACIP MCAST ESI AD PREFIX-ROUTE 60.60.60.60 7 500 144 140 0 0 00:54:55 4 3 8 2 1 1 1 66.66.66.66 7 500 125 0 0 00:24:51 4 127 2 12 0 1 0 9 Total number of neighbors 2 Total number of Established sessions 2 VTEP3# show bgp 12vpn 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

1	Network	Next Hop	Metric	LocPrf	Wei	ght	Path Pee	r
Enca	p							
RD[2	.2.4.4:41							
*>i	[2]:[0]:[1	0671:[48,3c2c:991c	:dc7a]:[32.	10.10.18.1	1:[1067	1		
	[2]•[0]•[1		0	100	0	, i	66 66 66 66	VXT.AN
*>;	[2].[0].[1	$10671 \cdot [48 - 82b \cdot b5cf]$	• F8061 • [32 -	10 10 18 2	J. [1067	1	00.00.00.00	V / 11/ 11V
~ 1	[2].[0].[]		.1000].[32,	10.10.10.2	0.1001			ταντ λη
+ \ 2	[2].[10(7]		0	100	0	T	00.00.00.00	VALAN
^ >1	[3]:[1067]	[:[32,00.00.00.00]	0	100	0			
		66.66.66.66	U	100	0	1	66.66.66.66	VXLAN
RD[2	.3.4.5:2]							
*>i	[1]:[00:00	0:00:44:44:55:55:00	:00:00]:[10	60]:[1060]				
		60.60.60.60	0	100	0	i	60.60.60.60	VXLAN
*>i								
[2]:	[00:00:00:4	44:44:55:55:00:00:00)]:[1060]:[4	48,0000:22	22:1060]:[32	2,10.240.38.1	L0]:[1060]
		60.60.60.60	0	100	0	i	60.60.60.60	VXLAN
*>i	[2]:[0]:[1	L060]:[48,0000:2222	:3333]:[32,3	10.240.38.	1]:[106	0]		
		60.60.60.60	0	100	0	i	60.60.60.60	VXLAN
*>i	[2]:[0]:[1	L060]:[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
2 חפ	3 / 6.21 5							
*>	[1]•[00•00	(100.44.44.55.55.00)	• 0 0 • 0 0 1 • [1 0 0	601.10601				
	[1].[00.00		.00.00].[10	100	0	2276	0 -	
VXTA	N	/0./0./0./0	0	100	0	5270	0 I	
* i			0	100	0	i	60 60 60 60	VXT.AN
* i	[1].)•00•44•44•55•55•00		919672951•	101	-	00.00.00.00	V / 11/ 11V
1	[1].[00.00		.00.00].[42.	100	[0]	:		ταντ λη
* \	[2].[00.00		.00.001.[10	001. 01.	0 6000000	⊥ •5610	00.00.00.00	
^ /	[2]:[00:00	1:00:44:44:55:55:00	.00:00]:[10	00]:[40,00		:0013):[U]:[IU60]	I.
VXT.Δ	N	/6./6./6./6	0	100	0	3276	8 1	
*>								
[2]:	[00:00:00:4	4:44:55:55:00:00:00)]:[1060]:[4	48,0000:22	22:1060	1:[32	2,10.240.38.1	L0]:[1060]
	-	76.76.76.76	0	. 100	0	3276	, 8 i	
VXLA	N		-		-			
* i		60.60.60.60	0	100	0	i	60.60.60.60	VXLAN
* i	[2]:[0]:[1	L060]:[48,0000:2222	:33331:[32,]	10.240.38.	1]:[106	01		
		60.60.60.60	0	100	0	i	60.60.60.60	VXLAN
*>		76.76.76.76	0	10	0	3276	8 i	
VXLA	N	, , , , .	0	101	0	0270	0 1	
* i	[2]:[0]:[1	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	0	1.00	0	3276	8 i	
VXLA	N		0	101	-	,0		
* i	[2]:[0]:[1	L067]:[48,3c2c:991c	:dc7a]:[32,2	10.10.18.1]:[1067]		
		66.66.66.66	0	100	- 0	i	66.66.66.66	VXLAN
* i	[2]:[0]:[1	L067]:[48,a82b:b5cf	:f806]:[32.]	10.10.18.2]:[1067	1		
		66,66,66,66	0	100	0	- i	66.66.66.66	VXTAN
			-	=	-	-		

* i	[3]:[1060]:[32,60.60.60.60] 60.60.60	0	100	0	i 60.60.60.60	VXLAN
*>	[3]:[1060]:[32,76.76.76.76]					
	76.76.76	0	100		32768 i	
* 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]:[500]			
	66.66.66.66	0	100	0	64603 i 66.66.66	.66
VXLA	N					
*>1	[5]:[0]:[500]:[24]:[10.10.18.0]:		[500]	0		
4 \ 2		U	TOO	0	? 66.66.66.66	VXLAN
^>1			100	0	61602 ÷ 66 66 66	66
VXLA	00.00.00.00 N	0	100	0	04003 I 00.00.00	.00
RD[6	0.60.60.60:1]					
*>i	[1]:[00:00:00:44:44:55:55:00:00:	00]:[42949	67295] : [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 [6	0.60.60.60:1040]					
*>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[6	6.66.66.66:1050]					
*>i	[5]:[0]:[500]:[0]:[0.0.0]:[0.0	.0.0]:[500]			
	66.66.66.66	0	100	0	64603 i 66.66.66	.66
VXLA	Ν					
*>i	[5]:[0]:[500]:[24]:[10.10.18.0]:	[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]:	[500]			
	66.66.66	0	100	0	64603 i 66.66.66	.66
VIIII						
RD[6	6 66 66 66.10601					
*>i	[5]:[0]:[500]:[0]:[0]:[0].0.0]:[0].0	.0.01:[500	1			
^ <u>+</u>	66, 66, 66	0	100	0	64603 i 66.66.66	. 66
VXLA	N	Ũ	200	Ũ	01000 1 00000000	• • • •
*>i	[5]:[0]:[500]:[24]:[10.10.18.0]:	[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]:	[500]			
	66.66.66.66	0	100	0	64603 i 66.66.66	.66
VXLA	N					
RD[7	6.76.76.76:1] VRF[evpn-gvrf-1]:					
*>	[1]:[00:00:00:44:44:55:55:00:00: 76 76 76 76	00]:[42949	67295] : [0]		32768 i	
VXLA	N	0	100		52,00 I	

* i [4]: *> [4]: VXLAN	[00:00:00:44 [00:00:00:44	1:44:55:55: 60.60.60.6 1:44:55:55: 76.76.76.	00:00:00]:[3 0 0 00:00:00]:[3 76	32,60.60.60.60] 100 32,76.76.76.76] 0 100	0 i 60 32768 i	.60.60.60	VXLAN
Total num	ber of prefi	ixes 34					
VTEP3# VTEP3#sho	w bgp l2vpr	n evpn pref	ix-route				
RD[4.5.6.	8:6]						
ESI IPAddress		Eth-Tag Pro	efix-Length L3VNID	IP-Address Nexthop	Encap	Router-Mac	GW-
0 500	500 66.66.66.66) 5 VXLAN	0.0.0.0 3c2c:99	91c:dc7a	0.0.0.0		
0 500	500 2 66.66.66.66	24 5 VXLAN	10.10.18.0 3c2c:99	91c:dc7a	0.0.0.0		
0 500	500 2 66.66.66.66	24 5 VXLAN	10.10.20.0 3c2c:99	91c:dc7a	0.0.0.0		
RD[60.60.	60.60:1040]						
ESI IPAddress		Eth-Tag Pro	efix-Length L3VNID	IP-Address Nexthop	Encap	Router-Mac	GW-
0 10402	10402 60.60.60.60	24) VXLAN	10.240.38.0 3c2c:99	9d1:117a	0.0.0.0		
RD[66.66.	66.66:1050]						
ESI IPAddress		Eth-Tag Pro	efix-Length L3VNID	IP-Address Nexthop	Encap	Router-Mac	GW-
0 500	500 66.66.66.66) 5 VXLAN	0.0.0.0 3c2c:99	91c:dc7a	0.0.0.0		
0 500	500 2	24 5 VXLAN	10.10.18.0 3c2c:99	91c:dc7a	0.0.0.0		
0 500	500 2 66.66.66.66	24 5 VXLAN	10.10.20.0 3c2c:99	91c:dc7a	0.0.0.0		
RD[66.66.	66.66:1060]						
ESI IPAddress		Eth-Tag Pro	efix-Length L3VNID	IP-Address Nexthop	Encap	Router-Mac	GW-
0 500	500) 5 VXLAN	0.0.0.0 3c2c:99	91c:dc7a	0.0.0.0		
0 500	500 2	24 5 VXLAN	10.10.18.0 3c2c:90	91c:dc7a	0.0.0.0		
0 500	500 2 66.66.66.66	24 5 VXLAN	10.10.20.0 3c2c:99	91c:dc7a	0.0.0.0		

VTEP2

```
AC - Access Port
         (u) - Untagged
     VNI-Name
                   VNI-Type Type Interface ESI
                                                                     VLAN DF-Status
VNTD
Src-Addr
               Dst-Addr
1060
       ____
                    L2
                            NW
                                 ____
                                          ____
                                                                      ____ ___
60.60.60.60
                76.76.76.76
        ____
1060
                  ___
                                         00:00:00:44:44:55:55:00:00:00 1060 DF
                           AC
                                po1000
____
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
                                                 00:26:50
                                                                00:26:50
                                Installed
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"
            10.10.10.0/31 [110/2] via 10.10.12.0, xe25, 00:57:13
0
С
            10.10.12.0/31 is directly connected, xe25, 00:57:57
            10.10.14.0/31 [110/2] via 10.10.12.0, xe25, 00:27:47
Ο
            10.10.16.0/31 [110/2] via 10.10.12.0, xe25, 00:57:13
0
0
            10.10.24.0/31 [110/2] via 10.10.12.0, xe25, 00:57:13
            51.51.51.51/32 [110/3] via 10.10.12.0, xe25, 00:57:03
0
            60.60.60.60/32 is directly connected, lo, 00:57:59
С
0
            66.66.66.66/32 [110/3] via 10.10.12.0, xe25, 00:27:02
0
            76.76.76.76/32 [110/3] via 10.10.12.0, xe25, 00:57:13
С
            127.0.0.0/8 is directly connected, lo, 00:58:00
IP Route Table for VRF "management"
            10.12.20.0/24 is directly connected, eth0, 00:57:29
С
С
            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
            0.0.0.0/0 [200/0] via 66.66.66 (recursive is directly connected,
R*
tunvxlan2), 00:25:49
```
10.10.18.0/24 [200/0] via 66.66.66 (recursive is directly connected, R tunvxlan2), 00:26:58 10.10.20.0/24 [200/0] via 66.66.66 (recursive is directly connected, R tunvxlan2), 00:08:19 С 10.240.38.0/24 is directly connected, irb1060, 00:57:58 66.66.66.66/32 [0/0] is directly connected, tunvxlan2, 00:26:58 В С 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 MsgRcv MsgSen TblVer Up/Down State/ AS InQ OutQ PfxRcd AD MACIP MCAST ESI PREFIX-ROUTE 66.66.66.66 4 500 135 133 11 0 0 00:27:29 2 1 9 12 0 0 76.76.76.76 500 4 146 150 11 0 0 00:57:30 4 1 9 2 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, 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 Weight Network Next Hop Metric LocPrf Path Peer Encap RD[2.2.4.4:4] *>i [2]:[0]:[1067]:[48,3c2c:991c:dc7a]:[32,10.10.18.1]:[1067] 66.66.66.66 100 i 66.66.66.66 0 0 VXLAN *>i [2]:[0]:[1067]:[48,a82b:b5cf:f806]:[32,10.10.18.2]:[1067] 66.66.66.66 0 100 i 66.66.66.66 0 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 Ο 100 0 i 76.76.76.76 VXLAN

VXLAN-IRB-Inter-VRF Route Leaking

*> VXLAI	N	60.60.60.60	0	100		32768	3 i		
* i	[1]:[00:00:00:4	4:44:55:55:00:0	00:00]:[429496	57295] : [0]				
		76.76.76.76	0	100	0	i	76.7	6.76.76	VXLAN
* i	[2]:[00:00:00:4	4:44:55:55:00:0	0:00]:[1060]:	:[48,0000	:0e8d	:5619]:[0]]:[1060]	
		76.76.76.76	0	100	0	i	76.7	6.76.76	VXLAN
* i									
[2]:	[00:00:00:44:44:	:55:55:00:00:00]	:[1060]:[48,0	0000:2222	:1060]:[32	,10.2	240.38.1	0]:[1060]
		76.76.76.76	0	100	0	i	76.7	6.76.76	VXLAN
*>		60.60.60.60	0	100		32768	3 i		
VXLA	N	F 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			[10C	0.1			
* 1	[2]:[0]:[1060]:	:[48,0000:2222:3	3333]:[32,10.2	240.38.1]	:[1060	J]			
		76.76.76.76	0	100	0	1	16.1	6.76.76	VXLAN
*>	NT.	60.60.60.60	0	100		32768	3 i		
VALAI	N [2].[0].[10(0].		00001.100 1.00		0 < 0 1				
^ 1	[2]:[0]:[1060]:	:[48,0000:2222:3	,100		060]				
		/6./6./6./6	0	100	0	1	/6./	6./6./6	VXLAN
*> \/\/\	NT.	60.60.60.60	0	100		32768	3 l		
* :	N [2].[0].[1067].	[40 2020.0010.0	1~7~1.[20 10 1	10 10 11.	[1067	1			
T	[2].[0].[100/].	.[40,3020.9910.0	nc/a].[52,10.1	100	[1007] _:			1777 A M
ч. !	[0] . [0] . [10(7] .			100	0	1	00.0	0.00.00	VALAN
^ 1	[2]:[U]:[1067]:	:[48,a82b:b5CI:1	[806]:[32,10.]	10.18.2]:	[T067]	J			
		66.66.66.66	0	TOO	0	1	66.6	6.66.66	VXLAN
*>	[3]:[1060]:[32,	60.60.60.60]	<u>^</u>	1.0.0					
1777 T T	NT.	60.60.60.60	0	100		32768	3 i		
VALAI	N [2].[1060].[22								
~ I	[5]:[1000]:[52,		0	100	0	2	767		5757T 7 NT
		10.10.10.10	0	100	0	T	10.1	0./0./0	VXLAN
* 1	[3]:[106/]:[32,	66.66.66.66]	0	100	0				
		66.66.66.66	0	100	0	1	66.6	6.66.66	VXLAN
0100	2 4 6.01								
KD[Z	.3.4.0:2]	14.44.55.55.00.0	0.001.[1060]	[1060]					
~ >1	[1]:[00:00:00:4		0:00]:[1060]:	100	0		7 7 7		5757T 7 NT
		/6./6./6./6	U	100	0	1	/6./	6./6./6	VXLAN
*>1	[2]:[00:00:00:4	4:44:55:55:00:0	00:00]:[1060]:	:[48,0000	:0e8d	:5619]:[0	[:[1060]	
		76.76.76.76	0	100	0	l	/6./	6.76.76	VXLAN
*>i	[00.00.00.44.44.	55.55.00.00.001	. [1060] . [40 (000.2222	.1060	1.[22	10 1	DAN 20 1	01.[1060]
[∠]•	[00.00.00.44.44.	. JJ. JJ. UU. UU. UU 76 76 76 76	.[1000].[40,0	100	.1000].[JZ	76 7	6 76 76	U].[1000]
* \ :	[2].[0].[1060].		U 10 CC1.ICCC	100 10 20 11	.[106	⊥ ∩ 1	/0./	0.70.70	VALAN
^>1	[2]:[0]:[1060]:	:[48,0000:2222:3	· · · · · · · · · · · · · · · · · · ·	100	:[106				
		/6./6./6./6	U 22221 [100 160	100	0	1	/6./	6./6./6	VXLAN
*>1	[2]:[0]:[1060]:	:[48,0000:2222:3	3333]:[128,160		060]				
		/6./6./6./6	0	100	0	l	/6./	6.76.76	VXLAN
*>i	[3]:[1060]:[32,	76.76.76.76]							
		76.76.76.76	0	100	0	i	76.7	6.76.76	VXLAN
ע ז כו כו	5 6 9.61								
KU[4				I					
~ > L	[3]:[0]:[300]:		.u.u.u]:[500]	100	~	CAC	0 2 ·		
<u>ν</u> γτ.δι	N	00.00.00.00	U	TUU	U	646	UJ 1	00.00.6	00.00
*>:		[24]•[10 10 10 0)]•[0 0 0 0]•]	5001					
~ ⊥	[5].[0].[500].]	66 66 66 66 66	۰ [۵۰۰۰۰۵۰۰] . [100	0	C	66 6	6 66 66	זות דע וז
		00.00.00.00	U	TOO	U	÷	00.00	0.00.00	VALAN

*>i	[5]:[0]:[500]:	[24]:[10.10.20.0]:[0.0.0.0	0]:[500] 100	0	64603 i	66 66 66	66
VXLAN	1	00.00.00.00	0	100	0	04000 1	00.00.00	.00
RD[60).60.60.60:1] V	RF[evpn-gvrf-1]:						
*>	[1]:[00:00:00:	44:44:55:55:00:0	0:00]:[42	94967295]:[0] 100		32768 i		
VXLAN	1	00.00.00.00	0	100		52700 1		
*>	[4]:[00:00:00:	44:44:55:55:00:0 60.60.60.60	0:00]:[32	,60.60.60.60] 100		32768 i		
VXLAN	1							
* i	[4]:[00:00:00:	44:44:55:55:00:0 76.76.76.76	0:00]:[32]	,76.76.76.76] 100	0	i 76.7	76.76.76	VXLAN
RD[66	5.66.66.66:1050]						
*>i	[5]:[0]:[500]:	[0]:[0.0.0]:[0	.0.0.0]:[5	500]				
VXLAN	1	66.66.66.66	0	100	0	64603 i	66.66.66	.66
*>i	[5]:[0]:[500]:	[24]:[10.10.18.0]:[0.0.0.0)]:[500]				
		66.66.66.66	0	100	0	? 66.6	56.66.66	VXLAN
*>i	[5]:[0]:[500]:	[24]:[10.10.20.0]:[0.0.0.0	D]:[500]				
VXLAN	1	66.66.66.66	0	100	0	64603 i	66.66.66	.66
RD[66	5.66.66.66:1060	1						
*>i	[5]:[0]:[500]:	[0]:[0.0.0.0]:[0	.0.0.0]:[5001				
		66.66.66.66	0	100	0	64603 i	66.66.66	.66
VXLAN	1							
*>i	[5]:[0]:[500]:	[24]:[10.10.18.0]:[0.0.0.0	D]:[500]				
		66.66.66.66	0	100	0	? 66.0	66.66.66	VXLAN
*>i	[5]:[0]:[500]:	[24]:[10.10.20.0]:[0.0.0.0	D]:[500]				
VXLAN	1	66.66.66.66	0	100	0	646U3 1	66.66.66	.66
RD[76	5.76.76.76:1]							
*>i	[1]:[00:00:00:	44:44:55:55:00:0	0:00]:[42	94967295] : [0]				
		76.76.76.76	0	100	0	i 76.7	76.76.76	VXLAN
*>i	[4]:[00:00:00:	44:44:55:55:00:0	0:00]:[32	,76.76.76.76]				
		76.76.76.76	0	100	0	i 76.7	76.76.76	VXLAN
RD[76	5.76.76.76 : 1040]						
*>i	[5]:[0]:[10402]:[24]:[10.240.3	8.0]:[0.0	.0.0]:[10402]				
		76.76.76.76	0	100	0	? 76.7	76.76.76	VXLAN
Total	number of pre	fixes 35						
VIEP2 VTEP2	.# 22#show bgp 12	vpn evpn prefix-	route					
RD[4.	5.6.8:61							
ESI	-	Eth-Tag Prefix	-Length	IP-Address				GW-
IPAdo	lress	-	L3VNID	Nexthop		Encap	Router-N	Mac

0 500	500 0 66.66.66.66	0.0.0.0 VXLAN 3c2c:991	c:dc7a	0.0.0.0		
0	500 24	10 10 18 0		0 0 0 0		
500	66.66.66.66	VXLAN 3c2c:991	.c:dc7a	0.0.0.0		
0	500 24	10.10.20.0		0.0.0.0		
500	66.66.66.66	VXLAN 3c2c:991	c:dc7a			
RD[66.66	.66.66:1050]					
ESI	Eth	-Tag Prefix-Length	IP-Address			GW-
IPAddres	S	L3VNID	Nexthop	Encap	Router-Mac	
0	500 0	0.0.0.0		0.0.0.0		
500	66.66.66.66	VXLAN 3c2c:991	.c:dc7a			
0	500 24	10.10.18.0		0.0.0.0		
500	66.66.66.66	VXLAN 3c2c:991	.c:dc7a			
0	500 24	10.10.20.0	. –	0.0.0.0		
500	66.66.66.66	VXLAN 3c2c:991	.c:dc7a			
RD[66.66	.66.66:1060]					
ESI	Eth	-Tag Prefix-Length	IP-Address			GW-
IPAddres	S	L3VNID	Nexthop	Encap	Router-Mac	
0 500	500 0 66.66.66.66	0.0.0.0 VXLAN 3c2c:991	.c:dc7a	0.0.0.0		
0	500 24	10.10.18.0		0.0.0.0		
500	66.66.66.66	VXLAN 3c2c:991	.c:dc7a			
0	500 24	10.10.20.0		0.0.0.0		
500	66.66.66.66	VXLAN 3c2c:991	.c:dc7a			
RD[76.76	.76.76:1040]					
ESI	Eth	-Tag Prefix-Length	IP-Address	_		GW-
IPAddres	S	L3VNID	Nexthop	Encap	Router-Mac	
0	10402 24	10.240.38.0	1 1 - 7 -	0.0.0.0		
10402 VTEP2#	/6./6./6./6	VXLAN 3CZC:99C	le:le/a			
"						
VTEP1						
VTEP1#sh VXLAN In	ow nvo vxlan formation					
Codes	========= : NW - Network P	ort				
	AC - Access Po	rt				
	(u) - Untagged					
VNID Src-Addr	VNI-Name VNI Dst-Add	-Type Type Interface r	ESI		VLAN DF-Sta	ltus
1050		AC ce50	Single Hom	ed Port	1050	
 10502	L3	NW				
51.51.51	.51 66.66.6	6.66				

Total number of entries are 2

```
VTEP1#show nvo vxlan tunnel
VXLAN Network tunnel Entries
                Destination
Source
                                                  Up/Down
                                 Status
                                                                Update
_____
                66.66.66.66
                                                                00:28:13
51.51.51.51
                                                  00:28:13
                                 Installed
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"
С
            10.10.10.0/31 is directly connected, xe40, 00:59:46
0
            10.10.12.0/31 [110/2] via 10.10.10.0, xe40, 00:59:01
0
            10.10.14.0/31 [110/2] via 10.10.10.0, xe40, 00:29:45
            10.10.24.0/31 [110/2] via 10.10.10.0, xe40, 00:59:01
Ο
            51.51.51.51/32 is directly connected, lo, 00:59:47
С
0
            60.60.60/32 [110/3] via 10.10.10.0, xe40, 00:59:01
Ο
            66.66.66.66/32 [110/3] via 10.10.10.0, xe40, 00:29:00
0
            76.76.76.76/32 [110/3] via 10.10.10.0, xe40, 00:59:01
            127.0.0.0/8 is directly connected, lo, 00:59:49
С
IP Route Table for VRF "management"
С
            10.12.20.0/24 is directly connected, eth0, 00:59:22
С
            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
R*
            0.0.0.0/0 [200/0] via 66.66.66 (recursive is directly connected,
tunvxlan2), 00:27:47
В
            10.10.18.0/24 [200/0] via 66.66.66 (recursive is directly connected,
tunvxlan2), 00:28:55
            10.10.20.0/24 [200/0] via 66.66.66 (recursive is directly connected,
В
tunvxlan2), 00:10:17
            10.12.32.0/24 is directly connected, irb1050, 00:59:47
С
R
            66.66.66.66/32 [0/0] is directly connected, tunvxlan2, 00:28:55
С
            127.0.0.0/8 is directly connected, lo.FAX, 00:59:48
VTEP1#
                     show bgp 12vpn 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
                               MsqRcv
                                         MsqSen TblVer
                                                        InQ
                                                              OutQ
                                                                     Up/Down
                                                                               State/
PfxRcd
          AD MACIP MCAST
                              ESI PREFIX-ROUTE
```

```
8 0 0 00:29:07
66.66.66.66
                     4 500 138
                                       132
              2
12
      0
                    1
                          0
Total number of neighbors 1
Total number of Established sessions 1
VTEP1#
                    show bqp 12vpn 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,
             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
                            Metric LocPrf
   Network
                Next Hop
                                                    Weight Path Peer
Encap
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 i 66.66.66.66
                                              100
                                      0
                                                                             VXLAN
*>i [3]:[1067]:[32,66.66.66.66]
                                     0 100 0 i 66.66.66.66
                    66.66.66.66
                                                                             VXT.AN
RD[2.3.4.5:1] VRF[RED]:
*> [2]:[0]:[1050]:[48,0000:0e8d:561a]:[0]:[1050]
                                                100
                     51.51.51.51
                                        0
                                                         32768 i
VXLAN
*> [2]:[0]:[1050]:[48,0000:0e8d:561a]:[32,10.12.32.11]:[1050]
                     51.51.51.51
                                                100
                                                          32768 i -----
                                        0
WXT.AN
*>
   [2]:[0]:[1050]:[48,0000:3333:1050]:[32,10.12.32.10]:[1050]
                     51.51.51.51
                                                          32768 i
                                        0
                                               100
VXTAN
   [2]:[0]:[1050]:[48,3c2c:99d6:167a]:[32,10.12.32.1]:[1050]
*>
                     51.51.51.51
                                                         32768 i
                                       0
                                                100
                                                                  _____
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

νντ. λι	,	51.51.51.51	0	100	3	2768 i		-
VALAI * ;	× [3]•[1067]•[32	66 66 66 661						
T	[3].[1007].[32,	66.66.66.66	0	100	0	i 66.60	5.66.66	VXLAN
RD[4.	.5.6.8:6]							
*>i	[5]:[0]:[500]:[0]:[0.0.0]:[0.0.0]	D]:[500]					
	-	66.66.66.66	0	100	0	64603 i	66.66.66.6	56
VXLAI		0.4.3 51.0 1.0 1.0 0.3 50 1		0.0.1				
*>1	[5]:[0]:[500]:[24]:[10.10.18.0]:[0.0	0.0.0]:[5	100	0			5752T 3 NT
* < :	[5],[0],[500],[0 0 0 1 • 1 5	100	0	: 00.00	5.00.00	VALAN
	[5].[0].[500].[66 66 66 66	0.0.0].[J	100	0	61603 i	66 66 66 6	56
VXLAI	7	00.00.00.00	0	100	0	04005 1	00.00.00.00.0	50
סחוגמ	5 66 66 66•10501							
KD[00 *\;		01.00000.00000000	01.5001					
	[5].[0].[500].[66 66 66 66	0	100	0	61603 i	66 66 66 6	56
VXLAN	V	00.00.00.00	0	100	0	0400J I	00.00.00.00.0	50
*>i	[5]:[0]:[500]:[24]:[10.10.18.0]:[0.0	0.0.0]:[5	00]				
		66.66.66.66	0	100	0	? 66.60	5.66.66	VXLAN
*>i	[5]:[0]:[500]:[24]:[10.10.20.0]:[0.0	0.0.0]:[5	00]				
		66.66.66.66	0	100	0	64603 i	66.66.66.6	56
VXLAI	V							
RD[60	b.66.66.66:1060]							
^>1	[5]:[0]:[500]:[J]:[500]	100	0	C1C02 -		~ ~
VXLAN	V	00.00.00.00	0	100	0	64603 I	00.00.00.0	00
*>i	[5]:[0]:[500]:[24]:[10.10.18.0]:[0.0	0.0.0]:[5	001				
		66.66.66.66	0	100	0	? 66.60	5.66.66	VXLAN
*>i	[5]:[0]:[500]:[24]:[10.10.20.0]:[0.0	0.0.0]:[5	00]				
		66.66.66.66	0	100	0	64603 i	66.66.66.6	56
VXLAN	7							
		1						
Total	L number of pref	lxes 21						
V'I'EPI	L #							
VTEP1	l#show ip route	Vrf FAX						
Codes	s: K - kernel. C	- connected. S - sta	atic. R -	RIP. B -	BGP			
00000	O - OSPF, IA	- OSPF inter area		, _	201			
	N1 - OSPF NSS	A external type 1, N2	2 – OSPF	NSSA exter	nal	type 2		
	E1 - OSPF ext	ernal type 1, $E2 - 03$	SPF exter	nal type 2	2	11		
	i - IS-IS, L1	- IS-IS level-1, L2	- IS-IS	level-2,				
	ia - IS-IS in	ter area, E - EVPN,						
	v - vrf leake	d						
	* – candidate	default						
IP Ro	oute Table for V	RF "FAX"						
Gatev	way of last reso	rt is 66.66.66.66 to	network	0.0.0.0				

VXLAN-IRB-Inter-VRF Route Leaking

B* tunvxlan2),	0.0.0.0/0 [200/0] via 66.66.66 (recursive is directly connected, 00:29:26
B tunvxlan2),	10.10.18.0/24 [200/0] via 66.66.66 (recursive is directly connected, 00:30:34
B tunvxlan2),	10.10.20.0/24 [200/0] via 66.66.66 (recursive is directly connected, 00:11:56
С	10.12.32.0/24 is directly connected, irb1050, 01:01:26
В	66.66.66.66/32 [0/0] is directly connected, tunvxlan2, 00:30:34
С	127.0.0.0/8 is directly connected, lo.FAX, 01:01:27

VTEP1#show bgp l2vpn evpn prefix-route

500 24

66.66.66.66

RD[4.5.6.8	B:6]							
ESI IPAddress		Eth-Ta	ag Prefix-	Length L3VNID	IP-Address Nexthop	Encap	Router-Mac	GW-
0 500	500 66.66.66.	0 66	0.0. VXLAN	0.0 3c2c:991c	:dc7a	0.0.0.0		
0 500	500 66.66.66.	24 66	10.1 VXLAN	0.18.0 3c2c:991c	:dc7a	0.0.0.0		
0 500	500 66.66.66.	24 66	10.1 VXLAN	0.20.0 3c2c:991c	:dc7a	0.0.0.0		
RD[66.66.6	66.66:1050]						
ESI IPAddress		Eth-Ta	ag Prefix-	Length L3VNID	IP-Address Nexthop	Encap	Router-Mac	GW-
0 500	500 66.66.66.	0 66	0.0. VXLAN	0.0 3c2c:991c	:dc7a	0.0.0.0		
0 500	500 66.66.66.	24 66	10.1 VXLAN	0.18.0 3c2c:991c	:dc7a	0.0.0.0		

RD[66.66.66.66:1060]

0

500

ESI IPAddress	Et	h-Tag Prefix-Length L3VNID	IP-Address Nexthop	Encap	Router-Mac	GW-
0 500	500 0 66.66.66.66	0.0.0.0 VXLAN 3c2c:991	c:dc7a	0.0.0.0		
0 500	500 24 66.66.66.66	10.10.18.0 VXLAN 3c2c:991	c:dc7a	0.0.0.0		
0 500	500 24 66.66.66.66	10.10.20.0 VXLAN 3c2c:991	c:dc7a	0.0.0.0		

0.0.0.0

Ping to 10.10.20.1 network which is advertised by Firewall from VTEP1 FAX vrf

10.10.20.0

VXLAN 3c2c:991c:dc7a

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

rtt min/avg/max/mdev = 0.373/0.410/0.446/0.037 ms VTEP1#

CHAPTER 5 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 5-3.



Figure 5-3: DHCP Relay over IRB

#configure terminal	Enter Configure mode.
OcNOS(config)#interface lo	Enter Interface mode for loopback.
OcNOS(config-if)#ip address 1.1.1.1/32 secondary	Assign secondary IP address.
OcNOS (config-if) #exit	Exit Interface mode and return to Configure mode.
OcNOS(config)#nvo vxlan enable	Enable VXLAN
OcNOS(config)#nvo vxlan irb	Enable VXLAN IRB
OcNOS(config)#ip vrf vrf1	Create routing/forwarding instance with VRF1 name and enter into VRF mode
OcNOS(config-vrf)#rd 200:1	Assign RD value
OcNOS(config-vrf)#route-target both 200:1	Assign route target value
OcNOS(config-vrf)#ip dhcp relay address 40.40.40.1	The relay address configured should be server interface address connected to DUT machine
OcNOS(config-vrf)#ip dhcp relay uplink evpn	Configure the uplink interface as L3 VNI interface for specific VRF
OcNOS(config-vrf)#13vni 45001	Configure L3VNI as 45001 for VRF1
OcNOS (config-vrf) #exit	Exit IP VRF mode

OcNOS(config)#mac vrf vrfred	Create MAC VRF instance with vrfred name and enter into VRF mode
OcNOS(config-vrf)#rd 1.1.1.1:1	Assign RD value
OcNOS(config-vrf)#route-target both 1.1.1.1:1	Assign route target value
OcNOS (config-vrf) #exit	Exit MAC VRF mode
OcNOS(config)#interface irb 1	Configure IRB interface
OcNOS(config-irb-if)#ip vrf forwarding vrf1	Configure IP VRF forwarding
OcNOS(config-irb-if)#ip address 11.1.1.1/24	Assign IP address on IRB interface.
OcNOS(config-irb-if)#ip dhcp relay	Relay should be configured on the interface connecting to the relay
OcNOS(config-irb-if)#exit	Exit IRB interface mode
OcNOS(config)#interface irb 2	Configure irb interface
OcNOS(config-irb-if)#ip vrf forwarding vrf1	Configure IP VRF forwarding
OcNOS(config-irb-if)#ip address 70.70.1/24	Assign IP address on IRB interface.
OcNOS (config-irb-if) #exit	Exit IRB interface mode
OcNOS(config)#interface ce49	Enter Interface mode for ce49.
OcNOS(config-if)#ip address 10.1.1.2/24	Assign IP address on ce49 interface.
OcNOS (config-if) #exit	Exit Interface mode and return to Configure mode.
OcNOS(config)#interface xe5	Enter Interface mode for xe5.
OcNOS(config-if)#switchport	Configure interface as L2 interface
OcNOS(config-if)#exit	Exit Interface mode and return to Configure mode.
OcNOS(config) #router ospf	Enter the Router OSPF mode
OcNOS(config-router)#network1.1.1.1/32 area 0.0.0.0	Advertise loopback address in OSPF
OcNOS(config-router)#network 10.1.1.0/24 area 0.0.0.0	Advertise network address in OSPF
OcNOS (config-router) #exit	Exit from Router OSPF mode and enter into config mode
OcNOS(config)#router bgp 1	Enter into BGP router mode
OcNOS(config-router)#neighbor 2.2.2.2 remote-as 1	Specify a VTEP2 loopback IP address and remote-as defined
OcNOS(config-router)#neighbor 2.2.2.2 update-source 1.1.1.1	Configure update as loopback for VTEP2
OcNOS(config-router)#address-family l2vpn evpn	Enter into L2VPN EVPN address family mode
OcNOS(config-router-af)#neighbor 2.2.2.2 activate	Activate neighbor in L2VPN mode
OcNOS(config-router-af)#exit-address-family	Exit from Address family mode
OcNOS (config-router) #address-family ipv4 vrf vrf1	Enter into address-family mode for VRF1
OcNOS(config-router-af)#redistribute connected	Configure Redistribute connected
OcNOS(config-router-af)#exit-address-family	Exit from Address family mode
OcNOS (config-router) #exit	Exit from router BGP mode and enter into config mode

OcNOS(config)#nvo vxlan vtep-ip-global 1.1.1.1	Configure Source VTEP-IP-global configuration. Use loopback IP address
OcNOS(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
OcNOS(config-nvo)#vxlan host-reachability- protocol evpn-bgp vrfred	Assign VRF for EVPN-BGP to carry EVPN route
OcNOS(config-nvo)#evpn irb1	Configure IRB1 under VXLAN ID 10
OcNOS (config-nvo) #exit	Exit from VXLAN tenant mode and enter into configuration mode.
OcNOS(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
OcNOS(config-nvo)#vxlan host-reachability- protocol evpn-bgp vrfred	Assign VRF for EVPN-BGP to carry EVPN route
OcNOS(config-nvo)#evpn irb2	Configure IRB2 under VXLAN ID 30
OcNOS(config-nvo)#exit	Exit from VXLAN tenant mode and enter into configuration mode.
OcNOS(config)#nvo vxlan access-if port-vlan xe5 2	Enable port-VLAN mapping i.e. access port to outer-VLAN (SVLAN) - Multihomed access port
OcNOS(config-nvo-acc-if)#map vnid 10	Map VXLAN Identified to access-port for VXLAN
OcNOS(config-nvo-acc-if)#exit	Exit from VXLAN access-interface mode and enter into configuration mode
OcNOS (config) #commit	Commit the candidate configuration to the running configuration
OcNOS(config)#exit	Exit from configuration mode

OcNOS#configure terminal	Enter Configure mode.
OcNOS(config)#interface ce0	Enter Interface mode for ce0.
OcNOS(config-if)#ip address 10.1.1.1/24	Assign IP address on ce0 interface.
OcNOS (config-if) #exit	Exit Interface mode and return to Configure mode.
OcNOS(config)#interface xel3	Enter Interface mode for xe13.
OcNOS(config-if)#ip address 30.1.1.1/24	Assign IP address on xe13 interface.
OcNOS (config-if) #exit	Exit Interface mode and return to Configure mode.
OcNOS(config)#router ospf	Enter the Router OSPF mode
OcNOS(config-router)#network 10.1.1.0/24 area 0.0.0.0	Advertise network address in OSPF
OcNOS(config-router)#network 30.1.1.10/24 area 0.0.0.0	Advertise network address in OSPF
OcNOS (config-router) #exit	Exit from Router OSPF mode and enter into config mode
OcNOS (config) #commit	commit the candidate configuration to the running configuration
OcNOS (config) #exit	Exit from configuration mode

OcNOS#configure terminal	Enter Configure mode.
OcNOS(config)#interface lo	Enter Interface mode for loopback.
OcNOS(config-if)#ip address 2.2.2.2/32 secondary	Assign secondary IP address.
OcNOS (config-if) #exit	Exit Interface mode and return to Configure mode.
OcNOS(config)#nvo vxlan enable	Enable VXLAN
OcNOS(config)#nvo vxlan irb	Enable VXLAN IRB
OcNOS(config)#ip vrf vrf1	Create routing/forwarding instance with VRF1 name and enter into VRF mode
OcNOS(config-vrf)#rd 300:1	Assign RD value
OcNOS(config-vrf)#route-target both 200:1	Assign route target value
OcNOS(config-vrf)#ip dhcp relay uplink evpn	Configure the uplink interface as L3 VNI interface for specific VRF
OcNOS(config-vrf)#13vni 45001	Configure L3VNI as 45001 for VRF1
OcNOS(config-vrf)#exit	Exit IP VRF mode
OcNOS(config)#mac vrf vrfred	Create MAC VRF instance with vrfred name and enter into VRF mode
OcNOS(config-vrf)#rd 2.2.2.1:1	Assign RD value
OcNOS(config-vrf)#route-target both 1.1.1.1:1	Assign route target value
OcNOS (config-vrf) #exit	Exit MAC VRF mode
OcNOS(config)#interface irb 2	Configure IRB interface
OcNOS(config-irb-if)#ip vrf forwarding vrf1	Configure IP VRF forwarding
OcNOS(config-irb-if)#ip address 40.40.40.2/ 24	Assign IP address on IRB interface.
OcNOS(config-irb-if)#exit	Exit IRB interface mode
OcNOS(config)#interface xel3	Enter Interface mode for xe13.
OcNOS(config-if)#ip address 30.1.1.2/24	Assign IP address on xe13 interface.
OcNOS (config-if) #exit	Exit Interface mode and return to Configure mode.
OcNOS(config)#interface xe19	Enter Interface mode for xe19.
OcNOS(config-if)#switchport	Configure interface as L2 interface
OcNOS (config-if) #exit	Exit Interface mode and return to Configure mode.
OcNOS(config)#router ospf	Enter the Router OSPF mode
OcNOS(config-router)#network 2.2.2.2/32 area 0.0.0	Advertise loopback address in OSPF
OcNOS(config-router)#network 30.1.1.0/24 area 0.0.0.0	Advertise network address in OSPF
OcNOS(config-router)#network 40.1.1.0/24 area 0.0.0.0	Advertise network address in OSPF
OcNOS (config-router) #exit	Exit from Router OSPF mode and enter into config mode
OcNOS (config) #router bgp 1	Enter into BGP router mode
OcNOS (config-router) #neighbor 1.1.1.1 remote-as 1	Specify a VTEP1 loopback IP address and remote-as defined

OcNOS(config-router)#neighbor 1.1.1.1 update-source 2.2.2.2	Configure update as loopback for VTEP1
OcNOS(config-router)#address-family 12vpn evpn	Enter into L2VPN EVPN address family mode
OcNOS(config-router-af)#neighbor 1.1.1.1 activate	Activate neighbor in L2VPN mode
OcNOS(config-router-af)#exit-address-family	Exit from Address family mode
OcNOS(config-router)#address-family ipv4 vrf vrf1	Enter into address-family mode for VRF1
OcNOS(config-router-af)#redistribute connected	Configure Redistribute connected
OcNOS(config-router-af)#exit-address-family	Exit from Address family mode
OcNOS (config-router) #exit	Exit from router BGP mode and enter into config mode
OcNOS(config)#nvo vxlan vtep-ip-global 2.2.2.2	Configure Source VTEP-IP-global configuration. Use loopback IP address
OcNOS(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
OcNOS(config-nvo)#vxlan host-reachability- protocol evpn-bgp vrfred	Assign VRF for EVPN-BGP to carry EVPN route
OcNOS(config-nvo)#exit	Exit from VXLAN tenant mode and enter into configuration mode.
OcNOS(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
OcNOS(config-nvo)#vxlan host-reachability- protocol evpn-bgp vrfred	Assign VRF for EVPN-BGP to carry EVPN route
OcNOS(config-nvo)#evpn irb2	Configure IRB2 under VXLAN ID 20
OcNOS (config-nvo) #exit	Exit from VXLAN tenant mode and enter into configuration mode.
OcNOS(config)#nvo vxlan access-if port xe19	Enable port mapping i.e. access port
OcNOS(config-nvo-acc-if)#map vnid 20	Map VXLAN Identified to access-port for VXLAN
OcNOS (config-nvo-acc-if) #exit	Exit from VXLAN access-interface mode and enter into configuration mode
OcNOS (config) #commit	Commit the candidate configuration to the running configuration
OcNOS (config) #exit	Exit from configuration mode

Validation

```
VTEP1#
!
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 irbl
 !
 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
1
nvo vxlan access-if port-vlan xe5 2
map vnid 10
!
VTEP1#show ip dhcp relay
DHCP relay service is Enabled.
VRF Name: vrf1
 Option 82: Disabled
 DHCP Servers configured: 40.40.40.1
                        Uplink/Downlink
 Interface
 _____
                        _____
                        Downlink
 irb1
                        uplink
 evpn
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
                                                              Туре
                                                                        Status
AccessPortDesc
      xe5
           2
                ____
                         ____
                                0000.2837.ddf5 1.1.1.1
                                                              Dynamic Local -----
10
  ____
                         b86a.97f9.85be 1.1.1.1
                                                     Static Local
      irb1
                                                                 _____ ____
10
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
_____
                                              Age-Out
VNID
        Ip-Addr
                                     Туре
                                                        Retries-Left
                      Mac-Addr
30
                   b86a.97f9.85be Static Local ----
       70.70.70.1
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
```

```
_____
               2.2.2.2
1.1.1.1
                                              01:51:11
                              Installed
                                                            01:51:11
Total number of entries are 1
ROUTER-2
VTEP2#show running-config nvo vxlan
1
nvo vxlan enable
1
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
                                                          ____
        11.1.1.30
                       0000.2837.ddf6 Dynamic
10
                                                Remote
                                                          ____
Total number of entries are 5
VTEP2#show running-config dhcp
interface eth0
ip address dhcp
!
I.
ip vrf vrf1
ip dhcp relay uplink evpn
```

CHAPTER 6 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 6-4



Figure 6-4: 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).

Generic configuration:

#configure terminal	Enter Configure mode.
(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 pol	Enter Interface mode for po1 (MH2)
(config-if)#switchport	Make it L2 interface
<pre>(config-if)# evpn multi-homed system-mac 0000.0000.2222</pre>	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
<pre>(config-router)#neighbor 2.2.2.2 update- source lo</pre>	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 I2vpn EVPN address family mode
<pre>(config-router-af)#neighbor 2.2.2.2 activate</pre>	Activate 2.2.2.2(VTEP2) into I2vpn evpn address family mode
(config-router-af) #neighbor 4.4.4.4 activate	Activate 3.3.3.3(VTEP4) into I2vpn evpn address family mode
(config-router-af)#neighbor 5.5.5.5 activate	Activate 5.5.5.5(VTEP5) into I2vpn evpn address family mode
(config-router-af)#exit-address-family	Exit from I2vpn 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
<pre>(config-vrf)#route-target both 9.9.9.9:100</pre>	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 pol 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 pol 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) #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 pol	Enter Interface mode for po1 (MH2)
(config-if) #switchport	Make it L2 interface
<pre>(config-if)# evpn multi-homed system-mac 0000.0000.2222</pre>	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
<pre>(config-if)#ip address 2.2.2/32 secondary</pre>	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
(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 I2vpn EVPN address family mode

<pre>(config-router-af)#neighbor 1.1.1.1 activate</pre>	Activate 1.1.1.1(VTEP1) into I2vpn evpn address family mode
(config-router-af) #neighbor 4.4.4.4 activate	Activate 4.4.4.4(VTEP4) into I2vpn evpn address family mode
(config-router-af)#neighbor 5.5.5.5 activate	Activate 5.5.5.5(VTEP5) into I2vpn evpn address family mode
(config-router-af)#exit-address-family	Exit from I2vpn address family mode
(config-router) #exit	Exit from Router BGP mode and enter into config mode
<pre>(config-router-af)#neighbor 5.5.5.5 activate (config-router-af)#exit-address-family (config-router)#exit</pre>	Activate 5.5.5(VTEP5) into I2vpn evpn address family mode Exit from I2vpn address family mode 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 2.2.2:11	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 2.2.2:21	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 pol 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 pol 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) #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 12vpn evpn	Enter into I2vpn EVPN address family mode
(config-router-af) #neighbor 1.1.1.1 activate	Activate 1.1.1.1(VTEP1) into I2vpn evpn address family mode
(config-router-af) #neighbor 2.2.2.2 activate	Activate 2.2.2.2(VTEP2) into I2vpn evpn address family mode
(config-router-af)#neighbor 5.5.5.5 activate	Activate 5.5.5.5(VTEP5) into I2vpn evpn address family mode
(config-router-af)#exit-address-family	Exit from I2vpn 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 4.4.4:11	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 4.4.4:21	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.
<pre>(config) # nvo vxlan access-if port-vlan xe3 20</pre>	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) #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 xel	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
<pre>(config-if)#ip address 5.5.5.5/32 secondary</pre>	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 I2vpn EVPN address family mode
<pre>(config-router-af)#neighbor 1.1.1.1 activate</pre>	Activate 1.1.1.1(VTEP1) into I2vpn evpn address family mode
<pre>(config-router-af)#neighbor 2.2.2.2 activate</pre>	Activate 2.2.2.2(VTEP2) into I2vpn evpn address family mode
(config-router-af) #neighbor 4.4.4.4 activate	Activate 4.4.4.4(VTEP4) into I2vpn evpn address family mode
(config-router-af) #exit-address-family	Exit from I2vpn 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
(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.
<pre>(config) # nvo vxlan access-if port-vlan xe1 10</pre>	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.
<pre>(config) # bridge 1 protocol rstp vlan-bridge</pre>	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
<pre>(config-if)# bridge-group 1 spanning-tree disable</pre>	Configure interface as stp disable
(config-if)# switchport mode trunk	Mode as trunk
<pre>(config-if)# switchport trunk allowed vlan add 10,20</pre>	Trunk allowed vlan as 10.20
(config-if) #exit	Exit Interface mode and return to Configure mode.
(config)#interface pol	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
<pre>(config-if)# bridge-group 1 spanning-tree disable</pre>	Configure po1 as stp disable
(config-if)# switchport mode trunk	Mode as trunk
<pre>(config-if)# switchport trunk allowed vlan add 10,20</pre>	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
<pre>(config-if)#ip address 100.100.100.100/32 secondary</pre>	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	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.

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.

VTEP1

(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
<pre>(config)#nvo vxlan tunnel qos-map-mode cos- dscp egress QUEUE_DSCP</pre>	Map the configured QoS profile to vxlan tunnel egress
(config)#nvo vxlan access-if port-vlan pol 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

(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 pol 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

(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)# 13vni 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)#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) #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
(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
<pre>(config)#nvo vxlan tunnel qos-map-mode cos- dscp ingress DSCP_QUEUE</pre>	Map the configured QoS profile to vxlan tunnel ingress
(config)#nvo vxlan access-if port-vlan xel 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 reaceived at TS1-11 with dscp value 32 and COS value 5(vlan10) at the VTEP5 access-if.

```
VTEP1#show running-config qos
qos enable
!
gos profile cos-to-queue COS_QUEUE
cos 1 queue 5
!
gos profile queue-color-to-dscp QUEUE_DSCP
queue 5 color all dscp 34
!
!
VTEP1#show running-config nvo vxlan
!
nvo vxlan enable
!
```

evpn vxla	an multih	noming	enable									
! nvo vxlar '	n vtep-ip	p-globa	al 1.1.1.	.1								
nvo vxlar 1	n tunnel	qos-ma	ap-mode d	cos-ds	cp egres	s QUE	EUE_I	DSCP				
<pre>! nvo vxlar vxlan ho vni-name ! nvo vxlar vxlan ho vni-name ! nvo vxlar map vnic mac 0000 ! nvo vxlar map vnic mac 0000 map qos- ! ! VTEP1#sho vxLAN Net Source</pre>	h id 101 pst-reach vNI-101 h id 201 pst-reach vNI-201 h access- i 101).2222.1(h access- i 201).2222.1(profile pw nvo vy twork tur	ingres habilit ingres habilit -if por 010 ip -if por 020 ip cos-to clan tu nel tr	as-replic cy-protoc cy-protoc ct-vlan p 11.11.11 ct-vlan p 21.21.22 o-queue (unnel tries	catior col ev col ev col 10 1.51 cos_qu	n inner-v ppn-bgp L n inner-v ppn-bgp L)) JEUE	id-di 2VRF1 id-di 2VRF2	isab: l isab: 2	led	Ind			
Source =======		Destir	nation ========	St =====	atus =========		נט =====	p/Down =======	Upd =======	ate ======		
1.1.1.1		5.5.5.	. 5	Ir	stalled		0	1:15:13	01:	15:13		
1.1.1.1		4.4.4.	. 4	Ir	stalled		0	1:15:28	01:	15:28		
1.1.1.1		2.2.2.	.2	Ir	istalled		0	1:11:40	01:	11:40		
L Lglcosy 1 Lglcosy 2 Lglcosy 2 <t< th=""><th>+ +</th><th> 0 0 0 0 0 0 133 0 0</th><th>Tx byte</th><th>+ +</th><th>Dropped pkts 0 0 0 0 0 0 0 0 0 0</th><th>+</th><th>·+ ·+</th></t<>						+ +	 0 0 0 0 0 0 133 0 0	Tx byte	+ +	Dropped pkts 0 0 0 0 0 0 0 0 0 0	+	·+ ·+
Detailed	mapping	:										
INI	2UT	(DUTPUT	 	IN	PUT		+ IUO	PUT	-		
cos	DEI	Queue	e Colo	or 	COS	DE	EI	' Queue ++	Color	_		
0	0	0	green	י ו ר	0	1		0	yellow			
1	0	5	greer	1 - ·	1	1		5	yellow			
2	0	2	green	1	2	⊥ 1		2	yellow			
3	0	3	greer	י ו ר ר	3	⊥ 1		з 4	Vellow			
5	0	5	greer	י ו ר ר	-	⊥ 1		5	Vellow			
6	0	6	areer	י י ר ר	6	1		6	vellow			
7	0	7	green	י 1	7	1		7	yellow			
VTEP1#sho profile r profile t profile a	ow qos-pi name: QUE cype: que attached	rofile EUE_DSC eue-col to 1 i	QUEUE_DS CP Lor-to-ds instances	SCP scp								

Detailed mapping:

		+	1			+	1			+		
II	NPUT	OUTPUT		INPUT		INPUT		OUTPUT		I INPUT		OUTPUT
Queue	Color	DSCP		Queue	Color	DSCP		Queue	Color	DSCP		
0	green	0	1	0	yellow	0		0	red	0		
1	green	10	I	1	yellow	12	Ι	1	red	14		
2	green	18	I	2	yellow	20		2	red	22		
3	green	26		3	yellow	28		3	red	30		
4	green	34		4	yellow	36		4	red	38		
5	green	34		5	yellow	34		5	red	34		
6	green	48		6	yellow	48		6	red	48		
7	green	56		7	yellow	56		7	red	56		

```
VTEP4#show running-config qos
qos enable
qos profile dscp-to-queue DSCP_QUEUE
 dscp 20 queue 1
I.
interface irb2001
 qos map-profile dscp-to-queue DSCP QUEUE
T.
VTEP4#show running-config nvo vxlan
!
nvo vxlan enable
!
nvo vxlan irb
evpn vxlan multihoming enable
1
nvo vxlan vtep-ip-global 4.4.4.4
1
nvo vxlan id 101 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp L2VRF1
 evpn irb1001
 vni-name VNI-101
1
nvo vxlan id 201 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp L2VRF2
 evpn irb2001
 vni-name VNI-201
1
nvo vxlan access-if port-vlan xe3 20
map vnid 201
mac 0000.5555.1020 ip 21.21.21.101
!
1
VTEP4#show nvo vxlan tunnel
VXLAN Network tunnel Entries
                                 Status Up/Down Update
Source
                Destination
_____

        2.2.2.2
        Installed
        00:08:40
        00:08:40

        1.1.1.1
        Installed
        00:12:28
        00:12:28

        5.5.5.5
        Installed
        00:12:13
        00:12:13

4.4.4.4
4.4.4.4
4.4.4.4
Total number of entries are 3
VTEP4#show nvo vxlan
VXLAN Information
_____
   Codes: NW - Network Port
         AC - Access Port
         (u) - Untagged
VNTD
       VNI-Name
                     VNI-Type Type Interface ESI
```


 VNI-101
 L2
 NW

 VNI-101
 L2
 NW

 VNI-101
 L2
 NW

 VNI-201
 L2
 NW

 VNI-201
 L2
 NW

 VNI-201
 L2
 NW

 VNI-201
 L2
 NW
 ---- 101 ____ ___ 4.4.4.4 2.2.2.2 1.1.1.1 ____ 101 ____ 4.4.4.4 ____ _____ 101 4.4.4.4 5.5.5.5 4.4.4.4 2.2.2.2 1.1.1.1 201 -----____ 4.4.4.4 201 ____ ____ 201 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 Type Age-Out Retries-Left Mac-Addr
 21.21.21.51
 0000.2222.1020
 Static Remote

 21.21.21.1
 3c2c.991a.da7a
 Static Local
 --- 201 201 21.21.21.101 0000.5555.1020 Static Local ____ 201
 11.11.11.51
 0000.2222.1010
 Static
 Remote

 11.11.11.1
 3c2c.991a.da7a
 Static
 Local
 --- 101 101 11.11.11.201 0000.4444.1010 Static Remote ----101 Total number of entries are 6 VTEP4#show nvo vxlan nd-cache VXLAN ND-CACHE Information _____ VNTD Ip-Addr Mac-Addr Type Age-Out Retries-Left 201 2121::1 3c2c.991a.da7a Static Local ____ 101 11111::1 3c2c.991a.da7a Static Local Total number of entries are 2 VTEP4#show nvo vxlan 13vni-map L3VNT L2VNI IRB-interface _____ 1000 101 irb1001 201 1000 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" С 11.11.11.0/24 is directly connected, irb1001, 00:01:35 С 21.21.21.0/24 is directly connected, irb2001, 00:01:16 127.0.0.0/8 is directly connected, lo.L3VRF1, 00:06:12 С 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" ::1/128 via ::, lo.L3VRF1, 00:06:29 С С 1111::/64 via ::, irb1001, 00:01:52 2121::/64 via ::, irb2001, 00:01:33 С С fe80::/64 via ::, irb2001, 00:01:33 VTEP4#show interface ce49 counters queue-stats E - Egress, I - Ingress, O-Size is in bytes | Queue/Class-map | Q-Size | Tx pkts | Tx bytes | Dropped pkts | Dropped bytes 1
 (E)
 125304832
 0
 0

 (E)
 125304832
 1422755
 1488201730
 0 0 q0 0 0 q1 (E) 125304832 0 0 0 0 q2

VXLAN-EVPN with IRB QoS

q3 (E) 125304832 0 q4 (E) 125304832 0 q5 (E) 125304832 0 q6 (E) 125304832 0 q7 (E) 125304832 0 q7 (E) 125304832 0 VTEP4#show qos-profile DSCP_QUEUE profile name: DSCP_QUEUE profile type: dscp-to-queue profile type: dscp-to-queue profile attached to 1 instances configured mapping: dscp 20 queue 1 Detailed mapping:						0 0 0 0			0 0 0 0								
 	-+ 				I	-+	OUTPUT			- tnf	++י יודי	OUTPUT			TNPUT	+-	
OUTPUT	' -+					+				·-	+					+-	
DSCP Queue	Queue Color -+	Color Out DSCI	 Out DSC! P -+	P 	DSCP	Que	ue Colo:	r Out	DSCF	> 	DSCP	Queue Co	lor Out	DS	CP	DSCP	
0	0	green	0	I	16	2	green	16	I	32	4	green	32	I	48	6	
1 green	48 0 49	green	1	Ι	17	2	green	17	I	33	4	green	33	Ι	49	6	
2 green	0	green	2		18	2	green	18	I	34	4	green	34	Ι	50	6	
3 green	0 51	green	3	I	19	2	green	19	I	35	4	green	35	I	51	6	
4 green	0 52	green	4		20	1	yellow	20	I	36	4	yellow	36	Ι	52	6	
5 green	0 53	green	5	I	21	2	green	21	T	37	4	green	37	I	53	6	
6 green	0 54	green	6	I	22	2	yellow	22	Ι	38	4	yellow	38	Ι	54	6	
7 green	0 55	green	7		23	2	green	23	Ι	39	4	green	39	Ι	55	6	
8 green	1 56	green	8		24	3	green	24	I	40	5	green	40	Ι	56	7	
9 green	1 57	green	9		25	3	green	25	I	41	5	green	41	Ι	57	7	
10 green	1 58	green	10	Ι	26	3	green	26	I	42	5	green	42	Ι	58	7	
11 green	1 59	green	11	Ι	27	3	green	27	I	43	5	green	43	Ι	59	7	
12 green	1 60	yellow	12	Ι	28	3	yellow	28	Ι	44	5	green	44	Ι	60	7	
13 green	1 61	green	13	Ι	29	3	green	29	I	45	5	green	45	Ι	61	7	
14 green	1 62	yellow	14	Ι	30	3	yellow	30	Ι	46	5	green	46	I	62	7	
15 green	1 63	green	15	Ι	31	3	green	31	I	47	5	green	47	I	63	7	
VTEP4#sl profile profile mapping	now qos-p name: DS e type: d g: -+	rofile in CP_QUEUE scp-to-qu	nterface i ueue (Ingre	rb2 ess 	001) 	+					+					+-	
INPUT OUTPUT	I	OUTPUT		Ι	INPUT		OUTPUT		Ι	INE	PUT	OUTPUT		I	INPUT	1	
	-+					-+				·-	+		1			+-	
DSCP Queue	Queue Color -+	Color Out DSCI +	Out DSC P -+	P 	DSCP	Que	ue Colo: +	r Out +	DSCF	·-	DSCP	Queue Co +	lor Out	DS		DSCP	
0	+ 0	green	0	I	16	2	green	16	I	32	4	green	32	I	48	6	
green 1	48 0	green	1	I	17	2	green	17	Ι	33	4	green	33	I	49	6	
green 2	49 0	green	2	I	18	2	green	18	I	34	4	green	34	I	50	6	
green 3	50 0	green	3	I	19	2	green	19	I	35	4	green	35	I	51	6	
green 4	51 0	green	4		20	1	yellow	20	I	36	4	yellow	36	I	52	6	
green	52																
5 green	0 53	green	5	I	21	2	green	21	Ι	37	4	green	37	I	53	6	
-------------	---------	--------	----	---	----	---	--------	----	---	----	---	--------	----	---	----	---	--
6 green	0 54	green	6	I	22	2	yellow	22	Ι	38	4	yellow	38	I	54	6	
7 green	0 55	green	7	I	23	2	green	23	Ι	39	4	green	39	I	55	6	
8 green	1 56	green	8	Ι	24	3	green	24	Ι	40	5	green	40	I	56	7	
9 green	1 57	green	9	Ι	25	3	green	25	Ι	41	5	green	41	I	57	7	
10 green	1 58	green	10	I	26	3	green	26	I	42	5	green	42	I	58	7	
11 green	1 59	green	11	I	27	3	green	27	I	43	5	green	43	I	59	7	
12 green	1 60	yellow	12	I	28	3	yellow	28		44	5	green	44	I	60	7	
13 green	1 61	green	13	I	29	3	green	29	I	45	5	green	45	I	61	7	
14 green	1 62	yellow	14		30	3	yellow	30		46	5	green	46	Ι	62	7	
15 green	1 63	green	15	I	31	3	green	31		47	5	green	47	I	63	7	

```
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
nvo vxlan enable
1
evpn vxlan multihoming enable
1
nvo vxlan vtep-ip-global 5.5.5.5
1
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
1
nvo vxlan id 201 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp L2VRF2
vni-name VNI-201
1
nvo vxlan access-if port-vlan xel 10
map vnid 101
 mac 0000.4444.1010 ip 11.11.11.201
 map qos-profile queue-color-to-cos QUEUE_COS
!
1
VTEP5#show nvo vxlan tunnel
VXLAN Network tunnel Entries
                                             Up/Down
              Destination Status
                                                           Update
Source
_____

        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

                                             01:14:50
5.5.5.5
              1.1.1.1
                              Installed
                                                           01:14:50
Total number of entries are 3
VTEP5#show interface xel 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 O
                                             0
                                                               0
                                                                                0
```

q1 q2 q3 q4 q5 q6 q7 VTEP5#sh profile profile profile configur queue 2 Detailed	n qos-pro name: QU type: qu attached ced mapping color a i mapping	(E) 125 (E) 125 (E) 125 (E) 125 (E) 125 (E) 125 file QUEU EUE_COS eue-color . to 1 ins ng: 11 cos 5 :	517376 0 517376 0 517376 0 517376 0 517376 0 517376 0 517376 0 517376 0 JE_COS 517376 0 JE_COS	580	0	0 105 0 0 0 0	2066800	0	0 0 0 0 0				0 0 0 0 0 0					
IN	 1PUT	-+	 ? :	INF	 UT	+	 IT	IN	IPUT	+ 	+ OUTPUT	-						
Queue	Color	-+ COS	 Queue		Color	+ COS	· (Queue	Color	+ 	+	-						
0 1 2 3 4 5 6 7	green green green green green green green	-+	 0 1 2 3 4 5 6 7	+	yellow yellow yellow yellow yellow yellow yellow	0 1 5 3 4 5 6 7		0 1 2 3 4 5 6 7	red red red red red red red red		+ 0 1 5 3 4 5 6 7	-						
VTEP5#sh profile profile configur dscp 56 Detailed 	now qos-p name: DS type: ds attached red mapping d mapping	rofile DS CP_QUEUE cp-to-que to 1 ins ng:	SCP_QUEUE eue stances		 INPUT	+	OUTPUT				- INPUT	+	OUTPUT				 INPUT	+-
OUTPUT DSCP Queue	Queue Color	Color Out DSCE		 ?		+ Queu	ue Co:		Out DS	CP	- DSC1	+ P (Queue Co	olor		DS	 CP	DSCP
+-	0	green			16	2	green	16			32	4	green	32	+		48	6
1 green	48 0 49	green	1	Ι	17	2	green	17	I	I	33	4	green	33		Ι	49	6
2 green	0 50	green	2	Ι	18	2	green	18	I	I	34	4	green	34		Ι	50	6
3 green	0 51	green	3	I	19	2	green	19	I	l	35	4	green	35		Ι	51	6
4 green	0 52	green	4	I	20	2	yellow	<i>i</i> 20	I	I	36	4	yellow	36		I	52	6
5 green	0	green	5	I	21	2	green	21	I		37	4	green	37		I	53	6
6	0	green	6		22	2	yellow	22		I	38	4	yellow	38		I	54	6
green 7	54 0	green	7	Ι	23	2	green	23		I	39	4	green	39		Ι	55	6
green 8	55 1	green	8	I	24	3	green	24			40	5	green	40		I	56	2
green 9	56 1	areen	9	I	25	3	areen	25		1	41	5	areen	41		I	57	7
green	57	910011	10		20	2	green	20		1	1.	F	910011	10			50	7
green	1 58	green	10		26	3	green	26			42	5	green	42		1	58	/
11 green	1 59	green	11	I	27	3	green	27			43	5	green	43		I	59	7
12 green	1 60	yellow	12		28	3	yellow	v 28			44	5	green	44		I	60	7
- 13 green	1 61	green	13	I	29	3	green	29			45	5	green	45		I	61	7
14	1	yellow	14	I	30	3	yellow	v 30			46	5	green	46		Ι	62	7
green 15 green	62 1 63	green	15	I	31	3	green	31		I	47	5	green	47		Ι	63	7

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 l2vnid.

(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)# 13vni 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) #int irb2001	Enter IRB L3 interface
<pre>(config-irb-if)#qos map-profile dscp-to- queue DSCP_QUEUE</pre>	Map the qos profile
(config-irb-if) #exit	Exit from interface mode
(config) #commit	Commit the candidate configuration to the running configuration
(config) #end	Exit from global config mode

Enable VXLAN IRB
Create mac routing/forwarding instance with L3VRF1 name and enter into vrf mode
Assign RD value
Assign route-target value for same for import and export.
Configure L3VNI as 1000 for L3VRF1
Exit from vrf mode
Configure anycast mac address
Configure IRB interface 1001
Configure L3VRF1
Configure ip address
Configure ipv6 address
Configure anycast mac address
Exit from interface config mode
Configure IRB interface 2001
Configure L3VRF1
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)#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) #commit	Commit the candidate configuration to the running configuration
(config) #end	Exit from global config mode

(config) #nvo vxlan irbEnable VXLAN IRB(config) #ip vrf L3VRF1Create mac routing/forwarding instance with L3VRF1 name and enter into vrf mode(config-vrf) #rd 41000:11Assign RD value(config-vrf) # route-target both 100:100Assign route-target value for same for import and export.(config-vrf) # 13vni 1000Configure L3VNI as 1000 for L3VRF1(config-vrf) # exitExit from vrf mode(config) # evpn irb-forwarding anycast- gateway-mac 0000.0000.1111Configure IRB interface 1001(config-if) ip vrf forwarding L3VRF1Configure L3VRF1(config-if) ip vrf forwarding L3VRF1Configure ip address(config-if) ip v6 address 1111:11/64Configure ipv6 address		
(config) #ip vrf L3VRF1Create mac routing/forwarding instance with L3VRF1 name and enter into vrf mode(config-vrf) #rd 41000:11Assign RD value(config-vrf) # route-target both 100:100Assign route-target value for same for import and export.(config-vrf) # 13vni 1000Configure L3VNI as 1000 for L3VRF1(config-vrf) # exitExit from vrf mode(config) # evpn irb-forwarding anycast- gateway-mac 0000.0000.1111Configure IRB interface 1001(config-if) ip vrf forwarding L3VRF1Configure L3VRF1(config-if) ip vrf forwarding L3VRF1Configure ip address(config-if) ip vrf address 11.11.11.1/24Configure ip vf address(config-if) ipv6 address 1111:1/64Configure ipv6 address	(config)#nvo vxlan irb	Enable VXLAN IRB
(config-vrf) #rd 41000:11Assign RD value(config-vrf) # route-target both 100:100Assign route-target value for same for import and export.(config-vrf) # 13vni 1000Configure L3VNI as 1000 for L3VRF1(config-vrf) #exitExit from vrf mode(config) # evpn irb-forwarding anycast- gateway-mac 0000.0000.1111Configure anycast mac address(config) # interface irb1001Configure IRB interface 1001(config-if) ip vrf forwarding L3VRF1Configure L3VRF1(config-if) ip address 11.11.11.1/24Configure ip address(config-if) ipv6 address 1111::1/64Configure ipv6 address	(config) #ip vrf L3VRF1	Create mac routing/forwarding instance with L3VRF1 name and enter into vrf mode
(config-vrf) # route-target both 100:100Assign route-target value for same for import and export.(config-vrf) # 13vni 1000Configure L3VNI as 1000 for L3VRF1(config-vrf) #exitExit from vrf mode(config) # evpn irb-forwarding anycast- gateway-mac 0000.0000.1111Configure anycast mac address(config) # interface irb1001Configure IRB interface 1001(config-if) ip vrf forwarding L3VRF1Configure L3VRF1(config-if) ip address 11.11.11.1/24Configure ip address(config-if) ipv6 address 1111::1/64Configure ipv6 address	(config-vrf)#rd 41000:11	Assign RD value
(config-vrf) # 13vni 1000Configure L3VNI as 1000 for L3VRF1(config-vrf) #exitExit from vrf mode(config) # evpn irb-forwarding anycast- gateway-mac 0000.0000.1111Configure anycast mac address(config) # interface irb1001Configure IRB interface 1001(config-if) ip vrf forwarding L3VRF1Configure L3VRF1(config-if) ip address 11.11.11.1/24Configure ip address(config-if) ipv6 address 1111:1/64Configure ipv6 address	<pre>(config-vrf)# route-target both 100:100</pre>	Assign route-target value for same for import and export.
(config-vrf) #exitExit from vrf mode(config) # evpn irb-forwarding anycast- gateway-mac 0000.0000.1111Configure anycast mac address(config) # interface irb1001Configure IRB interface 1001(config-if) ip vrf forwarding L3VRF1Configure L3VRF1(config-if) ip address 11.11.11.1/24Configure ip address(config-if) ipv6 address 1111:1/64Configure ipv6 address	(config-vrf)# 13vni 1000	Configure L3VNI as 1000 for L3VRF1
(config) # evpn irb-forwarding anycast- gateway-mac 0000.0000.1111Configure anycast mac address(config) # interface irb1001Configure IRB interface 1001(config-if) ip vrf forwarding L3VRF1Configure L3VRF1(config-if) ip address 11.11.11.1/24Configure ip address(config-if) ipv6 address 1111:1/64Configure ipv6 address	(config-vrf) #exit	Exit from vrf mode
(config) # interface irb1001Configure IRB interface 1001(config-if) ip vrf forwarding L3VRF1Configure L3VRF1(config-if) ip address 11.11.11.1/24Configure ip address(config-if) ipv6 address 1111::1/64Configure ipv6 address	<pre>(config)# evpn irb-forwarding anycast- gateway-mac 0000.0000.1111</pre>	Configure anycast mac address
(config-if) ip vrf forwarding L3VRF1Configure L3VRF1(config-if) ip address 11.11.11.1/24Configure ip address(config-if) ipv6 address 1111:1/64Configure ipv6 address	(config) # interface irb1001	Configure IRB interface 1001
(config-if) ip address 11.11.11.1/24Configure ip address(config-if) ipv6 address 1111:1/64Configure ipv6 address	(config-if)ip vrf forwarding L3VRF1	Configure L3VRF1
(config-if)ipv6 address 1111::1/64 Configure ipv6 address	(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.

(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)# 13vni 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
<pre>(config) # nvo vxlan id 101 ingress- replication inner-vid-disabled</pre>	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.</queue,>
(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
<pre>(config) #nvo vxlan tunnel qos-map-mode cos- dscp ingress DSCP_QUEUE</pre>	Map the qos profile in tunnel ingress
(config)#nvo vxlan access-if port-vlan xel 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
!
T
I.
interface irb2001
qos map-profile dscp-to-queue DSCP QUEUE
1
VTEP1#show running-config nvo vxlan
1
nvo vxlan enable
T
nvo vxlan irb
T
evpn vxlan multihoming enable
Т
evpn irb-forwarding anycast-gateway-mac 0000.0000.1111
Т
nvo vxlan vtep-ip-global 1.1.1.1
T
nvo vxlan id 101 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp L2VRF1
evpn irb1001
vni-name VNI-101
Т
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 pol 10
map vnid 101
mac 0000.2222.1010 ip 11.11.11.51
T.
nvo vxlan access-if port-vlan pol 20
map vnid 201
mac 0000.2222.1020 ip 21.21.21.51
!
T
VTEP1#show nvo vxlan tunnel
VXLAN Network tunnel Entries
Source
                Destination
                                Status
                                                 Up/Down
                                                               Update
_____
                                Installed
1.1.1.1
                5.5.5.5
                                                 01:15:13
                                                               01:15:13
1.1.1.1
                4.4.4.4
                                                               01:15:28
                                Installed
                                                 01:15:28
1.1.1.1
                2.2.2.2
                               Installed
                                                 01:11:40
                                                               01:11:40
```

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

101 1.1.1.1	VNI-101	L2 5.5.5.5	NW				
101 1.1.1.1	VNI-101	L2 4.4.4.4	NW				
101 1.1.1.1	VNI-101	L2 2.2.2.2	NW				
101	VNI-101		AC	pol	00:00:00:00:00:22:22:00:00:00	10	DF
201 1.1.1.1	VNI-201	L2 5.5.5.5	NW				
201 1.1.1.1	VNI-201	L2 4.4.4.4	NW				
201 1.1.1.1	VNI-201	L2 2.2.2.2	NW				
201	VNI-201		AC	pol	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	Туре Ас	ge-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	e		
101	11.11.11.1	0000.0000.1111	Static Local			
101	11.11.11.201	0000.4444.1010	Static Remote			
Total r VTEP1#s	number of entries show nvo vxlan nd-	are 7 cache				
VALAN I	======================================	====				
VNID Retries	Ip-Addr s-Left		Mac-Ad	dr	Туре .	Age-Out
201	2121::1		0000.0000.1111	Static Lo	ocal	
101	1111::10		0010.9400.0002	Dynamic H	Remote	
101	1111::1		0000.0000.1111	Static Lo	ocal	

```
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"
С
           11.11.11.0/24 is directly connected, irb1001, 00:13:19
           21.21.21.0/24 is directly connected, irb2001, 00:12:56
С
           127.0.0.0/8 is directly connected, lo.L3VRF1, 00:17:13
С
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"
С
      ::1/128 via ::, lo.L3VRF1, 00:17:23
      1111::/64 via ::, irb1001, 00:13:29
С
       2121::/64 via ::, irb2001, 00:13:06
С
      fe80::/64 via ::, irb2001, 00:13:06
С
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
             +----+
               (E) 125304832 O
q0
                                           0
                                                            0
                                                                           0
               (E) 125304832 O
q1
                                           0
                                                            0
                                                                           0
               (E) 125304832 O
                                          0
                                                            0
                                                                           0
q2
q3
               (E) 125304832 O
                                           0
                                                            0
                                                                           0
q4
              (E) 125304832 O
                                          0
                                                            0
                                                                           0
               (E) 125304832 O
                                          0
                                                            0
                                                                            0
q5
              (E) 125304832 O
                                          0
                                                            0
                                                                            0
q6
                                          0
                                                            0
               (E) 125304832 0
                                                                            0
q7
VTEP1#show nvo vxlan 13vni-map
L3VNI L2VNI IRB-interface
_____________________________
```

1000	10)1	irb100	1									
1000	20	01	irb2003	1									
VTEP1#s] profile profile profile	how qos-p name: DS type: ds attached	orofile DS SCP_QUEUE scp-to-que l to 1 ins	CP_QUEUE ue tances										
configu	red mappi	ng:											
dscp 20 Detailed	0 queue 4 d mappino	f :											
	-+						+						+
INPUT OUTPUT	 	OUTPUT INP	UT	+ 	INPUT OUTPUI		+	OUTPUT			IN]	PUT	+
				+									
DSCP Queue 	Queue Color -+	Color Out DSCP +	Out DS(DSC] +	CP P 	DSCE Queue 		Que Colo: +	eue Col c Out +	or DSCP +	Out D	SCP	DSCP	 +
0 green	+- 0 32	green 48	0 6	+ 	16 green	2	48	green	16	I	32	4	
1 green	0 33	green	1 6		17 green	2	49	green	17	I	33	4	
2 green	0 34	green 50	2 6		18 green	2	50	green	18		34	4	
3 green	0 35	green 51	3 6	I	19 green	2	51	green	19		35	4	
4 yellow	0 36	green 52	4 6		20 green	4	52	yellow	20	I	36	4	
5 green	0 37	green 53	5 6		21 green	2	53	green	21		37	4	
6 yellow	0 38	green 54	6 6	I	22 green	2	54	yellow	22	I	38	4	
7 green	0 39	green 55	7 6		23 green	2	55	green	23		39	4	
8 areen	1 40	green 56	8		24 green	3	56	green	24	I	40	5	
9	1	green	9 7		25	3	57	green	25	I	41	5	
10 green	41 1 42	green 58	10 7	I	26 green	3	57	green	26	I	42	5	
11 green	1 43	green	11 7	Ι	27 green	3	59	green	27	I	43	5	
12 green	1 44	yellow 60	12 7	Ι	28 green	3	60	yellow	28	ļ	44	5	
13 green	1 45	green 61	13 7	Ι	29 green	3	61	green	29	ļ	45	5	
14 green	1 46	yellow 62	14 7	Ι	30 green	3	62	yellow	30	I	46	5	
15 green	1 47	green 63	15 7		31 green	3	63	green	31	I	47	5	

VTEP1#show qos-profile interface irb2001
profile name: DSCP_QUEUE

profile mapping	e type: g: -+	dscp-to-qı	1eue	(Ingres	ss) -		+						+
INPUT OUTPUT	 -+	OUTPUT INF	- - ?UT	4 	INPUT OUTPUT	 [+	OUTPUT			INP	UT	+
DSCP Queue	Queue Color	Color Out DSCH	- - Oi 	at DSCP DSCP	DSCI Queue	 ₽ 	 Qu Colo	eue Col r Out	or DSCP	Out DS	СР	DSCP	 +
0	+ 0	green	- - 0	+	16	+ 2		green	16	I	32	4	
green 1 green	3∠ 0 33	green	1	6 6	green 17 green	2	48 49	green	17	I	33	4	
2 green	0 34	green 50	2	6 1	18 green	2	50	green	18	I	34	4	
3 green	0 35	green 51	3	ا 6	19 green	2	51	green	19	I	35	4	
4 yellow	0 36	green 52	4	6	20 green	4	52	yellow	20		36	4	
5 green	0 37	green 53	5	6	21 green	2	53	green	21		37	4	
6 yellow	0 38	green 54	6	6	22 green	2	54	yellow	22		38	4	
green	0 39	green 55	9	6	23 green	2	55	green	23		39	4	
green	1 40	green 56	8	7	24 green	ა ა	56	green	24		40	5	
green	1 41 1	green 57	9 10	7	green	с С	57	green	25	1	41	5	
green 11	42 1	58 green	11	7	green 27	3	58	green	20	1	43	5	
green 12	43 1	vellow	12	7 '	green 28	3	59	vellow	28	' I	44	5	
green 13	44 1	60 green	13	7	green 29	3	60	green	29		45	5	
green 14	45 1	61 yellow	14	7 	green 30	3	61	yellow	30	I	46	5	
green 15 green	46 1 47	62 green 63	15	7 7	green 31 green	3	62 63	green	31	I	47	5	

VTEP2#show running-config qos
qos enable
!
qos profile dscp-to-queue DSCP_QUEUE
 dscp 20 queue 4
!
!

```
!
interface irb2001
qos map-profile dscp-to-queue DSCP QUEUE
1
VTEP2#show running-config nvo vxlan
Т
nvo vxlan enable
T
nvo vxlan irb
1
evpn esi hold-time 90
Т
evpn vxlan multihoming enable
!
evpn irb-forwarding anycast-gateway-mac 0000.0000.1111
1
nvo vxlan vtep-ip-global 2.2.2.2
1
nvo vxlan id 101 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp L2VRF1
evpn irb1001
vni-name VNI-101
1
nvo vxlan id 201 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp L2VRF2
evpn irb2001
vni-name VNI-201
T.
nvo vxlan access-if port-vlan pol 10
map vnid 101
mac 0000.2222.1010 ip 11.11.11.51
Т
nvo vxlan access-if port-vlan pol 20
map vnid 201
mac 0000.2222.1020 ip 21.21.21.51
!
T.
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
                                              01:13:43
2.2.2.2
               5.5.5.5
                              Installed
                                                           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 L2 101 VNI-101 ____ ___ NW ____ ____ 1.1.1.1 2.2.2.2 101 VNI-101 L2 NW ____ ____ ____ ___ 2.2.2.2 5.5.5.5 101 po1 00:00:00:00:00:22:22:00:00:00 10 NON-DF VNI-101 ___ AC ____ ____ 201 VNI-201 L2 NW ____ ____ ____ ___ 2.2.2.2 4.4.4.4 L2 201 VNI-201 ____ ___ NW ____ ____ 2.2.2.2 1.1.1.1 201 VNI-201 L2 NW ____ ____ ____ ___ 5.5.5.5 2.2.2.2 201 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	Туре	Age	e-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 nu	mber of entries an	re 7					
VTEP2#sh	ow nvo vxlan nd-ca	ache					
VXLAN ND	-CACHE Informatior	1					
VNID Retries-:	Ip-Addr Left			Mac-Add:	r	Туре	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 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"
С
           11.11.11.0/24 is directly connected, irb1001, 00:10:20
С
           21.21.21.0/24 is directly connected, irb2001, 00:09:55
С
           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"
      ::1/128 via ::, lo.L3VRF1, 00:13:36
С
С
       1111::/64 via ::, irb1001, 00:10:26
С
       2121::/64 via ::, irb2001, 00:10:01
С
      fe80::/64 via ::, irb2001, 00:10:01
VTEP2#show nvo vxlan 13vni-map
t.3vnt
           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 O
                                         0
                                                           0
                                                                          0
q1
               (E) 12517376 0
                                         0
                                                           0
                                                                          0
               (E) 12517376 O
q2
                                         0
                                                           0
                                                                          0
q3
               (E) 12517376 O
                                         0
                                                           0
                                                                          0
                                      2998045000
               (E) 12517376 2998022
                                                          0
                                                                          0
q4
               (E) 12517376 O
                                         0
                                                           0
                                                                          0
q5
                                         0
                                                           0
q6
               (E) 12517376 0
                                                                          0
q7
               (E) 12517376 O
                                         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 | | INPUT | OUTPUT OUTPUT DSCP | Queue | Color | Out DSCP | DSCP | Queue | Color | Out DSCP | DSCP | Queue | Color | Out DSCP | DSCP | Queue | Color | Out DSCP 0 | 16 0 0 2 32 qreen green 16 4 32 | 48 6 48 green green 1 | 17 0 green 1 2 17 33 green 4 | 49 33 49 areen 6 green | 18 2 0 green 2 2 18 34 4 green | 50 34 6 green 50 green 3 0 | 19 2 green 3 green 19 35 4 35 | 51 6 51 green green 4 0 green 4 20 4 yellow 20 36 4 | 52 52 36 6 yellow green 5 0 green 5 | 21 2 21 37 4 green 37 | 53 6 green 53 green 0 | 22 6 green 6 2 yellow 22 T 38 4 | 54 vellow 38 6 green 54 7 0 7 | 23 2 23 39 4 green green qreen 39 | 55 6 green 55 8 1 | 24 5 green 8 3 green 24 40 | 56 40 7 56 green green | 25 9 1 green 9 3 5 green 25 41 | 57 7 57 41 green green 10 1 green 26 3 26 42 5 10 green 7 | 58 42 green 58 green 11 1 green 11 | 27 3 green 27 43 5 | 59 7 59 43 green green 12 1 yellow 12 | 28 3 yellow 28 44 5 | 60 7 green 44 green 60 13 1 green 13 | 29 3 29 45 5 green 7 green 45 | 61 green 61 1 14 yellow 14 30 3 yellow 30 5 46 7 46 | 62 green 62 areen 1 green | 31 3 31 47 5 15 15 green 7 47 | 63 63 green green VTEP2#show qos-profile interface irb2001 profile name: DSCP QUEUE profile type: dscp-to-queue (Ingress) mapping: OUTPUT | INPUT | OUTPUT | INPUT | INPUT | | INPUT | OUTPUT OUTPUT

	_+						+					Ι		_+
DSCP Queue	 Queu Color -+	e Color Out DSCP ++	Out DSCI	-+- P 	DSCI Queue 		 Que Color +	eue Col +	or DSCP	Out D	SCP		DSCP	 _+
+-		+		-+-		+		+						
0 green	0 32	green 0 48	6		16 green	2	48	green	16	I	32		4	
1 green	0 33	green 1 49	6	I	17 green	2	49	green	17	I	33		4	
2 green	0 34	green 2 50	6		18 green	2	50	green	18	I	34	1	4	
3 areen	0 35	green 3 51	6	I	19 green	2	51	green	19	I	35	J	4	
4 vellow	0 36	green 4 52	6		20 green	4	52	yellow	20	I	36	,	4	
5 areen	0 37	green 5 53	6	I	21 green	2	53	green	21	I	37		4	
6 vellow	0 38	green 6 54	6		22 green	2	54	yellow	22	I	38		4	
7 green	0 39	green 7	6	I	23 green	2	55	green	23	I	39)	4	
8 areen	1 40	green 8 56	7	I	24 areen	3	56	green	24	I	40	J	5	
9 areen	1 41	green 9 57	7	I	25 green	3	57	green	25	I	41		5	
10 green	1 42	green 1 58	.0		26 green	3	58	green	26	I	42		5	
11 green	1 43	green 1 59	.1 7		27 green	3	59	green	27	I	43	5	5	
12 green	1 44	yellow 1 60	.2	I	28 green	3	60	yellow	28	ļ	44	Į	5	
13 green	1 45	green 1 61	.3		29 green	3	61	green	29	I	45	j	5	
14 green	1 46	yellow 1	.4 7		30 green	3	62	yellow	30	I	46	;	5	
 15 green	1 47	green 1 63	.5		31 green	3	63	green	31	I	47	,	5	

/TEP4#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 Src-Addr	VNI-Name	VNI-T Dst-Addr	уре Туре	Interf	ace ESI				VLAN	DF-Status
101 4.4.4.4	VNI-101	L2 2.2.2.2	NW							
101 4.4.4.4	VNI-101	L2 1.1.1.1	NW							
101 4.4.4.4	VNI-101	L2 5.5.5.5	NW							
201 4.4.4.4	VNI-201	L2 2.2.2.2	NW							
201 4.4.4.4	VNI-201	L2 1.1.1.1	NW							
201 4.4.4.4	VNI-201	L2 5.5.5.5	NW							
201	VNI-201		AC	xe3	5	ingle	Homed H	Port	20	
Total nu VTEP4#sh VXLAN AR =======	mber of e ow nvo vx P-CACHE 1	entries ar klan arp-c Informatio	e 7 ache n =							
VNID	Ip-Addr	1	Mac-Addr		Туре	A	ge-Out	Retries	s-Left	
201	21.21.21	L.51	0000.222	2.1020	Static	Remote				
201	21.21.21	L.1	0000.000	0.1111	Static	Local				
201	21.21.21	L.101	0000.555	5.1020	Static	Local				
101	11.11.11	1.51	0000.222	2.1010	Static	Remote				
101	11.11.11	L.10	0010.940	0.0002	Dynamic	Remot	e			
101	11.11.11	1.1	0000.000	0.1111	Static	Local				
101	11.11.11	1.201	0000.444	4.1010	Static	Remote				
Total nu VTEP4#sh VXLAN ND	mber of e ow nvo vy -CACHE Ir	entries ar klan nd-ca nformation	e 7 che =							
VNID Retries-	Ip-Addr Left					Mac-Ac	ldr	Туре	A	ge-Out
201	2121:1			 0	000.000	0.1111	Static	Local		
101	11111::10)		0	010.940	0.0002	Dvnami	c Remote		
101	1111::1			0	000.000	0.1111	Static	Local		
Total nu	mber of e	entries ar	e 3	-						
VTEP4#sh	low ipv4 r	route vrf	L3VRF1							
Codes: K	- kernel	L. C - con	nected,	S - sta	tic, R	- RIP,	B – BG	P		
C	- OSPF,	IA - OSPF	inter a	rea		,		-		
N	1 - OSPF	NSSA exte	rnal tvp	e 1. N2	- OSPF	NSSA	externa	l type 2		
T	1 - OSPF	external	type 1.	E2 - OS	PF exte	rnal +	vpe 2			
i	- IS-IS.	, L1 - IS-	IS level	-1, L2	- IS-IS	level	-2,			
i	a - IS-JS	S inter ar	ea, E -	, EVPN.	, =0		,			
v	- vrf le	eaked								

```
* - candidate default
IP Route Table for VRF "L3VRF1"
             11.11.11.0/24 is directly connected, irb1001, 00:07:24
С
С
             21.21.21.0/24 is directly connected, irb2001, 00:07:14
С
             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"
С
       ::1/128 via ::, lo.L3VRF1, 00:10:21
        1111::/64 via ::, irb1001, 00:07:29
С
        2121::/64 via ::, irb2001, 00:07:19
С
        fe80::/64 via ::, irb2001, 00:07:19
С
VTEP4#show nvo vxlan 13vni-map
 L3VNI
              L2VNI
                           IRB-interface
_____
 1000
              101
                          irb1001
 1000
              201
                          irb2001
VTEP5
VTEP5#show running-config gos
gos 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
!
T
VTEP5#show running-config nvo vxlan
Т
nvo vxlan enable
1
nvo vxlan irb
1
evpn vxlan multihoming enable
1
```

evpn irb-forwarding anycast-gateway-mac 0000.0000.1111

```
!
nvo vxlan vtep-ip-global 5.5.5.5
!
nvo vxlan tunnel qos-map-mode cos-dscp ingress DSCP QUEUE
1
nvo vxlan id 101 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp L2VRF1
evpn irb1001
vni-name VNI-101
1
nvo vxlan id 201 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp L2VRF2
evpn irb2001
vni-name VNI-201
T
nvo vxlan access-if port-vlan xel 10
map vnid 101
mac 0000.4444.1010 ip 11.11.11.201
map qos-profile queue-color-to-cos QUEUE COS
!
T
VTEP5#show nvo vxlan tunnel
VXLAN Network tunnel Entries
                Destination
                                                               Update
Source
                                Status
                                                Up/Down
_____
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
                   VNI-Type Type Interface ESI
                                                                     VLAN DF-Status
VNID
        VNI-Name
Src-Addr
               Dst-Addr
101
        VNI-101
                   T.2
                            NW
                                 ____
                                                                     ____ ___
5.5.5.5
                2.2.2.2
101
        VNI-101
                 L2
                            NW
                                 ____
                                          ____
                                                                     ____ ___
                4.4.4.4
5.5.5.5
                 L2
101
        VNI-101
                            NW
                                 ____
                                          ____
                                                                     ____ ___
5.5.5.5
                1.1.1.1
101
        VNI-101
                                         --- Single Homed Port ---
                            AC
                                                                     10 ----
                   ___
                                xe1
____
201
       VNI-201
                            NW
                                 ____
                                                                     ____ ___
                   L2
                                          ____
                2.2.2.2
5.5.5.5
```

```
201
       VNI-201
                   L2
                             NW
                                  ____
                                                                        ____ ___
                                           ____
5.5.5.5
                4.4.4.4
                  L2
201
                                                                        ____ ___
        VNI-201
                                  ____
                             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
                                                       ____
                         0000.5555.1020 Static Remote
201
         21.21.21.101
                                                       ____
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
                                                       ____
        11.11.11.201
                         0000.4444.1010 Static Local
101
                                                       ____
Total number of entries are 7
VTEP5#show nvo vxlan nd-cache
VXLAN ND-CACHE Information
_____
VNID
        Ip-Addr
                                                Mac-Addr
                                                                           Age-Out
                                                              Type
Retries-Left
201
         2121::1
                                       0000.0000.1111 Static Local
101
        1111::10
                                       0010.9400.0002 Dynamic Local
                                                                       ____
         1111::1
                                       0000.0000.1111 Static Local
101
                                                                        ____
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"
            11.11.11.0/24 is directly connected, irb1001, 00:05:08
С
С
             21.21.21.0/24 is directly connected, irb2001, 00:04:57
С
            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"
С
     ::1/128 via ::, lo.L3VRF1, 00:07:35
С
     1111::/24 via ::, irb1001, 00:05:13
С
     2121::/64 via ::, irb2001, 00:05:02
С
     fe80::/64 via ::, irb2001, 00:05:02
VTEP5#show nvo vxlan l3vni-map
         L2VNI
L3VNI
                 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 | Q-Size | Tx pkts | Tx bytes | Dropped pkts |
Dropped bytes
         +----+
                                0
                                             0
q0
           (E) 12517376 0
                                                         0
           (E) 12517376 O
                                0
                                             0
                                                         0
q1
                               1224549062
           (E) 12517376 1170696
                                             0
                                                         0
q2
           (E) 12517376 O
                                0
                                             0
                                                         0
q3
           (E) 12517376 O
                                0
                                             0
                                                         0
q4
           (E) 12517376 O
                                0
                                             0
                                                         0
q5
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:
| OUTPUT |
    INPUT
                     INPUT
                            | OUTPUT |
                                        INPUT
                                               | OUTPUT
Queue | Color | COS | Queue | Color | COS | Queue | Color | COS
| 0
                   0
                        yellow
 0
           0
                 0
                                                 0
      green
                                           red
                        yellow 1
 1
           1
                 | 1
                                    | 1
                                                 1
     green
                                           red
                | 2
                        yellow 6
                                    | 2
 2
      green 6
                                           red
                                                  6
                                    | 3
 3
     green
           3
                 | 3
                        yellow 3
                                           red
                                                  3
           4
                        yellow 4
                                    | 4
                 | 4
 4
      green
                                           red
                                                 4
                                   | 5
                 | 5
 5
           5
                        yellow 5
                                                 5
     green
                                          red
                        yellow 6
                                    | 6
 6
     green 6
                 | 6
                                          red
                                                 6
```

VXLAN-EVPN with IRB QoS

7	green	7	Ι	7		yellow	7	7	7		red		7		
VTEP5#sh profile profile configur dscp 34 Detailed	ow qos-p name: DS type: ds attached ed mappi queue 2 mapping	profile D CP_QUEUE cp-to-que l to 1 in: ng:	SCP_Q eue stanc	UEUE es									1		
INPUT OUTPUT	 +	OUTPUT	- - PUT 		-+- - -	INPUT OUTPUT		 +	OUTPUT			INI	' 9UT 		-+
DSCP Queue	Queue Color	Color Out DSC	- - Ou P	t DSCP	-+- >	DSCE Queue		Que Color	ue Col	or DSCP	Out DS	CP	' D	SCP	
+ 0 green	0 32	green 48	- - 0	 	- - - + -	16 areen	2	48	green	+ 16	 I	32		4	-+
1	0	green	1	G		17 27	2	10	green	17	I	33		4	
green 2 green	33 0 34	green 50	2	6		18 green	2	49 50	green	18	I	34		2	
3 green	0 35	green 51	3	6		19 green	2	51	green	19	I	35		4	
4 yellow	0 36	green 52	4	6		20 green	2	52	yellow	20	I	36		4	
5 green	0 37	green 53	5	6		21 green	2	53	green	21	I	37		4	
6 yellow	0 38	green 54	6	6		22 green	2	54	yellow	22	I	38		4	
7 green	0 39	green 55	7	6		23 green	2	55	green	23	Ι	39		4	
8 green	1 40	green 56	8	7		24 green	3	56	green	24	I	40		5	
9 green	1 41	green	9	7		25 green	3	57	green	25	I	41		5	
10 green	1 42	green	10	7		26 green	3	58	green	26	I	42		5	
11 green	1	green	11	, 7		27 green	3	50	green	27	I	43		5	
12 green	1	yellow	12	7		28 green	3	60	yellow	28	I	44		5	
13	1	green	13	7		29	3	61	green	29	I	45		5	
14 areen	40 1 46	yellow	14	' 7	I	30 green	3	o⊥ 62	yellow	30	I	46		5	
15 green	1 47	green 63	15	7		31 green	3	63	green	31	I	47		5	

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 I3vni 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
<pre>(config-vrf)# route-target both 100:100</pre>	Assign route-target value for same for import and export.
(config-vrf)# 13vni 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 profile dscp-to-queue DSCP_QUEUEConfigure qos profile to remark at vxlan ingress tunnel. Here dscp to <queue, dscp=""> is not applicable. Le ingress remarking of dscp at the ingress tunnel is not applicable.(config-ingress-dscp-map) #dscp 56 queue 6 (config-ingress-dscp-map) #exitConfigure particular outer dscp value to queue value. Here classification at the ingress vtep is based on overlay dscp value(config-ingress-dscp-map) #exitExit from qos profile config mode(config-egress-dscp-map) #dscp 20 dscp 32Configure particular dscp value to dscp value(config-egress-dscp-map) #exitExit from qos profile config mode(config-egress-dscp-map) #exitExit from qos profile for remark at vxlan access-if QUEUE_COS(config-egress-cos-map) #queue 6 cos 2Configure particular queue value to COS value(config) #nvo vxlan tunnel qos-map-mode cos- dscp ingress DSCP_QUEUEMap the qos profile to vxlan tunnel ingress(config #nvo vxlan access-if port-vlan xe3 20Enter vxlan access-if mode(config-nvo-acc-if) #map qos-profile queue- color-to-cos QUEUE_COSMap qos profile commit the candidate configuration to the running configuration(config-nvo-acc-if) #endExit from global configuration mode</queue,>	(config) #qos remark dscp	Enable qos dscp remark for dscp-to-dscp mapping if required
(config-ingress-dscp-map) #dscp 56 queue 6Configure particular outer dscp value to queue value. Here classification at the ingress vtep is based on overlay dscp value(config-ingress-dscp-map) #exitExit from qos profile config mode(config-egress-dscp-map) #dscp 20 dscp 32Configure particular dscp value to dscp value(config-egress-dscp-map) #exitExit from qos profile config mode(config) #qos profile queue-color-to-cos QUEUE_COSConfigure qos profile for remark at vxlan access-if(config-egress-cos-map) #queue 6 cos 2Configure particular queue value to COS value(config) #nvo vxlan tunnel qos-map-mode cos- dscp ingress DSCP_QUEUEMap the qos profile to vxlan tunnel ingress(config) #nvo vxlan access-if port-vlan xe3Enter vxlan access-if mode(config-nvo-acc-if) #map qos-profile queue- color-to-cos QUEUE_COSMap qos profile(config-nvo-acc-if) #endCommit the candidate configuration to the running configuration	(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.</queue,>
(config-ingress-dscp-map)#exitExit from qos profile config mode(config-egress-dscp-map)#dscp 20 dscp 32Configure particular dscp value to dscp value(config-egress-dscp-map)#exitExit from qos profile config mode(config)#qos profile queue-color-to-cos QUEUE_COSConfigure qos profile for remark at vxlan access-if(config-egress-cos-map)#queue 6 cos 2Configure particular queue value to COS value(config)#nvo vxlan tunnel qos-map-mode cos- dscp ingress DSCP_QUEUEMap the qos profile to vxlan tunnel ingress(config-nvo-acc-if)#map qos-profile queue- color-to-cos QUEUE_COSEnter vxlan access-if mode(config-nvo-acc-if)#endExit from global configuration mode	(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-egress-dscp-map)#dscp 20 dscp 32Configure particular dscp value to dscp value(config-egress-dscp-map)#exitExit from qos profile config mode(config)#qos profile queue-color-to-cos QUEUE_COSConfigure qos profile for remark at vxlan access-if(config-egress-cos-map)#queue 6 cos 2Configure particular queue value to COS value(config-egress-cos-map)#exitExit from qos profile config mode(config)#nvo vxlan tunnel qos-map-mode cos- dscp ingress DSCP_QUEUEMap the qos profile to vxlan tunnel ingress(config)#nvo vxlan access-if port-vlan xe3Enter vxlan access-if mode(config-nvo-acc-if)#map qos-profile queue- color-to-cos QUEUE_COSCommit the candidate configuration to the running configuration(config-nvo-acc-if)#endExit from global configuration mode	(config-ingress-dscp-map) #exit	Exit from qos profile config mode
(config-egress-dscp-map) #exitExit from qos profile config mode(config) #qos profile queue-color-to-cos QUEUE_COSConfigure qos profile for remark at vxlan access-if QUEUE_COS(config-egress-cos-map) #queue 6 cos 2Configure particular queue value to COS value(config) #nvo vxlan tunnel qos-map-mode cos- dscp ingress DSCP_QUEUEMap the qos profile to vxlan tunnel ingress(config) #nvo vxlan access-if port-vlan xe3 20Enter vxlan access-if mode(config-nvo-acc-if) #map qos-profile queue- color-to-cos QUEUE_COSMap qos profile(config-nvo-acc-if) #commitCommit the candidate configuration to the running configuration(config-nvo-acc-if) #endExit from global configuration mode	(config-egress-dscp-map)#dscp 20 dscp 32	Configure particular dscp value to dscp value
(config) #qos profile queue-color-to-cos QUEUE_COSConfigure qos profile for remark at vxlan access-if Configure particular queue value to COS value(config-egress-cos-map) #queue 6 cos 2Configure particular queue value to COS value(config-egress-cos-map) #exitExit from qos profile config mode(config) #nvo vxlan tunnel qos-map-mode cos- dscp ingress DSCP_QUEUEMap the qos profile to vxlan tunnel ingress(config) #nvo vxlan access-if port-vlan xe3 20Enter vxlan access-if mode(config-nvo-acc-if) #map qos-profile queue- color-to-cos QUEUE_COSMap qos profile(config-nvo-acc-if) #commitCommit the candidate configuration to the running configuration(config-nvo-acc-if) #endExit from global configuration mode	(config-egress-dscp-map) #exit	Exit from qos profile config mode
(config-egress-cos-map) #queue 6 cos 2Configure particular queue value to COS value(config-egress-cos-map) #exitExit from qos profile config mode(config) #nvo vxlan tunnel qos-map-mode cos- dscp ingress DSCP_QUEUEMap the qos profile to vxlan tunnel ingress(config) #nvo vxlan access-if port-vlan xe3 20Enter vxlan access-if mode(config-nvo-acc-if) #map qos-profile queue- color-to-cos QUEUE_COSMap qos profile(config-nvo-acc-if) #commitCommit the candidate configuration to the running configuration(config-nvo-acc-if) #endExit from global configuration mode	(config)#qos profile queue-color-to-cos QUEUE_COS	Configure qos profile for remark at vxlan access-if
(config-egress-cos-map) #exitExit from qos profile config mode(config) #nvo vxlan tunnel qos-map-mode cos- dscp ingress DSCP_QUEUEMap the qos profile to vxlan tunnel ingress(config) #nvo vxlan access-if port-vlan xe3 20Enter vxlan access-if mode(config-nvo-acc-if) #map qos-profile queue- color-to-cos QUEUE_COSMap qos profile(config-nvo-acc-if) #commitCommit the candidate configuration to the running 	(config-egress-cos-map)#queue 6 cos 2	Configure particular queue value to COS value
(config) #nvo vxlan tunnel qos-map-mode cos- dscp ingress DSCP_QUEUEMap the qos profile to vxlan tunnel ingress(config) #nvo vxlan access-if port-vlan xe3 20Enter vxlan access-if mode(config-nvo-acc-if) #map qos-profile queue- color-to-cos QUEUE_COSMap qos profile(config-nvo-acc-if) #commitCommit the candidate configuration to the running configuration(config-nvo-acc-if) #endExit from global configuration mode	(config-egress-cos-map) #exit	Exit from qos profile config mode
(config) #nvo vxlan access-if port-vlan xe3 20Enter vxlan access-if mode(config-nvo-acc-if) #map qos-profile queue- color-to-cos QUEUE_COSMap qos profile(config-nvo-acc-if) #commitCommit the candidate configuration to the running configuration(config-nvo-acc-if) #endExit from global configuration mode	(config)#nvo vxlan tunnel qos-map-mode cos- dscp ingress DSCP_QUEUE	Map the qos profile to vxlan tunnel ingress
(config-nvo-acc-if) #map qos-profile queue- color-to-cos QUEUE_COSMap qos profile(config-nvo-acc-if) #commitCommit the candidate configuration to the running configuration(config-nvo-acc-if) #endExit from global configuration mode	(config)#nvo vxlan access-if port-vlan xe3 20	Enter vxlan access-if mode
(config-nvo-acc-if) #commitCommit the candidate configuration to the running configuration(config-nvo-acc-if) #endExit from global configuration mode	(config-nvo-acc-if)#map qos-profile queue- color-to-cos QUEUE_COS	Map qos profile
(config-nvo-acc-if) #end Exit from global configuration mode	(config-nvo-acc-if) #commit	Commit the candidate configuration to the running configuration
	(config-nvo-acc-if) #end	Exit from global configuration mode

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
<pre>(config-vrf)# route-target both 100:100</pre>	Assign route-target value for same for import and export.
(config-vrf)# 13vni 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)#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#show running-config qos
gos enable
!
qos profile dscp-to-queue DSCP QUEUE
 dscp 20 queue 4
!
!
!
T
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 id 101 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp L2VRF1
evpn irb1001
vni-name VNI-101
T
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 xel 10
map vnid 101
mac 0000.4444.1010 ip 11.11.11.201
!
!
VTEP5#show nvo vxlan tunnel
VXLAN Network tunnel Entries
             Destination
                          Status
Source
                                           Up/Down
                                                    Update
_____
                                           00:29:54
              2.2.2.2
                            Installed
5.5.5.5
                                                        00:29:54
                                          00:29:54
5.5.5.5
              4.4.4.4
                            Installed
                                                        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
```

101 5.5.5.5	VNI-101	L2 2.2.2.2	NW				
101 5.5.5.5	VNI-101	L2 4.4.4.4	NW				
101 5.5.5.5	VNI-101	L2 1.1.1.1	NW				
101	VNI-101		AC	xel	Single Homed Port	10	
201 5.5.5.5	VNI-201	L2 2.2.2.2	NW				
201 5.5.5.5	VNI-201	L2 4.4.4.4	NW				
201 5.5.5.5	VNI-201	L2 1.1.1.1	NW				
1000 5.5.5.5		L3 4.4.4.4	NW				

Total number of entries are 8 VTEP5#show nvo vxlan arp-cache VXLAN ARP-CACHE Information _____ Туре Mac-Addr Age-Out VNTD Ip-Addr 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 Туре Age-Out Retries-Left 201 2121::1 3c2c.991a.da7a Static Remote ____ 04f8.f82f.8eee Static Local 101 1111::1 ____ Total number of entries are 2 VTEP5#show nvo vxlan 13vni-map t.3vnt T-2VNT 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 * - candidate default IP Route Table for VRF "L3VRF1" R 4.4.4.4/32 [0/0] is directly connected, tunvxlan1000, 00:04:09 11.11.11.0/24 is directly connected, irb1001, 00:02:38 С R 21.21.21.0/24 [200/0] via 4.4.4.4 (recursive is directly connected, tunvxlan1000), 00:04:09 С 127.0.0.0/8 is directly connected, lo.L3VRF1, 00:04:46 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"
С
     ::1/128 via ::, lo.L3VRF1, 00:04:50
В
     ::ffff:404:404/128 [0/0] via ::, tunvxlan1000, 00:04:13
С
     1111::/64 via ::, irb1001, 00:02:42
В
     2121::/64 [200/0] via ::ffff:404:404 (recursive via ::, unknown), 00:04:13
     fe80::/64 via ::, irb1001, 00:02:42
С
VTEP5#show interface ce53 counter gueue-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) 50069504 0
                              0
                                           0
                                                      0
q1
           (E) 50069504 0
                              0
                                          0
                                                      0
           (E) 50069504 0
                              0
                                          0
                                                      0
q2
                              0
                                          0
                                                      0
q3
           (E) 50069504 0
                             698314400
           (E) 50069504 498796
                                          0
                                                      0
q4
           (E) 50069504 0
                                          0
                                                      0
q5
                              0
           (E) 50069504 0
                              0
                                          0
                                                      \cap
q6
           (E) 50069504 0
                              0
                                          0
                                                      0
q7
VTEP5#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 |
INPUT |
          OUTPUT
                               | INPUT |
          | INPUT |
                       OUTPUT
OUTPUT
DSCP | Queue | Color | Out DSCP | DSCP | Queue | Color | Out DSCP | DSCP |
Queue | Color | Out DSCP | DSCP | Queue | Color | Out DSCP
green O
                    | 16 2
     0
                                green 16
0
                                           | 32
                                                  4
         | 48
green
                  6
                       green
                             48
     32
          green 1
                    | 17 2
                                green 17
    0
1
                                           | 33
                                                  4
          | 49
                  6
                             49
    33
green
                       green
          green 2
                     | 18
2
    0
                            2
                                green 18
                                           | 34
                                                  4
     34
                  6
         | 50
                             50
green
                       green
3 O
green 35
                    | 19
                                green 19 | 35
          green 3
                           2
                                                  4
                  6
         | 51
                      green 51
```

4 yellow	0 36	green 52	4	6		20 green	4	52	yellow	20	Ι	36	4
5 green	0 37	green 53	5	6	I	21 green	2	53	green	21	Ι	37	4
6 yellow	0 38	green 54	6 1	6		22 green	2	54	yellow	22	Ι	38	4
7 green	0 39	green 55	7	6		23 green	2	55	green	23		39	4
8 green	1 40	green 56	8	7		24 green	3	56	green	24		40	5
9 green	1 41	green 57	9	7		25 green	3	57	green	25		41	5
10 green	1 42	green 58	10) 7		26 green	3	58	green	26	Ι	42	5
11 green	1 43	green 59	11	7		27 green	3	59	green	27	I	43	5
12 green	1 44	yellow 60	12	2 7	Ι	28 green	3	60	yellow	28		44	5
13 green	1 45	green 61	13	3 7		29 green	3	61	green	29	I	45	5
14 green	1 46	yellow 62	2	1 7	I	30 green	3	62	yellow	30		46	5
15 green	1 47	green 63	15 3	5 7		31 green	3	63	green	31	Ι	47	5
mapping	+							+					
INPUT OUTPUT	 +	OUTPUT IN	ן נעפו 		-+ 	INPUT OUTPU3			OUTPUT			INPU	JT +_
INPUT OUTPUT DSCP Queue	+ Queue Color +	OUTPUT IN 		C Out DSCI DSCP	- + · P	INPUT OUTPUT DSCF Queue 		+ Que Color +	OUTPUT ue Col Out +	 or Out DSCP	 DS(INPU CP 	JT + DSCP +
INPUT OUTPUT DSCP Queue + 0	 Queue Color + 0 32	OUTPUT IN Color Out DSC +		Out DSCP	-+ P 	INPUT OUTPUT DSCF Queue 16	2	+ Que Color +	OUTPUT ue Col Out 	or Out DSCP 16	 	INPU CP 32	JT + DSCP + 4
INPUT OUTPUT DSCP Queue 		OUTPUT IN Color Color Out DSC +	 1PU1 CP +- 0 3 1	C Out DSCI DSCP 	-+ + P -+ 	INPUT OUTPUT DSCF Queue 16 green 17 green	2	+ Que Color + 48 49	OUTPUT ue Col Out 	or Out DSCP 16 17	 DS(INPU CP 32 33	JT + DSCP + 4 4
INPUT OUTPUT DSCP Queue 0 green 1 green 2 green	+ Queue Color + 0 32 0 33 0 34	OUTPUT IN Color Out DSC +	 NPUJ CP + 0 3 1 2	C Out DSCP DSCP 6 6 6	-+ P 	INPUT OUTPUJ DSCF Queue 16 green 17 green 18 green	2 2 2	+ Que Color + 48 49 50	OUTPUT ue Col Out -+ green green green	or Out DSCP 16 17 18	 DS(INPU CP 32 33 34	JT + DSCP + 4 4 4 4
INPUT OUTPUT DSCP Queue + 0 green 1 green 2 green 3 green	+ Queue Color + 0 32 0 33 0 34 0 35	OUTPUT IN Color Out DSC +	 IPUJ CP + 0 1 2 3 1 3 2 3	C Out DSCP DSCP 6 6 6 6	-+ -+ P -+ 	INPUT OUTPUT DSCE Queue 16 green 17 green 18 green 19 green	2 2 2 2 2	+ Que Color + 48 49 50 51	OUTPUT ue Col Out 	or Out DSCP 16 17 18 19	 DS0 	INPU CP 32 33 34 35	JT + DSCP + 4 4 4 4 4 4
INPUT OUTPUT DSCP Queue Queue Green 1 green 2 green 3 green 4 yellow	+ Queue Color + 0 32 0 33 0 34 0 35 0 36	OUTPUT IN Color Out DSC + green 48 green 49 green 50 green 51 green 51	 NPU CP +- 0 3 1 2 3 2 3 2 3 2 4 2	C Out DSCP DSCP 	-+' -+ P -+ 	INPUT OUTPUT DSCF Queue 16 green 17 green 18 green 19 green 20 green	2 2 2 4	+ Que Color + 48 49 50 51 51	OUTPUT ue Col Out 	or Out DSCP 16 17 18 19 20	 DS(INPU CP 32 33 34 35 36	JT + DSCP + 4 4 4 4 4 4 4 4 4 4
INPUT OUTPUT DSCP Queue 0 green 1 green 2 green 3 green 4 yellow 5 green		OUTPUT IN Color Out DSC + green 48 green 49 green 50 green 51 green 52 green 52 green 53	 NPUJ CP +- 0 3 1 2 3 2 4 2 5 3	C Out DSCP DSCP 6 6 6 6 6 6 6 6 6 6	-+- P 	INPUT OUTPUJ DSCF Queue 16 green 17 green 18 green 19 green 20 green 21 green	2 2 2 4 2	+ Que color + 48 49 50 51 52 53	OUTPUT ue Col Out 	or Out DSCP 16 17 18 19 20 21	 DS0 	INPU 32 33 34 35 36 37	JT + DSCP + 4 4 4 4 4 4 4 4 4 4 4 4
INPUT OUTPUT DSCP Queue 0 green 1 green 2 green 3 green 4 yellow 5 green 6 yellow	+ Queue Color + 0 32 0 33 0 34 0 35 0 36 0 37 0 38	OUTPUT IN Color Out DSC +	 IPU CP +- 0 1 0 0 0 0 0 	C Out DSCP DSCP 6 6 6 6 6 6 6 6 6 6 6 6 6 6	-++ + P 	INPUT OUTPUT DSCF Queue 16 green 17 green 18 green 20 green 21 green 22 green	2 2 2 4 2 2	+ Que Color + 48 49 50 51 52 53 54	OUTPUT ue Col Out 	or Out DSCP 16 17 18 19 20 21 22	 DS0 	INPU CP 32 33 34 35 36 37 38	JT + DSCP + 4 4 4 4 4 4 4 4 4 4 4 4 4

8 green	1 40	green 8 56	3 7	I	24 green	3	56	green	24		40	5
9 green	1 41	green 9 57	9 7		25 green	3	57	green	25		41	5
10 green	1 42	green 1 58	LO 7	I	26 green	3	58	green	26	I	42	5
11 green	1 43	green 1 59	11 7	I	27 green	3	59	green	27	I	43	5
12 green	1 44	yellow 1 60	12 7	Ι	28 green	3	60	yellow	28	Ι	44	5
13 green	1 45	green 1 61	13 7	I	29 green	3	61	green	29	I	45	5
14 green	1 46	yellow 1 62	14 7	Ι	30 green	3	62	yellow	30	Ι	46	5
15 green	1 47	green 1 63	15 7		31 green	3	63	green	31	I	47	5

```
VTEP4#show run qos
qos enable
qos remark dscp
I.
!
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
!
!
1
L
VTEP4#show run nvo vxlan
T.
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
!
T
VTEP4#show nvo vxlan tunnel
VXLAN Network tunnel Entries
              Destination
Source
                             Status
                                           Up/Down
                                                    Update
_____
4.4.4.4
              2.2.2.2
                             Installed
                                           00:28:32
                                                        00:28:32
                                           00:28:38
4.4.4.4
             1.1.1.1
                            Installed
                                                        00:28:38
              5.5.5.5
4.4.4.4
                                           00:28:31
                                                       00:28:31
                            Installed
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
              L2
101
                                                              ____ ___
       VNI-101
                         NW
                             ____
                                      ____
              5.5.5.5
4.4.4.4
201
               L2
                            ____
      VNI-201
                         NW
                                     ____
                                                              ____
              2.2.2.2
4.4.4.4
201
      VNI-201
               L2
                         NW
                            ____
                                     ____
                                                              ____ ___
4.4.4.4
              1.1.1.1
              L2
201
       VNI-201
                         NW
                            ____
                                     ____
                                                              ____ ___
              5.5.5.5
4.4.4.4
201
                ___
                                     --- Single Homed Port ---
       VNI-201
                         AC
                             xe3
                                                              20 ----
              ____
____
1000
                 L3
                         NW
                             ____
                                     ____
                                                              ____ ___
       ____
              5.5.5.5
4.4.4.4
Total number of entries are 8
VTEP4#show nvo vxlan arp-cache
VXLAN ARP-CACHE Information
_____
      Ip-Addr
VNID
                     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
                                                      ____
                         0000.2222.1010 Static Remote ----
101
        11.11.11.51
101
        11.11.11.1
                        04f8.f82f.8eee Static Remote ----
                        0000.4444.1010 Static Remote ----
101
        11.11.11.201
Total number of entries are 6
VTEP4#show nvo vxlan nd-cache
VXLAN ND-CACHE Information
_____
VNID
       Ip-Addr
                                              Mac-Addr
                                                            Туре
                                                                        Age-Out
Retries-Left
                                      3c2c.991a.da7a Static Local
201
       2121::1
                                                                     ____
                                       04f8.f82f.8eee Static Remote
101
        1111::1
                                                                     ____
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"
            5.5.5.5/32 [0/0] is directly connected, tunvxlan1000, 00:01:03
R
            11.11.11.0/24 [200/0] via 5.5.5.5 (recursive is directly connected,
B
tunvxlan1000), 00:01:03
С
            21.21.21.0/24 is directly connected, irb2001, 00:03:31
С
            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"
С
       ::1/128 via ::, lo.L3VRF1, 00:15:18
       ::ffff:505:505/128 [0/0] via ::, tunvxlan1000, 00:01:08
В
В
       1111::/64 [200/0] via ::ffff:505:505 (recursive via ::, unknown), 00:01:08
С
       2121::/64 via ::, irb2001, 00:03:36
С
       fe80::/64 via ::, irb2001, 00:03:36
VTEP4#show nvo vxlan 13vni-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 +----+ 0 0 q0 (E) 12517376 0 0 (E) 12517376 O 0 0 0 q1 (E) 12517376 0 0 0 0 q2 q3 (E) 12517376 O 0 0 0 (E) 12517376 0 0 0 0 q4 q5 (E) 12517376 O 0 0 0 3209162748 (E) 12517376 2219303 0 q6 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: | OUTPUT | INPUT | OUTPUT | INPUT | OUTPUT TNPUT | Queue | Color | COS Queue | Color | COS | Queue | Color | COS 0 | 0 0 0 vellow 0 0 green red 1 green 1 | 1 yellow 1 | 1 red 1 | 2 2 | 2 yellow 2 2 2 red green | 3 3 green 3 yellow 3 | 3 red 3 4 | 4 yellow 4 | 4 4 green red 4 | 5 | 5 5 yellow 5 5 green 5 red | 6 | 6 2 yellow 2 2 6 green red 7 7 | 7 yellow 7 | 7 7 red green 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: OUTPUT | INPUT | INPUT | | INPUT | OUTPUT | INPUT | OUTPUT OUTPUT

	-+						+							-+
DSCP Queue	Queue Color	Color Out DSCP	Out DSCE DSCP	-+- ? 	DSCE Queue		 Que Color	eue Col	or DSCP	Out	DSC	CP	DSCP	I
	-++-	·+	+	 - + -			+	+	+					-+
0 green	0 32	green 48	0 6	I	16 green	2	48	green	16			32	4	
1 green	0 33	green 49	1 6		17 green	2	49	green	17			33	4	
2 green	0 34	green 50	2 6		18 green	2	50	green	18		Ι	34	4	
3 green	0 35	green 51	3 6		19 green	2	51	green	19		I	35	4	
4 yellow	0 36	green 52	4 6		20 green	2	52	yellow	20		I	36	4	
5 green	0 37	green 53	5 6		21 green	2	53	green	21		I	37	4	
6 yellow	0 38	green 54	6 6		22 green	2	54	yellow	22		Ι	38	4	
7 green	0 39	green 55	7 6		23 green	2	55	green	23			39	4	
8 green	1 40	green 56	8 6		24 green	3	56	green	24		I	40	5	
9 green	1 41	green 57	9 7		25 green	3	57	green	25			41	5	
10 green	1 42	green 58	10 7		26 green	3	58	green	26		I	42	5	
11 green	1 43	green 59	11 7		27 green	3	59	green	27		Ι	43	5	
12 green	1 44	yellow 60	12 7		28 green	3	60	yellow	28		I	44	5	
13 green	1 45	green 61	13 7		29 green	3	61	green	29		I	45	5	
14 green	1 46	yellow 62	14 7		30 green	3	62	yellow	30		I	46	5	
15 green	1 47	green 63	15 7		31 green	3	63	green	31			47	5	
VTEP4#s profile profile mapping	now qos-p name: de e type: d g: -+	profile in fault lscp-to-que	terface in eue (Ingre	sb2	2001		+							-+
INPUT	 	OUTPUT		-+- 	INPUT			OUTPUT				INPU	UT	
OUTPUT	-+	INP	UT 		OUTPU1		+							-+
DSCP Queue	Queue Color -+	Color Out DSCP	 Out DSCE DSCP +	-+- ? 	DSCH Queue 		 Que Color +	eue Col c Out	or DSCP +	Out	DSC	CP	DSCP	 -+
0 green	0 32	green 48	0 6	-+- 	16 green	2	48	green	16		I	32	4	

1 green	0 33	green 49	1 6		17 green	2	49	green	17	Ι	33	4
2	0	green	2	I	18 37000	2	50	green	18	Ι	34	4
green 3	34 0	green	3	I	19 19	2	50	green	19	Ι	35	4
green 4	35 0	51 areen	6 4	I	green 20	2	51	vellow	20	I	36	4
yellow	36	52	6	I	green	_	52	101101	20			-
5 green	0 37	green 53	5 6	I	21 green	2	53	green	21	I	37	4
6 vellow	0 38	green 54	6 6	I	22 green	2	54	yellow	22	Ι	38	4
7	0	green	7	Ι	23 groon	2	55	green	23	Ι	39	4
8	1	green	8	I	24	3	55	green	24	Ι	40	5
green 9	40 1	56 green	9	I	green 25	3	56	green	25	Ι	41	5
green	41	57	7		green	C	57		26		4.0	F
green	1 42	green 58	10 7	I	26 green	3	58	green	26	Ι	42	С
11 green	1 43	green 59	11 7		27 green	3	59	green	27		43	5
12 green	1 44	yellow	12 7		28 green	3	60	yellow	28		44	5
13	1	green	13		29 29	3	00	green	29	Ι	45	5
green 14	45 1	yellow	14	I	green 30	3	61	yellow	30		46	5
green	46	62	7		green	-	62					_
15 green	1 47	green 63	15 7		31 green	3	63	green	31	I	47	5
CHAPTER 7 Single Home VxLAN IRB with OSPF or ISIS

Overview

Single Home Virtual Extensible LAN (VxLAN) with Integrated Routing (IRB) using Open Shortest Path First (OSPF) and Intermediate System to Intermediate System (ISIS) protocols provides the solution for connecting and managing virtual networks within a data center or network infrastructure.

This feature offers a solution for networks where the interconnection of VLANs is required. These protocols can be configured on IRB interfaces within layer 3 switches or routers. This configuration enables dynamic routing, facilitating the exchange of routing information with other devices in the network. By assigning IP addresses to the IRB interfaces, they serve as the default gateways for devices within the respective VLANs.

Both OSPF and ISIS routing updates are dynamically exchanged over IRB interfaces, ensuring up-to-date routing tables and optimized traffic routing across different VLANs and networks.

This feature offers flexibility in configuring network topologies, and ensures compatibility and interoperability within diverse network environments.

Feature Characteristics

The OSPF and ISIS support over the IRB Interface feature has the following characteristics:

- Enables the control of Receive (RX)/ Transmit (TX) of OSPF and ISIS packets on IRB interfaces, providing
 effective management of IRB interfaces interactions with OSPF and ISIS for optimized network communication
 and routing.
- IRB interfaces process configured MTU size packets.
- Maintains consistency in CLI commands with SVI interfaces for OSPF and ISIS configurations, simplifying network management tasks.

Benefits

The OSPF and ISIS support over the IRB Interface has the following benefits:

- Enables seamless inter-subnet communication across different VNIDs and subnets within the same customer network.
- Promotes seamless connectivity between devices, irrespective of whether they are connected through IRB or SVI interfaces, and simplifies network management.
- The network gains greater adaptability to various scenarios and evolving requirements, offering greater versatility in its operations.

Prerequisites

- Router must be up and running.
- Maintain synchronization with VRF changes by performing IRB shut/no shut actions when specific events
 occur within the IPVRF. These events may involve adding or removing Route Targets (RTs), updating Route
 Distinguishers (RDs), or modifying Layer 3 Virtual Network Identifiers (L3VNIs).

Topology for OSPF

The network topology includes various network elements such as routers, customer edge (CE) devices, Service Aggregator (SA) devices, and Provider Edge (PE) routers. The feature enables OSPF on the IRB interfaces, allowing for efficient routing and communication between network devices within the topology.



Configuration

Perform the following configurations to set up different interfaces, routing protocols, and BGP parameters to enable VXLAN, IRB, and EVPN functionality in the network.

Configure OSPF

PEI(Config)# terminal	Enters the configuration mode.
PE1(config)#interface sal	Configure the sa1 interface as a network interface.
PE1(config-if)# ip address 10.1.1.1/24	Assigns an IP address to the sa1 interface with a subnet mask of /24.
PE1(config-if)# ip ospf cost 10	Configures the OSPF cost for the sa1 interface, setting it to 10.
<pre>PE1(config-if) # load-interval 30</pre>	Configures the load-interval for monitoring traffic on the sa1 interface.
PE1(config)#interface xe1	Enters the interface xe1 mode.
PE1(config-if)# static-channel-group 1	Assigns the static channel group 1 to the xe1 interface.
PE1(config-irb-if)#interface lo	Configures the loopback (lo) interface.
<pre>PE1(config-if)# ip address 1.1.1.1/32 secondary</pre>	Assigns the primary IP address 1.1.1.1/32 to the loopback interface and specifies it as secondary.

PE1(config)#router ospf 1	Enters the OSPF configuration mode for OSPF process 1.
PE1(config-router)# ospf router-id 1.1.1.1	Sets the OSPF router ID to 1.1.1.1 for OSPF process 1.
PE1(config-router)# network 1.1.1.1/32 area 0.0.0.0	Advertises the network 1.1.1.1/32 into OSPF area 0.0.0.0.
PE1(config-router) # network 10.1.1.0/24 area 0.0.0.0	Advertises the network 10.1.1.0/24 into OSPF area 0.0.0.0.
PE1(config)#nvo vxlan enable	Enables the VXLAN feature on the device.
PE1(config)#nvo vxlan irb	Enables VXLAN IRB functionality.
PE1(config-vrf)#mac vrf L2VRF1	Configures a MAC VRF named L2VRF1.
PE1(config-vrf)# rd 1.1.1.1:11	Sets the Route Distinguisher (RD) to 1.1.1.1:11 for the VRF.
PE1(config-vrf)# route-target both 9.9.9.9100	Configures both import and export route targets for the VRF.
PE1(config-vrf)#ip vrf L3VRF1	Configures an IP VRF named L3VRF1.
PE1(config-vrf)# rd 51000:11	Sets the RD value to 51000:11 for the L3VRF1.
PE1(config-vrf)# route-target both 100:100	Configures both import and export route targets for L3VRF1.
PE1(config-vrf)# 13vni 1000	Configures the L3 Virtual Network Identifier (L3VNI) with the value 1000.
PE1(config)#interface irb1001	Configures the IRB interface for L3VRF1.
<pre>PE1(config-irb-if)# ip vrf forwarding L3VRF1</pre>	Assigns the L3VRF1 to the IRB interface.
PE1(config-irb-if)# ip address 11.11.11.1/24	Assigns an IP address 11.11.11.1/24 to the IRB interface.
PE1(config-irb)#interface irb2001	Configures the IRB interface for IPv6 in L3VRF1.
<pre>PE1(config-irb-if)# ip vrf forwarding L3VRF1</pre>	Assigns the L3VRF1 to the IPv6 IRB interface.
PE1(config-irb-if)# ipv6 address 2001::1/64	Assigns an IP address 11.11.11.1/24 to the IRB interface.
PE1(config-irb-if)#mtu 9000	Sets the Maximum Transmission Unit (MTU) for this IRB interface to 9000 bytes.
PE1(config-router)#router ospf 2 L3VRF1	Configures OSPF on the L3VRF1.
PE1(config-router)# network 11.11.11.0/24 area 0.0.0.0	Advertises the network 11.11.11.0/24 into OSPF area 0.0.0.0.
PE1(config-router)#router ipv6 vrf ospf L3VRF1	Configures OSPFv3 on the L3VRF1.
PE1(config-router)# router-id 1.1.1.1	Configures the router ID as 1.1.1.1.
PE1(config-irb)#interface irb2001	Configures the IPv6 IRB interface.
PE1(config-irb-if)# ipv6 router ospf area 0.0.0.0 tag L3VRF1 instance-id 0	Attaches the OSPFv3 instance ID to the IPv6 IRB interface.
PE1(config)#nvo vxlan vtep-ip-global 1.1.1.1	Configures the global VTEP IP address as 1.1.1.1.
PE1(config)#nvo vxlan id 101 ingress- replication	Configures the VXLAN ID as 101 for ingress replication.
PE1(config-nvo)# vxlan host-reachability- protocol evpn-bgp L2VRF1	Maps the EVPN-BGP host reachability protocol to L2VRF1.
PE1(config-nvo)# evpn irb1001	Maps the IRB interface 1001 to EVPN.
PE1(config-nvo) # vni-name VNI-101	Configures the VNI name as VNI-101.
PE1(config)#nvo vxlan id 2001 ingress- replication	Configures the VXLAN ID as 2001 for ingress replication.
PE1(config-nvo)# vxlan host-reachability- protocol evpn-bgp L2VRF1	Maps the EVPN-BGP host reachability protocol to L2VRF1.

PE1(config-nvo)# evpn irb2001	Maps the IPv6 IRB interface to EVPN.
PE1(config)#interface xe2	Configures the xe2 interface.
PE1(config-if) # switchport	Configures the port as a Layer 2 (L2) switchport.
<pre>PE1(config-if) # load-interval 30</pre>	Configures the load-interval of 30 minutes for monitoring traffic on the xe2 interface.
PE1(config)#nvo vxlan access-if port-vlan xe2 100	Configures a VxLAN network virtualization overlay (NVO) on the interface xe2 with VLAN ID 100
PE1(config-nvo-acc-if)# map vnid 101	Maps VLAN 100 to the VxLAN Network Identifier (VNID) 101.
PE1(config-nvo-acc-if)#nvo vxlan access-if port-vlan xe2 2001	Configures another VxLAN NVO on the same interface xe2, but this time with VLAN ID 2001
PE1(config-nvo-acc-if)# map vnid 2001	Maps VLAN 2001 to a different VxLAN VNID.
PE1(config-router)#router bgp 100	Configures the BGP process with AS number 100.
PE1(config-router)# bgp router-id 1.1.1.1	Assigns the router ID as 1.1.1.1 for the BGP instance.
PE1(config-router)# neighbor 4.4.4.4 remote- as 100	Configures neighbor 4.4.4.4 with a remote AS number of 100.
PE1(config-router)# neighbor 4.4.4.4 update- source lo	Configures the update source for neighbor 4.4.4.4 to be the loopback interface.
PE1(config-router)# neighbor 4.4.4.4 advertisement-interval 0	Configures the advertisement interval for neighbor 4.4.4.4 as 0.
PE1(config-router)# address-family l2vpn evpn	Configures the address-family for L2VPN EVPN.
<pre>PE1(config-router-af)# neighbor 4.4.4.4 activate</pre>	Activates the neighbor for the L2VPN EVPN address-family.
PE1(config-router-af)# exit-address-family	Exits from the address family configuration.
PE1(config-router)# address-family ipv4 vrf L3VRF1	Configures the IPv4 address-family for VRF L3VRF1.
<pre>PE1(config-router-af) # redistribute connected</pre>	Configures the redistribution of connected routes within the IPv4 address-family.
PE1(config-router-af)# exit-address-family	Exits the IPv4 address-family configuration.
PE1(config-router)# address-family ipv6 vrf L3VRF1	Configures the IPv6 address-family for VRF L3VRF1.
<pre>PE1(config-router-af) # redistribute connected</pre>	Configures the redistribution of connected routes within the IPv6 address-family.
<pre>PE1(config-router-af)# exit-address-family</pre>	Exits the IPv6 address-family configuration.

PE5#configure terminal	Enters the configuration mode
PE5(config)#interface sal	Configure the sa1 interface as a network interface.
PE5(config-if)# ip address 10.1.1.1/24	Assigns an IP address to the sa1 interface with a subnet mask of /24.
PE5(config-if)# ip ospf cost 10	Configures the OSPF cost for the sa1 interface, setting it to 10.
PE5(config-if)# load-interval 30	Configures the load-interval for monitoring traffic on the sa1 interface.
PE5(config)#interface xel	Configure network interface towards PE6.
PE5(config-if) # static-channel-group 1	Assigns the static channel group 1 to the xe1 interface.

PE5(config)#interface xe5	configures the xe5 interface.
PE5(config-if)#ip address 30.1.1.1/24	Assigns the primary IP address 1.1.1.1/32 to the loopback interface and specifies it as secondary.
PE5(config)#ip ospf cost 10	Configures the OSPF cost for the xe5 interface, setting it to 10.
PE5(config-router)# ospf router-id 1.1.1.1	Assigns an IP address (30.1.1.1) to the xe5 interface with a subnet mask of /24.
PE5(config)#load-interval 30	Configures the load-interval for monitoring traffic on the xe5 interface.
PE5(config)#router ospf 1	Enters the OSPF configuration mode for OSPF process 1.
PE5(config-router)# network 30.1.1.0/24 area 0.0.0.0	Advertises the network 30.1.1.0/24 into OSPF area 0.0.0.0.
PE5(config-router)# network 10.1.1.0/24 area 0.0.0.0	Advertises the network 10.1.1.0/24 into OSPF area 0.0.0.0.

PE3#configure terminal	Enters the configuration mode
PE3(config)#interface ce30	Configure the ce30 interface as a network interface.
<pre>PE3(config-if)# ip address 40.1.1.2/24</pre>	Assigns an IP address to the ce30 interface with a subnet mask of /24.
PE3(config-if)# ip ospf cost 10	Configures the OSPF cost for the sa1 interface, setting it to 10.
PE3(config-if)# load-interval 30	Configures the load-interval for monitoring traffic on the sa1 interface.
PE3(config)#interface lo	Configure the loopback interface.
PE3(config-if)#ip address 4.4.4.4/32 secondary	Assign an secondary IP to an loopback interface.
PE3(config)#ip ospf cost 10	Configures the OSPF cost for the xe7interface, setting it to 10.
PE3(config)#load-interval 30	Configures the load-interval for monitoring traffic on the xe5 interface.
PE3(config)#router ospf 1	Enters the OSPF configuration mode for OSPF process 1.
PE3(config-router)# ospf router-id 4.4.4.4	Configures the router id to an ospf instance.
PE3(config-router)# network 4.4.4.4/32 area 0.0.0.0	Advertises the loopback address.
PE3(config-router)# network 40.1.1.0/24 area 0.0.0.0	Advertises the network interface IP address.
PE3(config)#nvo vxlan enable	Enables VXLAN on the device, allowing it to participate in VXLAN networks.
PE3(config)#nvo vxlan irb	Enables VXLAN IRB functionality, that allows routing between VXLAN and non-VXLAN networks.
PE3(config-vrf)#mac vrf L2VRF1	Configures a L2 MAC VRF instance named L2VRF1, which is a logical network segment for L2 traffic isolation.
PE3(config-vrf)# rd 4.4.4.4:11	Configures a RD for the L2VRF1, with the value 4.4.4.4:11.
PE3(config-vrf)# route-target both 9.9.9.9:100	Configures a route target for the VRF.

PE3(config-vrf)#ip vrf L3VRF1	Configures a L3 VRF named L3VRF1.
PE3(config-vrf)# rd 56000:11	Configures a RD for the L3VRF1, with the value 56000:11.
PE3(config-vrf)# route-target both 100:100	Configures a route target for the VRF.
PE3(config-vrf)# 13vni 1000	Configures a L3VNI with the ID 1000 for the VRF.
PE3(config)#interface irb1001	Configures the IRB interface with the ID 1001.
PE3(config-irb-if)# ip vrf forwarding L3VRF1	Associates the IRB interface with the L3VRF1, ensuring that traffic from this interface is isolated within that VRF.
PE3(config-irb-if)# ip address 12.12.12.1/24	Assigns an IP address 12.12.12.1 with a subnet mask of /24 to the IRB interface, enabling it for L3 routing.
PE3(config-irb-if)# mtu 1500	Configures the MTU for the interface irb1001 to 1500 bytes.
PE3(config)#interface irb2001	Configures another IRB interface with the ID 2001.
<pre>PE3(config-irb-if)# ip vrf forwarding L3VRF1</pre>	Associates the IRB interface with the L3VRF1.
<pre>PE3(config-irb-if)# ipv6 address 2002::1/64</pre>	Assigns an IPv6 address 2002::1 with a subnet mask of /64 to the IRB interface, enabling it for IPv6 routing.
PE3(config-irb-if)# mtu 1500	Configures the MTU for the interface irb2001 to 1500 bytes.
PE3(config-router)#router ospf 2 L3VRF1	Configures the OSPF routing process on OSPF instance 2 for the L3VRF1.
PE3(config-router)# network 12.12.12.0/24 area 0.0.0.0	Advertises the network 12.12.12.0/24 to OSPF area 0.0.0.0.
PE3(config-router)#router ipv6 vrf ospf L3VRF1	Configures the OSPFv3 routing process on OSPFv3 instance for the L3VRF1.
PE3(config-router)# router-id 4.4.4.4	Sets the router ID for the OSPF/OSPFv3 instances to 4.4.4.4.
PE3(config)#nvo vxlan vtep-ip-global 4.4.4.4	Configures the global VTEP IP address as 4.4.4.4 for VXLAN.
PE3(config)#nvo vxlan id 102 ingress- replication	Configures the VXLAN with VNI ID 102 for ingress replication.
PE3(config-nvo)# vxlan host-reachability- protocol evpn-bgp L2VRF1	Maps the VXLAN configuration with the EVPN-BGP protocol and associates it with the L2VRF1.
PE3(config-nvo)# evpn irb1001	Maps the IRB interface irb1001 to the VXLAN.
DE2 (configure) # and none Mut 101	
PE3(CONIIG=NVO)# VNI=Name VNI=IUI	Configures the VNI name as VNI-101.
PE3(config)#nvo vxlan id 2002 ingress- replication	Configures the VNI name as VNI-101. Configures another VXLAN with VNI ID 2002 for ingress repli- cation.
PE3(config)#nvo vxlan id 2002 ingress- replication PE3(config-nvo)# vxlan host-reachability- protocol evpn-bgp L2VRF1	Configures the VNI name as VNI-101. Configures another VXLAN with VNI ID 2002 for ingress repli- cation. Maps the VXLAN configuration with the EVPN-BGP protocol and associates it with the L2VRF1.
<pre>PE3(config=nvo)# vn1=name vN1=101 PE3(config)#nvo vxlan id 2002 ingress- replication PE3(config=nvo)# vxlan host=reachability= protocol evpn=bgp L2VRF1 PE3(config=nvo)# evpn irb2001</pre>	Configures the VNI name as VNI-101. Configures another VXLAN with VNI ID 2002 for ingress repli- cation. Maps the VXLAN configuration with the EVPN-BGP protocol and associates it with the L2VRF1. Maps the IPv6 IRB interface irb2001 to the VXLAN.
PE3(config=nvo) # vn1=name vN1=101 PE3(config) #nvo vxlan id 2002 ingress- replication PE3(config=nvo) # vxlan host=reachability= protocol evpn=bgp L2VRF1 PE3(config=nvo) # evpn irb2001 PE3(config) #interface sa4	Configures the VNI name as VNI-101. Configures another VXLAN with VNI ID 2002 for ingress repli- cation. Maps the VXLAN configuration with the EVPN-BGP protocol and associates it with the L2VRF1. Maps the IPv6 IRB interface irb2001 to the VXLAN. Configures interface sa4.
<pre>PE3(config=nvo)# vn1=name vN1=101 PE3(config)#nvo vxlan id 2002 ingress- replication PE3(config=nvo)# vxlan host=reachability= protocol evpn=bgp L2VRF1 PE3(config=nvo)# evpn irb2001 PE3(config=nvo)# evpn irb2001 PE3(config=nvo)# switchport</pre>	Configures the VNI name as VNI-101. Configures another VXLAN with VNI ID 2002 for ingress repli- cation. Maps the VXLAN configuration with the EVPN-BGP protocol and associates it with the L2VRF1. Maps the IPv6 IRB interface irb2001 to the VXLAN. Configures interface sa4. Configures the interface as a switchport.
<pre>PE3(config=nvo)# vn1=name vn1=101 PE3(config)#nvo vxlan id 2002 ingress- replication PE3(config=nvo)# vxlan host=reachability= protocol evpn=bgp L2VRF1 PE3(config=nvo)# evpn irb2001 PE3(config=nvo)# evpn irb2001 PE3(config=if)# switchport PE3(config=if)# load=interval 30</pre>	Configures the VNI name as VNI-101. Configures another VXLAN with VNI ID 2002 for ingress repli- cation. Maps the VXLAN configuration with the EVPN-BGP protocol and associates it with the L2VRF1. Maps the IPv6 IRB interface irb2001 to the VXLAN. Configures interface sa4. Configures the interface as a switchport. Sets the load interval for the interface to 30 seconds.
<pre>PE3(config=nvo)# vn1=name vn1=101 PE3(config)#nvo vxlan id 2002 ingress- replication PE3(config=nvo)# vxlan host=reachability= protocol evpn=bgp L2VRF1 PE3(config=nvo)# evpn irb2001 PE3(config=if)# evpn irb2001 PE3(config=if)# switchport PE3(config=if)# load=interval 30 PE3(config=if)# mtu 1500</pre>	Configures the VNI name as VNI-101. Configures another VXLAN with VNI ID 2002 for ingress repli- cation. Maps the VXLAN configuration with the EVPN-BGP protocol and associates it with the L2VRF1. Maps the IPv6 IRB interface irb2001 to the VXLAN. Configures interface sa4. Configures the interface as a switchport. Sets the load interval for the interface to 30 seconds. Configures the MTU for the interface to 1500 bytes.
<pre>PE3(config=nvo)# vn1=name vn1=101 PE3(config)#nvo vxlan id 2002 ingress- replication PE3(config=nvo)# vxlan host=reachability= protocol evpn=bgp L2VRF1 PE3(config=nvo)# evpn irb2001 PE3(config)#interface sa4 PE3(config=if)# switchport PE3(config=if)# load=interval 30 PE3(config=if)# mtu 1500 PE3(config=if)# mtu 1500 PE3(config=if)# interface xe1</pre>	Configures the VNI name as VNI-101. Configures another VXLAN with VNI ID 2002 for ingress repli- cation. Maps the VXLAN configuration with the EVPN-BGP protocol and associates it with the L2VRF1. Maps the IPv6 IRB interface irb2001 to the VXLAN. Configures interface sa4. Configures the interface as a switchport. Sets the load interval for the interface to 30 seconds. Configures the MTU for the interface to 1500 bytes. Configures interface xe1.
<pre>PE3(config=nvo)# vn1=name vn1=101 PE3(config)#nvo vxlan id 2002 ingress- replication PE3(config=nvo)# vxlan host=reachability= protocol evpn=bgp L2VRF1 PE3(config=nvo)# evpn irb2001 PE3(config)#interface sa4 PE3(config=if)# switchport PE3(config=if)# load=interval 30 PE3(config=if)# mtu 1500 PE3(config=if)# mtu 1500 PE3(config=if)# static=channel=group 4</pre>	Configures the VNI name as VNI-101. Configures another VXLAN with VNI ID 2002 for ingress repli- cation. Maps the VXLAN configuration with the EVPN-BGP protocol and associates it with the L2VRF1. Maps the IPv6 IRB interface irb2001 to the VXLAN. Configures interface sa4. Configures the interface as a switchport. Sets the load interval for the interface to 30 seconds. Configures the MTU for the interface to 1500 bytes. Configures interface xe1. Assigns a static channel group to interface xe1.

PE3(config-nvo-acc-if)# map vnid 101	Maps VLAN 100 to the VxLAN VNID 101.
PE3(config-nvo-acc-if)#nvo vxlan access-if port-vlan sa4 2001	Configures another VxLAN NVO on the same interface xe2.
PE3(config-nvo-acc-if)# map vnid 2001	Maps VLAN 2001 to a different VxLAN VNID, in this case, VNID 2001.
PE3(config-router)#router bgp 100	Configures the BGP with AS number 100.
PE3(config-router)# bgp router-id 4.4.4.4	Sets the BGP router ID to 4.4.4.4.
PE3(config-router)# neighbor 1.1.1.1 remote- as 100	Configures a BGP neighbor with the remote AS number 100 and the IP address 1.1.1.1.
PE3(config-router)# neighbor 1.1.1.1 update- source lo	Specifies the BGP neighbor to use the loopback interface as the source for updates.
PE3(config-router)# neighbor 1.1.1.1 advertisement-interval 0	Configures the advertisement interval for BGP neighbor updates.
PE3(config-router)# address-family l2vpn evpn	Configures the BGP address family for Layer 2 VPN EVPN.
PE3(config-router-af)# neighbor 1.1.1.1 activate	Activates the BGP neighbor for the specified address family.
<pre>PE3(config-router-af)# exit-address-family</pre>	Exits the BGP address family configuration.
PE3(config-router)# address-family ipv4 vrf L3VRF1	Configures the BGP address family for IPv4 within VRF L3VRF1.
PE3(config-router-af)# redistribute connected	Configures BGP to redistribute connected routes into the BGP process.
<pre>PE3(config-router-af) # exit-address-family</pre>	Exits the BGP address family configuration for IPv4.
PE3(config-router)# address-family ipv6 vrf L3VRF1	Configures the BGP address family for IPv6 within VRF L3VRF1.
<pre>PE3(config-router-af)# redistribute connected</pre>	Configures BGP to redistribute connected routes into the BGP process.
<pre>PE3(config-router-af)# exit-address-family</pre>	Exits the BGP address family configuration for IPv6.

PE6#configure terminal	Enters the configuration mode.
PE6(config)#interface ce2	Configure the ce2 interface as a network interface.
PE6(config-if)# ip address 10.1.1.1/24	Assigns an IP address to the sa1 interface with a subnet mask of /24.
PE6(config-if)# ip ospf cost 10	Configures the OSPF cost for the sa1 interface, setting it to 10.
<pre>PE6(config-if) # load-interval 30</pre>	Configures the load-interval for monitoring traffic on the sa1 interface.
PE6(config)#interface xe7	Configure network interface towards PE5.
PE6(config-if)# static-channel-group 1	Assigns the static channel group 1 to the xe1 interface.
PE6(config-if)#ip address 30.1.1.1/24	Assign IP address to network interface.
PE6(config)#ip ospf cost 10	Configures the OSPF cost for the xe7interface, setting it to 10.

PE6(config)#load-interval 30	Configures the load-interval for monitoring traffic on the xe5 interface.
PE6(config)#router ospf 1	Enters the OSPF configuration mode for OSPF process 1.
PE6(config-router)# network 30.1.1.0/24 area 0.0.0.0	Advertises the network 30.1.1.0/24 into OSPF area 0.0.0.0.
PE6(config-router) # network 40.1.1.0/24 area 0.0.0.0	Advertises the network 40.1.1.0/24 into OSPF area 0.0.0.0.

Topology for ISIS

The network topology includes various network elements such as routers, customer edge (CE) devices, Service Aggregator (SA) devices, and Provider Edge (PE) routers. The feature enables OSPF and ISIS support on the IRB interfaces, allowing for efficient routing and communication between network devices within the topology.



Configure ISIS

PE2(config-if) # interface pol	Enters configuration mode for po 1.
PE2(config-if)# ip address 20.1.1.1/24	Assigns the IP address 20.1.1.1 with a subnet mask of 255.255.255.0 to the interface.
PE2(config-if)#ip router isis 1	Enables ISIS routing protocol on the interface with process ID 1.
PE2(config-if)#load-interval 30	Sets the interval for which interface statistics are collected to 30 seconds.
PE2(config)#nvo vxlan enable	Enables the VXLAN feature on the device.
PE2(config)#nvo vxlan irb	Enables VXLAN IRB functionality.
PE2(config-vrf)#mac vrf L2VRF2	Enters the configuration mode for a MAC VRF named L2VRF2.

PE2(config-vrf)# rd 2.2.2.2:11	Sets the route distinguisher (RD) for the VRF to 2.2.2.2:11.
PE2(config-vrf)#route-target both 10.10.10.10:100	Specifies import and export route targets for the VRF.
PE2(config-vrf)#ip vrf L3VRF2	Enters the configuration mode for an IP VRF named L3VRF2.
PE2(config-vrf)#rd 61000:11	Sets the RD for the IP VRF to 61000:11
PE2(config-vrf)# route-target both 101:101	Specifies import and export route targets for the IP VRF.
PE2(config-vrf)# 13vni 2000	Configures the Layer 3 VNI (Virtual Network Identifier) for the IP VRF.
PE2(config)#interface irb2001	Enters the configuration mode for interface IRB2001.
<pre>PE2(config-irb-if)# ip vrf forwarding L3VRF2</pre>	Associates the interface with the IP VRF L3VRF2.
PE2(config-irb-if)# ip address 13.13.13.1/24	Configures an IP address with a subnet mask of /24 on IRB2001.
PE2(config-irb-if)#mtu 9000	Sets the Maximum Transmission Unit (MTU) for the interface to 9000 bytes.
PE2(config-irb-if)#ip router isis 2	Associates the interface with ISIS routing process 2.
PE2(config-irb)#interface irb3001	Enters the configuration mode for interface IRB3001.
<pre>PE2(config-irb-if)# ip vrf forwarding L3VRF2</pre>	Associates the interface with the IP VRF L3VRF2.
<pre>PE2(config-irb-if)# ipv6 address 3001::1/64</pre>	Configures an IPv6 address on IRB3001 with the specified prefix length.
PE2(config-irb-if)#mtu 9000	Sets the MTU for the interface to 9000 bytes.
PE2(config-irb)#ipv6 router isis 3	Associates the interface with IPv6 ISIS routing process 3.
PE2(config)#router isis 2 L3VRF2	Enters the configuration mode for ISIS routing process 2 within VRF L3VRF2.
PE2(config-router)#is-type level-1-2	Specifies the ISIS level type as level-1-2.
PE2(config-router)#metric-style wide	Configures a wide metric style for ISIS.
PE2(config-router)# dynamic-hostname	Enables dynamic hostname assignment for the ISIS router.
<pre>PE2(config-router)# bfd all-interfaces</pre>	Enables Bidirectional Forwarding Detection (BFD) on all interfaces within ISIS.
PE2(config-router)#net 49.0000.0000.0221.00	Configures the network entity title (NET) for the ISIS process.
PE2(config)#router isis 3 L3VRF2	Enters the configuration mode for ISIS routing process 3 within VRF L3VRF2.
PE2(config-router)#is-type level-1-2	Specifies the ISIS level type as level-1-2.
PE2(config-router)# metric-style wide	Configures a wide metric style for ISIS.
PE2(config-router)# dynamic-hostname	Enables dynamic hostname assignment for the ISIS router.
PE2(config-router)#bfd all-interfaces	Enables BFD on all interfaces within ISIS.
PE2(config-router) # net 49.0000.0000.0222.00	Configures the network entity title (NET) for ISIS routing with the specified value.
PE2(config)#nvo vxlan vtep-ip-global 2.2.2.2	Configures the global VxLAN VTEP IP address to 2.2.2.2.
PE2(config)#nvo vxlan id 201 ingress- replication	Configures a VxLAN with VNI 201 and specifies ingress- replication for multicast traffic handling.
PE2(config-nvo)# vxlan host-reachability- protocol evpn-bgp L2VRF2	Specifies the EVPN-BGP host-reachability-protocol for the VxLAN with the VRF L2VRF2
PE2(config-nvo)# evpn irb2001	Enables EVPN IRB (Integrated Routing and Bridging) for VxLAN interface IRB2001.
PE2(config-nvo)# vni-name VNI-201	Assigns a name VNI-201 to the VxLAN VNI 201.

PE2(config)#nvo vxlan id 3001 ingress- replication	Configures another VxLAN with VNI 3001 and specifies ingress-replicationr for multicast traffic handling.		
PE2(config-nvo) # vxlan host-reachability- protocol evpn-bgp L2VRF2	Specifies the EVPN-BGP host-reachability-protocol for the VxLAN with the VRF L2VRF2.		
PE2(config-nvo)# evpn irb3001	Enables EVPN IRB for VxLAN interface IRB3001.		
PE2(config-if)#interface xell	Enters the configuration mode for the interface 11.		
PE2(config-if)#switchport	Configures the interface as a Layer 2 switchport.		
<pre>PE2(config-if) #load-interval 30</pre>	Sets the interval for which interface statistics are collected to 30 seconds.		
PE2(config)#nvo vxlan access-if port-vlan xell 100	Configures a VxLAN network virtualization overlay (NVO) on the interface xe2 with VLAN ID 100		
PE2(config-nvo-acc-if)# map vnid 101	Maps VLAN 100 to the VxLAN Network Identifier (VNID) 101.		
PE2(config-nvo-acc-if)#nvo vxlan access-if port-vlan xell 2001	Configures another VxLAN NVO on the same interface xe2, but this time with VLAN ID 2001		
PE2(config-nvo-acc-if)# map vnid 101	Maps VLAN 100 to the VxLAN Network Identifier (VNID) 101.		
PE2(config-nvo-acc-if)#nvo vxlan access-if port-vlan xell 2001	Configures another VxLAN NVO on the same interface xe2, but this time with VLAN ID 2001		
PE2(config-nvo-acc-if) # map vnid 2001	Maps VLAN 2001 to a different VxLAN VNID.		
PE2(config-if) #router isis 1	Starts the ISIS routing process with process ID 1.		
PE2(config-if)#is-type level-1-2	Specifies that the router participates in both Level 1 and Level 2 routing.		
PE2(config-if)#metric-style wide	Configures the metric style to be wide, enabling more flexibility in metric calculations.		
PE2(config-if)#dynamic-hostname	Enables the dynamic hostname feature for ISIS.		
PE2(config-if)#bfd all-interfaces	Configures Bidirectional Forwarding Detection on all interfaces.		
PE2(config-if)#net 49.0000.0000.0001.00	Specifies the network entity title (NET) for ISIS.		

BGP Configuration

PE2(config) #router bgp 100	Starts the BGP routing process with an autonomous system number (AS) of 100.		
PE2(config-router)#bgp router-id 2.2.2.2	Sets the BGP router ID to 2.2.2.2.		
PE2(config-router)#neighbor 3.3.3.3 remote- as 100	Configures a BGP neighbor with the IP address 3.3.3.3 and specifies the remote AS number as 100.		
PE2(config-router)#neighbor 3.3.3.3 update- source lo	Specifies that loopback interface (lo) is the source for BGP updates to the neighbor.		
PE2(config-router)#neighbor 3.3.3.3 advertisement-interval 0	Sets the advertisement interval to 0, which means updates will be sent immediately.		
PE2(config-router)#address-family ipv4 unicast	Enters the configuration mode for the IPv4 unicast address family within the router configuration.		
PE2(config-router-af)#network 2.2.2.2/32	Specifies that network 2.2.2.2 with a /32 subnet mask is part of the IPv4 unicast address family.		
PE2(config-router-af)#neighbor 3.3.3.3 activate	Activates the neighbor with the IP address 3.3.3.3 for the IPv4 unicast address family.		
PE2(config-router-af)#exit-address-family	Exits the configuration mode for the IPv4 unicast address family.		

PE2(config-router)#address-family l2vpn evpn	Enters the configuration mode for the L2VPN EVPN address family within the router configuration.
PE2(config-router-af)#neighbor 3.3.3.3 activate	Activates the neighbor with the IP address 3.3.3.3 for the L2VPN EVPN address family.
<pre>PE2(config-router-af)#exit-address-family</pre>	Exits the configuration mode for the L2VPN EVPN address family.
PE2(config-router)#address-family ipv4 vrf L3VRF2	Enters the configuration mode for the IPv4 address family within the VRF named L3VRF2.
PE2(config-router-af)#redistribute connected	Configures the redistribution of directly connected routes into the IPv4 address family for the specified VRF.
<pre>PE2(config-router-af)#exit-address-family</pre>	Exits the configuration mode for the IPv4 address family within the VRF L3VRF2.
PE2(config-router-af)#address-family ipv6 vrf L3VRF2	Enters the configuration mode for the IPv6 address family within the VRF named L3VRF2.
PE2(config-router-af)#redistribute connected	Configures the redistribution of directly connected routes into the IPv6 address family for the specified VRF.
PE2(config-router-af)#exit-address-family	Exits the configuration mode for the IPv6 address family within the VRF L3VRF2.

PE5(config-if)#interface pol	Enters the configuration mode for po1.		
PE5(config-if)#ip address 20.1.1.2/24	Assigns the IP address 20.1.1.2 with a subnet mask of /24 this interface.		
PE5(config-if)#ip router isis 1	Specifies that ISIS routing process 1 is enabled on this interface.		
PE5(config-if)#load-interval 30	Sets the load interval to 30 seconds for monitoring the interface.		
PE5(config-if)#interface po2	Enters the configuration mode for po2.		
PE5(config-if)#ip address 70.1.1.2/24	Assigns the IP address 70.1.1.2 with a subnet mask of /24 this interface.		
PE5(config-if)#load-interval 30	Sets the load interval to 30 seconds for monitoring the interface.		
PE5(config-if)#interface sal	Assigns the IP address 10.1.1.2 with a subnet mask of /24 to this interface.		
PE5(config-if)#ip ospf cost 10	Sets the OSPF cost for this interface to 10.		
PE5(config-if)#load-interval 30	Sets the load interval to 30 seconds for monitoring the interface.		
PE5(config-if)#interface ce50	Enters the configuration mode for ce50.		
PE5(config-if)#ip address 50.1.1.1/24	Assigns the IP address 50.1.1.1 with a subnet mask of /24 to this interface.		
PE5(config-if)#ip router isis 1	Specifies that ISIS routing process 1 is enabled on this interface.		
PE5(config-if)#load-interval 30	Sets the load interval to 30 seconds for monitoring the interface.		
PE5(config-if)#router ospf 1	Enters ISIS configuration mode with process ID 1.		
PE5(config-if)#network 10.1.1.0/24 area 0.0.0.0	Specifies that the network 10.1.1.0 with subnet mask 255.255.255.0 belongs to OSPF area 0.0.0.0.		

PE5(config-if)#network 30.1.1.0/24 area 0.0.0.0	Specifies another network, 30.1.1.0 with subnet mask 255.255.255.0, also belonging to OSPF area 0.0.0.0.		
PE5(config-if)#network 70.1.1.0/24 area 0.0.0.0	Specifies a third network, 70.1.1.0 with subnet mask 255.255.255.0, in OSPF area 0.0.0.0.		
PE5(config-if)#router isis 1	Enters ISIS configuration mode with process ID 1.		
PE5(config-if)#is-type level-1-2	Configures this ISIS router to support both Level 1 and Lev 2 routing.		
PE5(config-if)#metric-style wide	Configures ISIS to use the wide metric style, which allows for greater flexibility in metric values.		
PE5(config-if)#dynamic-hostname	Allows the hostname to be dynamically generated.		
PE5(config-if)#bfd all-interfaces	Enables Bidirectional Forwarding Detection on all interfaces.		
PE5(config-if)#net 49.0000.0005.0001.00	Sets the NET for this router.		
PE5(config-if)#exit	Exits from the router mode.		

PE6#configure terminal	Enters the configuration maode.		
PE6(config-if)#interface sa2	Enters configuration mode for interface sa2.		
PE6(config-if)#ip address 80.1.1.2/24	Assigns the IP address 80.1.1.2 with a subnet mask of 255.255.255.0 to interface sa2.		
PE6(config-if)#ip router isis 1	Associates ISIS routing protocol with this interface using process ID 1.		
PE6(config-if)#load-interval 30	Sets the load-interval to 30 seconds.		
PE6(config-if)#interface cel	Enters configuration mode for interface ce1.		
PE6(config-if)#ip address 50.1.1.2/24	Assigns the IP address 50.1.1.2 with a subnet mask of 255.255.255.0 to interface ce1.		
PE6(config-if)#ip router isis 1	Associates ISIS routing protocol with this interface using process ID 1.		
PE6(config-if)#load-interval 30	Sets the load-interval to 30 seconds.		
PE6(config-if)#interface ce2	Enters configuration mode for interface ce2.		
PE6(config-if)#speed 40g	Sets the interface speed to 40 gigabits per second.		
PE6(config-if)#ip address 40.1.1.1/24	Assigns the IP address 40.1.1.1 with a subnet mask of 255.255.255.0 to interface ce2.		
PE6(config-if)#ip ospf cost 10	Sets the OSPF cost for this interface to 10.		
PE6(config-if)#load-interval 30	Sets the load-interval to 30 seconds.		
PE6(config-if)#router ospf 1	Enters ISIS configuration mode with process ID 1.		
PE6(config-if)#network 30.1.1.0/24 area 0.0.0.0	Specifies another network, 30.1.1.0 with subnet mask 255.255.255.0, also belonging to OSPF area 0.0.0.0.		
PE6(config-if)#network 40.1.1.0/24 area 0.0.0.0	Specifies a third network, 40.1.1.0/24 with subnet mask 255.255.255.0, in OSPF area 0.0.0.0.		
PE6(config-if)#router isis 1	Enters ISIS configuration mode with process ID 1.		
PE6(config-if)#is-type level-1-2	Configures this ISIS router to support both Level 1 and Level 2 routing.		
PE6(config-if)#metric-style wide	Configures ISIS to use the wide metric style, which allows fo greater flexibility in metric values.		

PE6(config-if)#dynamic-hostname	Allows the hostname to be dynamically generated.
PE6(config-if)#bfd all-interfaces	Enable BFD on all network interfaces.

PE4#configure terminal	Enters the configuration mode.			
PE4(config-if)# interface xe5	Enters configuration mode for xe5.			
<pre>PE4(config-if)# ip address 60.1.1.2/24</pre>	Assigns the IP address 60.1.1.2 with a subnet mask of 255.255.255.0 to the interface.			
PE4(config-if)#ip router isis 1	Enables ISIS routing protocol on the interface with process I 1.			
PE4(config-if)#load-interval 30	Sets the interval for which interface statistics are collected to 30 seconds.			
PE4(config)#nvo vxlan enable	Enables the VXLAN feature on the device.			
PE4(config)#nvo vxlan irb	Enables VXLAN IRB functionality.			
PE4(config-vrf)#mac vrf L2VRF2	Configures a VRF instance named L2VRF2 and associates it with a specific RD			
PE4(config-vrf)# rd 3.3.3.3:11	Sets the RD for the L2VRF2 VRF to 3.3.3.3:11.			
PE4(config-vrf)#route-target both 10.10.10.10.100	Associates a route target with the L2VRF2 VRF for VPN route distribution.			
PE4(config-vrf)#ip vrf L3VRF2	Configures another VRF named L3VRF2.			
PE4(config-vrf)#rd 63000:11	Sets the RD for the L3VRF2 VRF to 63000:11.			
<pre>PE4(config-vrf)# route-target both 101:101</pre>	Associates a route target with the L3VRF2 VRF for VPN rout distribution.			
PE4(config-vrf)# 13vni 2000	Configures the L3VNI for the L3VRF2 VRF.			
PE4(config)#interface irb2001	Configuring an IRB interface with the number 2001.			
<pre>PE4(config-irb-if)# ip vrf forwarding L3VRF2</pre>	Associates the IRB interface with the L3VRF2 VRF.			
PE4(config-irb-if)# ip address 14.14.14.1/24	Assigns an IP address to the IRB interface.			
PE4(config-irb-if)#mtu 9000	Sets the MTU for the IRB interface.			
PE4(config-irb-if)#ip router isis 2	Associates the IRB interface with ISIS routing.			
PE4(config-irb)#interface irb3002	Configures another IRB interface with the number 3002.			
<pre>PE4(config-irb-if)# ip vrf forwarding L3VRF2</pre>	Associates the second IRB interface with the "L3VRF2" VRF.			
PE4(config-irb-if)# ipv6 address 3002::1/64	Assigns an IPv6 address to the second IRB interface.			
PE4(config-irb-if)#mtu 9000	Sets the MTU for the second IRB interface.			
PE4(config-irb)#ipv6 router isis 3	Associates the IRB interfaces with IPv6 and ISIS routing.			
PE4(config)#router isis 2 L3VRF2	Configures ISIS routing with the VRF L3VRF2.			
PE4(config-router)#is-type level-1-2	Sets the ISIS level type to level-1-2.			
PE4(config-router)# metric-style wide	Configures a wide metric style for ISIS.			
PE4(config-router)# dynamic-hostname	Enables dynamic hostname assignment for the ISIS router.			
PE4(config-router)#bfd all-interfaces	Enables BFD on all interfaces within ISIS.			
PE4(config-router)# net 49.0000.0000.0441.00	0 Configures the network entity title (NET) for ISIS routing with the specified value.			
PE4(config)#router isis 3 L3VRF2	Configures ISIS routing with the VRF L3VRF2.			
PE4(config-router)#is-type level-1-2	Sets the ISIS level type to level-1-2.			

PE4(config-router)# metric-style wide	Configures a wide metric style for ISIS.		
PE4(config-router)# dynamic-hostname	Enables dynamic hostname assignment for the ISIS router.		
PE4(config-router)#bfd all-interfaces	Enables BFD on all interfaces within ISIS.		
PE4(config-router)# net 49.0000.0000.0442.00	Configures the network entity title (NET) for ISIS routing with the specified value.		
PE4(config)#nvo vxlan vtep-ip-global 3.3.3.3	Configures the global VxLAN VTEP IP address to 3.3.3.3.		
PE4(config)#nvo vxlan id 201 ingress- replication	Configures a VxLAN with VNI 201 and specifies ingress- replication for multicast traffic handling.		
PE4(config-nvo)# vxlan host-reachability- protocol evpn-bgp L2VRF2	Specifies the EVPN-BGP host-reachability-protocol for the VxLAN with the VRF L2VRF2		
PE4(config-nvo)# evpn irb2001	Enables EVPN IRB (Integrated Routing and Bridging) for VxLAN interface IRB2001.		
PE4(config-nvo)# vni-name VNI-201	Assigns a name VNI-201 to the VxLAN VNI 201.		
PE4(config)#nvo vxlan id 3002 ingress- replication	Configures another VxLAN with VNI 3002 and specifies ingress-replicationr for multicast traffic handling.		
PE4(config-nvo)# vxlan host-reachability- protocol evpn-bgp L2VRF2	Specifies the EVPN-BGP host-reachability-protocol for the VxLAN with the VRF L2VRF2.		
PE4(config-nvo)# evpn irb3002	Enables EVPN IRB for VxLAN interface IRB3002		
PE4(config-if)#interface xe5	Enters the configuration mode for the interface 5.		
PE4(config-if)#switchport	Configures the interface as a L2 switchport.		
PE4(config-if)#load-interval 30	Sets the interval for which interface statistics are collected to 30 seconds.		
PE4(config)#nvo vxlan access-if port-vlan xe5 100	Configures a VxLAN network virtualization overlay (NVO) on the interface xe2 with VLAN ID 100		
PE4(config-nvo-acc-if)# map vnid 101	Maps VLAN 100 to the VxLAN Network Identifier (VNID) 101.		
PE4(config-nvo-acc-if)#nvo vxlan access-if port-vlan xe5 2001	Configures another VxLAN NVO on the same interface xe2, but this time with VLAN ID 2001		
PE4(config-nvo-acc-if)# map vnid 2001	Maps VLAN 2001 to a different VxLAN VNID.		
PE4(config-if)#router isis 1	Starts the ISIS routing process with process ID 1.		
PE4(config-if)#is-type level-1-2	Specifies that the router participates in both Level 1 and Level 2 routing.		
PE4(config-if)#metric-style wide	Configures the metric style to be wide, enabling more flexibility in metric calculations.		
PE4(config-if)#dynamic-hostname	Enables the dynamic hostname feature for ISIS.		
PE4(config-if)#bfd all-interfaces	Configures Bidirectional Forwarding Detection on all interfaces.		
PE4(config-if)#net 49.0000.0003.0001.00	Specifies the network entity title (NET) for ISIS.		

BGP Configuration

PE4(config)#router bgp 100	Starts the BGP routing process with an autonomous system number (AS) of 100.
PE4(config-router)#bgp router-id 3.3.3.3	Sets the BGP router ID to 3.3.3.3
PE4(config-router)#neighbor 2.2.2.2 remote- as 100	Configures a BGP neighbor with the IP address 2.2.2.2 and specifies the remote AS number as 100.
PE4(config-router)#neighbor 2.2.2.2 update- source lo	Specifies that loopback interface (lo) is the source for BGP updates to the neighbor.

PE4(config-router)#neighbor 2.2.2.2 advertisement-interval 0	Sets the advertisement interval to 0, which means updates will be sent immediately.		
PE4(config-router)#address-family ipv4 unicast	Enters the configuration mode for the IPv4 unicast address family within the router configuration.		
<pre>PE4(config-router-af)#network 3.3.3.3/32</pre>	Specifies that network 3.3.3.3 with a /32 subnet mask is part of the IPv4 unicast address family.		
PE4(config-router-af)#neighbor 2.2.2.2 activate	Activates the neighbor with the IP address 2.2.2.2 for the IPv- unicast address family.		
PE4(config-router-af)#exit-address-family	Exits the configuration mode for the IPv4 unicast address family.		
PE4(config-router)#address-family l2vpn evpn	Enters the configuration mode for the L2VPN EVPN addres family within the router configuration.		
PE4(config-router-af)#neighbor 2.2.2.2 activate	Activates the neighbor with the IP address 2.2.2.2 for the L2VPN EVPN address family.		
PE4(config-router-af)#exit-address-family	Exits the configuration mode for the L2VPN EVPN address family.		
PE4(config-router)#address-family ipv4 vrf L3VRF2	Enters the configuration mode for the IPv4 address family within the VRF named L3VRF2.		
PE4(config-router-af)#redistribute connected	Configures the redistribution of directly connected routes into the IPv4 address family for the specified VRF.		
PE4(config-router-af)#exit-address-family	Exits the configuration mode for the IPv4 address family within the VRF L3VRF2.		
PE4(config-router-af)#address-family ipv6 vrf L3VRF2	Enters the configuration mode for the IPv6 address family within the VRF named L3VRF2.		
PE4(config-router-af)#redistribute connected	Configures the redistribution of directly connected routes into the IPv6 address family for the specified VRF.		
PE4(config-router-af)#exit-address-family	Exits the configuration mode for the IPv6 address family within the VRF L3VRF2.		

Implementation Examples

Scenario: Configure OSPF and ISIS protocols on an IRB interface with an assigned IP address.

New CLI Commands

No CLI commands are introduced.

Validation

OSPF Validation

PE1#show ip osp	of neig	ghbor			
Total number of	f full	neighbors: 1			
OSPF process 1	VRF (de	efault):			
Neighbor ID	Pri	State	Dead Time	Address	Interface
Instance	e ID				
50.1.1.1	1	Full/DR	00:00:38	10.1.1.2	sal

0

```
Total number of full neighbors: 1
OSPF process 2 VRF(L3VRF1):
Neighbor ID
              Pri State
                                   Dead Time
                                               Address
                                                             Interface
      Instance ID
192.0.0.1
         0
                  Full/DROther 00:00:34
                                              11.11.11.2 irb1001
          0
PE1#show nvo vxlan tunnel
VXLAN Network tunnel Entries
               Destination
                              Status
Source
                                            Up/Down
                                                        Update
_____
1.1.1.1
               4.4.4.4
                               Installed
                                            00:15:59
                                                        00:15:59
Total number of entries are 2
PE1# show evpn irb-status
IRB is ACTIVE in Hardware
PE1#show nvo vxlan arp-cache
VXLAN ARP-CACHE Information
_____
VNID
       Ip-Addr
                       Mac-Addr
                                      Туре
                                               Age-Out
                                                          Retries-Left
101
       11.11.11.1
                       9819.2ccd.9301 Static Local ----
        11.11.11.2
101
                        0010.9400.0001 Dynamic Local ----
Total number of entries are 2
PE1#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"
С
            1.1.1.1/32 is directly connected, lo, 00:53:03
0
            4.4.4.4/32 [110/31] via 10.1.1.2, sal, 00:16:29
            7.7.7.7/32 [110/12] via 10.1.1.2, sal, 00:44:26
0
            10.1.1.0/24 is directly connected, sal, 00:50:10
С
            30.1.1.0/24 [110/20] via 10.1.1.2, sal, 00:44:22
0
Ο
            40.1.1.0/24 [110/30] via 10.1.1.2, sal, 00:17:14
            70.1.1.0/24 [110/11] via 10.1.1.2, sal, 00:45:18
0
            127.0.0.0/8 is directly connected, lo, 00:53:03
С
IP Route Table for VRF "management"
С
            10.12.98.0/24 is directly connected, eth0, 00:53:03
С
            127.0.0.0/8 is directly connected, lo.management, 00:53:03
IP Route Table for VRF "L2VRF1"
IP Route Table for VRF "L3VRF1"
            4.4.4/32 [0/0] is directly connected, tunvxlan2, 00:16:25
В
```

B C B		7.7.7.7/32 [0 11.11.11.0/24 12.12.12.0/24	/0] is dir is direct [200/0] v	ectly connectoria 4.4.4.4	ected, tun ed, irb100 (recursiv	nvxlan2, 01, 00:53 ve is dir	00:4 :03 ect	44:21 Ly connected	l,
tun B	vxlan2),	00:16:26	[200/0] v	ia 7.7.7.7	(recursiv	ve is dir	ect	Ly connected	l,
C	vxianz),	127.0.0.0/8 i	s directly	connected	, lo.L3VRI	F1, 00:53	:03		
Gatev	way of l	ast resort is	not set						
PE1#s BGP t Statu - int Origi	show bgp table ve us codes ternal, in codes	l2vpn evpn rsion is 5, lo : s suppressed l - labeled, : i - IGP, e -	cal router , d damped S Stale EGP, ? -	ID is 1.1 , h history incomplete	.1.1 y, a add-g	path, * v	alio	d, > best, i	
[EVPN 1 - E 2 - N 3 - J 4 - E 5 - E	N route Ethernet MAC/IP R Inclusiv Ethernet Prefix R	type]:[ESI]:[V Auto-discover oute e Multicast Ro Segment Route oute	NID]:[rele y Route ute	vent route	informant	tion]			
Ν	letwork	Next H	qc	Metric	LocPrf	Weight	F	ath Peer	Encap
RD[71	100:11]								
*>i	[5] : [0]	:[0]:[24]:[16. 7.7.	16.16.0]:[7.7	0.0.0.0]:[2	1000] 100	0	i	7.7.7.7	VXLAN
*>i	[5] : [0]	:[0]:[64]:[700 7.7.	2::]:[::]: 7.7	[1000] 0	100	0	i	7.7.7.7	VXLAN
RD[56	6000:11]								
*>i	[5] : [0]	:[0]:[24]:[12.	12.12.0]:[0.0.0]:[]	1000]				
		4.4.	4.4	0	100	0	?	4.4.4.4	VXLAN
*>i	[5]:[0]	:[0]:[64]:[200 4.4.	2::]:[::]: 4.4	[1000] 0	100	0	?	4.4.4.4	VXLAN
RD[1.	.1.1.1:1	1] VRF[L2VRF1]	:						
*>	[2]:[0]	:[101]:[48,001	0:9400:000	1]:[0]:[10]	1]				
		1.1.1	.1	0	100	32768	i		VXLAN
*>	[2]:[0]	:[101]:[48,001 1.1.1	0:9400:000 .1	1]:[32,11.] 0	11.11.2]: 100	[101] 32768	i		VXLAN
*>	[2]:[0]	:[101]:[48,981 1.1.1	9:2ccd:930 .1	1]:[32,11.] 0	11.11.1]: 100	[101] 32768	i		VXLAN
* i	[2]:[0]	:[102]:[48,001 4.4.	0:9400:000 4.4	2]:[0]:[10: 0	2] 100	0	i	4.4.4.4	VXLAN
* i	[2]:[0]	:[102]:[48,001	0:9400:000	2]:[32,12.]	12.12.2]:	[102]	-		
		4.4.	4.4	0	100	0	i	4.4.4.4	VXLAN

4.4.4 Total	1.4 I.l.	1.1 es are 1	installed	00:18:19	00	:18:	:19	
Sourc	ce Dest	ination	Status	Up/Down	Up	date	e	
PE3#s	show nvo vxlan tu	nnel Entrica						
Total	l number of prefi	xes 28						
_		4.4.4.4	0	100	0	i	4.4.4.4	VXLAN
*>i	[3]:[2002]:[32,4	4.4.4.4	0	100	0	i	4.4.4.4	VXLAN
*>i	[3]:[102]:[32,4.	4.4.4.4 4.4.4]	0	100	0	i	4.4.4.4	VXLAN
*>i	[2]:[0]:[2002]:[4.4.4.4 48,5c07:581	0 3:425e]:[128,2	100 002::1][200	0 2]	i	4.4.4.4	VXLAN
*>i	[2]:[0]:[2002]:[48,0010:940	0:000a]:[128,2	002::2][200)2]		1.1.1.1	V 7111111
*>i	[2]:[0]:[2002]:[48,0010:940	0:000a]:[0]:[2	002]	0	i	4 4 4 4	VXI.AN
*>i	[2]:[0]:[102]:[4	8,5c07:5813	:425e]:[32,12.	12.12.1]:[1	.02]	i	4 . 4 . 4 . 4	VXLAN
*>i	[2]:[0]:[102]:[4	8,0010:9400 4.4.4.4	:0002]:[32,12. 0	12.12.2]:[1 100	.02] 0	i	4.4.4.4	VXLAN
*>i	[2]:[0]:[102]:[4	8,0010:9400 4.4.4.4	:0002]:[0]:[10 0	2] 100	0	i	4.4.4.4	VXLAN
RD[4.	.4.4.4:11]							
* i	[3]:[2002]:[32,4	.4.4.4] 4.4.4.4	0	100	0	i	4.4.4.4	VXLAN
^ >	[3]:[2001]:[32,1	• • • • • • • • • • • • • • • • • • • •	0	100	32768	i		VXLAN
* \		4.4.4.4	0	100	0	i	4.4.4.4	VXLAN
* i	[3]•[102]•[32.4	1.1.1.1	0	100	32768	i		VXLAN
*>	[3]:[101]:[32,1.	4.4.4.4	0	100	0	i	4.4.4.4	VXLAN
* i	[2]:[0]:[2002]:[4.4.4.4 48,5c07:581	0 3:425e]:[128,2	100 002 :: 1][200	0)2]	i	4.4.4.4	VXLAN
* i	[2]:[0]:[2002]:[4.4.4.4 48,0010:940	0 0:000a]:[128,2	100 002::2][200	0)2]	i	4.4.4.4	VXLAN
* i	[2]:[0]:[2002]:[1.1.1.1 48,0010:940	0 0:000a]:[0]:[2	100 002]	32768	i		VXLAN
*>	[2]:[0]:[2001]:[1.1.1.1 48,9819:2cc	0 d:9301]:[128,2	100 001::1][200	32768)1]	i		VXLAN
*>	[2]:[0]:[2001]:[48,0010:940	0:0009]:[128,2	001::2][200	32768	1		VXLAN
*>	[2]:[0]:[2001]:[48,0010:940	0:0009]:[0]:[2	001]	22760		1.1.1.1	V 7511711V
* i	[2]:[0]:[102]:[4	8,5c07:5813	:425e]:[32,12.	12.12.1]:[1	.02]	i	ΔΛΔΔ	νχιαν

```
PE3#show ip ospf neighbor
Total number of full neighbors: 1
OSPF process 1 VRF(default):
Neighbor ID
               Pri State
                                     Dead Time
                                                  Address
                                                                  Interface
      Instance ID
40.1.1.2
           1 Full/DR
                                    00:00:36
                                                  40.1.1.1
                                                                 ce30
           0
Total number of full neighbors: 1
OSPF process 2 VRF(L3VRF1):
Neighbor ID
              Pri
                    State
                                     Dead Time
                                                  Address
                                                                 Interface
       Instance ID
192.0.0.2
                    Full/DROther 00:00:36
                                                  12.12.12.2
                                                                  irb1001
                0
           \cap
PE3#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"
            1.1.1.1/32 [110/31] via 40.1.1.1, ce30, 00:18:35
0
             4.4.4/32 is directly connected, lo, 00:19:22
С
            7.7.7.7/32 [110/22] via 40.1.1.1, ce30, 00:18:35
Ο
            10.1.1.0/24 [110/30] via 40.1.1.1, ce30, 00:18:35
0
            30.1.1.0/24 [110/20] via 40.1.1.1, ce30, 00:18:35
0
С
             40.1.1.0/24 is directly connected, ce30, 00:19:21
Ο
             70.1.1.0/24 [110/21] via 40.1.1.1, ce30, 00:18:35
С
            127.0.0.0/8 is directly connected, lo, 00:20:05
IP Route Table for VRF "management"
            10.12.98.0/24 is directly connected, eth0, 00:19:19
С
С
             127.0.0.0/8 is directly connected, lo.management, 00:20:05
IP Route Table for VRF "L3VRF1"
             1.1.1.1/32 [0/0] is directly connected, tunvxlan2, 00:18:31
В
            11.11.11.0/24 [200/0] via 1.1.1.1 (recursive is directly connected,
В
tunvxlan2), 00:18:32
С
            12.12.12.0/24 is directly connected, irb1001, 00:19:28
            127.0.0.0/8 is directly connected, lo.L3VRF1, 00:19:29
С
IP Route Table for VRF "L2VRF1"
Gateway of last resort is not set
PE3# show bgp 12vpn evpn
BGP table version is 4, local router ID is 4.4.4.4
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
                                                            Weight Path Peer
                      Next Hop
                                      Metric
                                                LocPrf
                                                                                    Encap
RD[51000:11]
*>i [5]:[0]:[24]:[11.11.11.0]:[0.0.0.0]:[1000]
                                                                       1.1.1.1
                       1.1.1.1
                                             0
                                                      100
                                                                0
                                                                     ?
                                                                                       VXLAN
*>i
     [5]:[0]:[0]:[64]:[2001::]:[::]:[1000]
                       1.1.1.1
                                             0
                                                      100
                                                                0
                                                                     ?
                                                                        1.1.1.1
                                                                                       VXLAN
RD[1.1.1:11]
*>i
     [2]:[0]:[101]:[48,0010:9400:0001]:[0]:[101]
                       1.1.1.1
                                                      100
                                                                0
                                                                       1.1.1.1
                                                                                       VXLAN
                                             0
                                                                     i
     [2]:[0]:[101]:[48,0010:9400:0001]:[32,11.11.11.2]:[101]
*>i
                       1.1.1.1
                                             0
                                                      100
                                                                0
                                                                        1.1.1.1
                                                                                       VXLAN
                                                                     i
*>i
     [2]:[0]:[101]:[48,9819:2ccd:9301]:[32,11.11.11.1]:[101]
                       1.1.1.1
                                             0
                                                      100
                                                                0
                                                                        1.1.1.1
                                                                                       VXLAN
                                                                     i
*>i
     [2]:[0]:[2001]:[48,0010:9400:0009]:[0]:[2001]
                       1.1.1.1
                                                                0
                                             0
                                                      100
                                                                     i
                                                                        1.1.1.1
                                                                                       VXLAN
*>i
     [2]:[0]:[2001]:[48,0010:9400:0009]:[128,2001::2][2001]
                       1.1.1.1
                                             0
                                                      100
                                                                        1.1.1.1
                                                                0
                                                                     i
                                                                                       VXLAN
*>i
     [2]:[0]:[2001]:[48,9819:2ccd:9301]:[128,2001::1][2001]
                                                      100
                       1.1.1.1
                                             \cap
                                                                \cap
                                                                     i
                                                                        1.1.1.1
                                                                                       VXLAN
*>i
     [3]:[101]:[32,1.1.1.1]
                       1.1.1.1
                                                      100
                                                                0
                                                                        1.1.1.1
                                             0
                                                                     i
                                                                                       VXLAN
*>i
     [3]:[2001]:[32,1.1.1.1]
                                                      100
                                                                0
                       1.1.1.1
                                             0
                                                                     i
                                                                        1.1.1.1
                                                                                       VXLAN
RD[4.4.4.4:11] VRF[L2VRF1]:
    [2]:[0]:[101]:[48,0010:9400:0001]:[0]:[101]
* i
                       1.1.1.1
                                             0
                                                      100
                                                                0
                                                                     i
                                                                       1.1.1.1
                                                                                       VXLAN
*
     [2]:[0]:[101]:[48,0010:9400:0001]:[32,11.11.11.2]:[101]
 i
                       1.1.1.1
                                             0
                                                      100
                                                                0
                                                                     i
                                                                        1.1.1.1
                                                                                       VXLAN
* i
     [2]:[0]:[101]:[48,9819:2ccd:9301]:[32,11.11.11.1]:[101]
                       1.1.1.1
                                             0
                                                      100
                                                                 0
                                                                      i
                                                                        1.1.1.1
                                                                                       VXLAN
     [2]:[0]:[102]:[48,0010:9400:0002]:[0]:[102]
*>
                      4.4.4.4
                                           0
                                                   100
                                                             32768
                                                                    i
                                                                                       VXLAN
*>
     [2]:[0]:[102]:[48,0010:9400:0002]:[32,12.12.12.2]:[102]
                      4.4.4.4
                                          0
                                                   100
                                                             32768
                                                                    i
                                                                                       VXLAN
     [2]:[0]:[102]:[48,5c07:5813:425e]:[32,12.12.12.1]:[102]
*>
                       4.4.4.4
                                             0
                                                      100
                                                                 32768
                                                                        i
VXLAN
* i [2]:[0]:[2001]:[48,0010:9400:0009]:[0]:[2001]
```

	1.1.1.1	0	100	0	i 1.1.1.1	VXLAN
* i	[2]:[0]:[2001]:[48,0010:9400:000	9]:[128,2	001::2][20	01]		
	1.1.1.1	0	100	0	i 1.1.1.1	VXLAN
* i	[2]:[0]:[2001]:[48,9819:2ccd:930	1]:[128,2	001::1][20	01]		
	1.1.1.1	0	100	0	i 1.1.1.1	VXLAN
*>	[2]:[0]:[2002]:[48,0010:9400:000	a]:[0]:[2	002]			
	4.4.4.4	0	100	32768	i	VXLAN
*>	[2]:[0]:[2002]:[48,0010:9400:000	a]:[128,2	002::2][20	02]		
	4.4.4.4	0	100	32768	i	VXLAN
*>	[2]:[0]:[2002]:[48,5c07:5813:425	e]:[128,2	002::1][20	02]		
	4.4.4.4	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
*>	[3]:[102]:[32,4.4.4.4]					
	4.4.4.4	0	100	32768	i	VXLAN
* i	[3]:[2001]:[32,1.1.1.1]					
	1.1.1.1	0	100	0	i 1.1.1.1	VXLAN
*>	[3]:[2002]:[32,4.4.4.4]					
	4.4.4.4	0	100	32768	i	VXLAN

Total number of prefixes 26

ISIS Validation

PE2#show nvo vxlan tunnel VXLAN Network tunnel Entries Source Destination Status Up/Down Update										
2.2.2.2	3.3.3.3		Installed	00:00	:10	00:00:	10			
Total number of PE2#show clns	of entries an neighbors	re 1								
Total number of Total number of Total number of Tag 1: VRF : System Id PE5	of L1 adjacer of L2 adjacer of adjacencie default Interface pol	ncies: 1 ncies: 1 es: 2 SNPA b86a.9	9725.a7f2	State Up	Holdtime 28	e Type L1	Protocol IS-IS			
				Up	28	L2	IS-IS			
Total number of Total number of Total number of Tag 2: VRF :	of L1 adjacer of L2 adjacer of adjacencie L3VRF2	ncies: (ncies: 1 es: 1)							
System Id Spirent-1	Interface irb2001	SNPA 0010.9	9400.0003	State Up	Holdtime 28	e Type L2	Protocol IS-IS			
Total number of Total number of Total number of	of L1 adjacer of L2 adjacer of adjacencie	ncies: (ncies: 1 es: 1)							

```
Tag 3: VRF : L3VRF2
System Id
              Interface
                          SNPA
                                              State Holdtime Type Protocol
Spirent-1
              irb3001
                          0010.9400.000c
                                                     28
                                                               L2
                                                                    IS-IS
                                              Up
PE2#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"
            2.2.2.2/32 is directly connected, lo, 02:13:57
С
i L2
            3.3.3.3/32 [115/30] via 20.1.1.2, po1, 00:00:32
i Ll
            7.7.7.7/32 [115/40] via 20.1.1.2, po1, 01:05:49
            20.1.1.0/24 is directly connected, po1, 02:13:21
С
i Ll
            50.1.1.0/24 [115/20] via 20.1.1.2, po1, 01:06:05
i Ll
            60.1.1.0/24 [115/30] via 20.1.1.2, po1, 00:00:47
            80.1.1.0/24 [115/30] via 20.1.1.2, po1, 01:05:49
i Ll
            127.0.0.0/8 is directly connected, lo, 02:13:57
С
IP Route Table for VRF "management"
С
             10.12.98.0/24 is directly connected, eth0, 02:13:57
             127.0.0.0/8 is directly connected, lo.management, 02:13:57
С
IP Route Table for VRF "L3VRF2"
             3.3.3/32 [0/0] is directly connected, tunvxlan2, 00:00:28
В
С
             13.13.13.0/24 is directly connected, irb2001, 02:13:57
            14.14.14.0/24 [200/0] via 3.3.3.3 (recursive is directly connected,
В
tunvxlan2), 00:00:28
             127.0.0.0/8 is directly connected, lo.L3VRF2, 02:13:57
С
IP Route Table for VRF "L2VRF2"
Gateway of last resort is not set
PE2# show bgp 12vpn 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,
              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
                  Next Hop Metric LocPrf Weight Path Peer
                                                                                 Encap
   Network
```

RD[6	3000:11]							
*>i	[5]:[0]:[0]:[24]:[14.14.14.0]:[0	0.0.0]:[2	000]				
		3.3.3.3	0	100	0	?	3.3.3.3	VXLAN
*>i	[5]:[0]:[0]:[64]:[3002::]:[::]:[2000]					
		3.3.3.3	0	100	0	?	3.3.3.3	VXLAN
2 מא	2 2 2.111 VRF[I	.2VRF21 •						
*>	1.2.2.2.11] VICE	/8 0010•9/00•0003	81 • [0] • [2 0 1	1				
	[2].[0].[201].[2 2 2 2 2	0	100	32768	÷		VYT.AN
*>	1.1.01.1.01.1.01	/8 0010.9/00.0003	ں 1 1 1 2 1 2 1	3 13 21.	2011	т		VIAUN
	[2] • [0] • [201] • [2 2 2 2 2	0	100	32768	÷		VYT.AN
* i	[2] • [0] • [201] • [48 0010.9400.0005	51•[0]•[201	1	52700	-		V 2311711V
1	[2] • [0] • [201] • [3 3 3 3	0	100	0	÷	3 3 3 3	VYT.AN
* ;	1.1.01.1.01.1.01	18 0010.9/00.000F	, N. C.S.J. 1	1 1 A 21 · [2011	Ť	5.5.5.5	VIAUN
1	[2] • [0] • [201] • [0	100	0	i	3 3 3 3	<u>νγ</u> τ.δΝ
*>	[2] • [0] • [201] • [2	18 e8c5:7a76:581c	ں ۱۰٫۱۰٫۱۲ ۱۲ ۱	3 13 11.	2011	Ŧ	5.5.5.5	V 23 LL 11 V
	[2].[0].[201].[2 2 2 2 2	0	100	30768	÷		ταντ λη
* ;	1.1.001.001.0011.0	2.2.2.2	U 1 N 1 22 1 4	1 1 1 1 1 · r	2011	Ŧ		VALAN
T	[2].[0].[201].[40, e000.7aa0.7000	0	100	201]	-	、、、、、 、	τοντ λη
* \	[2].[0].[2001].		U 201010101000	100	0	T	5.5.5.5	VALAN
^ >	[2]:[0]:[3001]:			100	22760	-		17.VT 7 NT
+ \	[0].[0].[00.1].		U 2 - 1 - 1 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -	100 121.120	32768 011	T		VXLAN
^ >	[2]:[0]:[3001]:	[48,0010:9400:000	JC]:[128,30	100				5757T 3 3 T
± >	[0] . [0] . [0001] .		U	LUU	32768	l		VXLAN
*>	[2]:[0]:[3001]:	[48, e8C5: /a/6:58]	.a]:[128,30	101::1][30	UIJ			
		2.2.2.2	U 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	100	32768	l		VXLAN
* 1	[2]:[0]:[3002]:	[48,0010:9400:000	08]:[0]:[d	102]	0			
		3.3.3.3	0	100	0	l	3.3.3.3	VXLAN
* 1	[2]:[0]:[3002]:	[48,0010:9400:000	b]:[128,30	02::2][30	02]			
		3.3.3.3	0	100	0	i	3.3.3.3	VXLAN
* i	[2]:[0]:[3002]:	[48,e8c5:7aa8:7ck	3]:[128,30	02::1][30	02]			
		3.3.3.3	0	100	0	i	3.3.3.3	VXLAN
*>	[3]:[201]:[32,2	.2.2.2]						
		2.2.2.2	0	100	32768	i		VXLAN
* i	[3]:[201]:[32,3	.3.3.3]						
		3.3.3.3	0	100	0	i	3.3.3.3	VXLAN
*>	[3]:[3001]:[32,	2.2.2]						
		2.2.2.2	0	100	32768	i		VXLAN
* i	[3]:[3002]:[32,	3.3.3.3]						
		3.3.3.3	0	100	0	i	3.3.3.3	VXLAN
RD[3	.3.3.3:111							
*>i	[2]:[0]:[201]:[48,0010:9400:0005	51:[0]:[201	1				
	[2]•[0]•[201]•[3 3 3 3	0	100	0	i	3 3 3 3	VXLAN
*>i	[2] • [0] • [201] • [48,0010.9400.0005	51•[32_14_1	4 14 21 • [2011	-	5.5.5.5	V 11 11 11 11 11 11 11 11 11 11 11 11 11
× 1	[2] • [0] • [201] • [3 3 3 3	0	100	0	i	3 3 3 3	VXT.AN
*>;	[2] • [0] • [201] • [2	18 e8c5:7aa8:7cb3	ں 1 ، 1 ، 1 ، 1	л 1л 11•г	2011	Ŧ	5.5.5.5	V 2311711V
✓⊥	[2]•[0]•[201]•[3 3 3 3	, , , , , , , , , , , , , , , , , , ,	100	∠v⊥] ∩	;	3 3 3 3	۲/VT א אז
*>:	[2].[0].[2]		U 101.101.101	1021	U	T	J.J.J.J	VАЦАN
· ∕⊥	[2].[0].[3002]:		,	100	0	:	、、、、、 、、、、、、、、、、、、、、、、、、、、、、、、、、、、、、、	۲/۲/۲ אי ז
* \ '	[0].[0].[000].		\mathbf{v}		0.01	T	3.3.3.3	VALAN
^ <i>></i> l	[2]:[0]:[3002]:	[48,0010:9400:000	אטן:נעא,30	02::2][30	UZJ			

		3.3.3.3	0	10	0 0	i	3.3.3.3	VXLAN
*>i [2]:[0]:[3002]:[4	8,e8c5:7aa	8:7cb3]:[128,	,3002::1]	[3002]			
		3.3.3.3	0	10	0 0	i	3.3.3.3	VXLAN
*>i [3]:[201]:[32,3.3	.3.3]	<u>_</u>	1.0				
4×1 [0	1	3.3.3.3	0	10	0 0	l	3.3.3.3	VXLAN
^>1 [3]:[3002]:[32,3.	3.3.3]	0	1.0	0 0	-	2 2 2 2	1757T 7 NT
		3.3.3.3	U	10	0 0	Ţ	3.3.3.3	VXLAN
Total n	umber of prefix	es 26						
PE2# sh	ow nvo vxlan ar	p-						
arp-cac	he arp-nd							
PE2# sh	ow nvo vxlan ar	p-cache						
VXLAN A	RP-CACHE Inform	ation						
VNID	==================== Ip-Addr	===== Mac-Ad	dr Type	e	Age-Out	Retr	ies-Left	
201	13.13.13.1	e8c5.7	a76.581d Stat	tic Local				
201	13.13.13.2	0010.9	400.0003 Dyna	amic Loca	⊥			
201	14.14.14.1	e8c5./	aa8./CD3 Stat	tic Remot	e			
ZUI	14.14.14.2	0010.9	400.0005 Dyna	amic Remo	te			
DECH -h	umper of entrie	s are 4						
PEZ# SN	ow evpn irb-sta	tus						
IRB 15 .	ACTIVE in Hardw	are						
PLZ#								
PE4#sho	w nyo yxlan tun	nel						
VXLAN N	etwork tunnel E	ntries						
Source	Desti	nation	Status	Up/Do	wn	Update		
				========	=========		====	
3.3.3.3	7.7.7	.7	Installed	00:01	:28	00:01:2	28	
3.3.3.3	2.2.2	.2	Installed	00:01	:28	00:01:	28	
_		_						
Total n	umber of entrie	s are 2						
PE4#sho	w clns neighbor	S						
Total n	umber of L1 adi	acencies	1					
Total n	umber of 12 adj	acencies.	1					
TOLAL II	umber of 12 auj		T					
TOLAL II	UNDE: OI adjace	ncies: z						
Tay I.	VKr . Uelault	CND3		Ctata			Ductorel	
System	iu interia	Ce SNPA	4h71 £10 a	State	AOTACTINE	= iype	PIOLOCOL	
PEO	xeb	0000.	40/1.1120	Up	25	ЦЦ Т 2	12-12	
				υþ	20	ЦZ	12-12	
Total n	umber of L1 adi	acencies:	0					
Total n	umber of L2 adi	acencies:	1					
Total n	umber of adiace	ncies: 1						
Tag 2:	VRF : L3VRF2							
System	Id Interfa	ce SNPA		State	Holdtime	e Tvpe	Protocol	
Spirent	-1 irb2001	0010.	9400.0005	Up	28	L2	IS-IS	
-				-				

```
Total number of L1 adjacencies: 0
Total number of L2 adjacencies: 1
Total number of adjacencies: 1
Tag 3: VRF : L3VRF2
System Id
               Interface
                           SNPA
                                                State Holdtime Type Protocol
               irb3002
                           0010.9400.000b
                                                       28
                                                                 L2
Spirent-1
                                               Up
                                                                      IS-IS
PE4#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"
             2.2.2/32 [115/30] via 60.1.1.1, xe5, 00:01:46
i L2
С
             3.3.3.3/32 is directly connected, lo, 02:09:52
i Ll
             7.7.7.7/32 [115/30] via 60.1.1.1, xe5, 00:01:46
             20.1.1.0/24 [115/30] via 60.1.1.1, xe5, 00:01:46
i Ll
i Ll
             50.1.1.0/24 [115/20] via 60.1.1.1, xe5, 00:01:46
             60.1.1.0/24 is directly connected, xe5, 00:02:02
С
i Ll
             80.1.1.0/24 [115/20] via 60.1.1.1, xe5, 00:01:46
С
             127.0.0.0/8 is directly connected, lo, 02:09:52
IP Route Table for VRF "management"
             10.12.98.0/24 is directly connected, eth0, 02:09:52
С
С
             127.0.0.0/8 is directly connected, lo.management, 02:09:52
IP Route Table for VRF "L3VRF2"
             2.2.2/32 [0/0] is directly connected, tunvxlan2, 00:01:42
В
             7.7.7/32 [0/0] is directly connected, tunvxlan2, 00:01:42
R
             13.13.13.0/24 [200/0] via 2.2.2.2 (recursive is directly connected,
В
tunvxlan2), 00:01:42
С
             14.14.14.0/24 is directly connected, irb2001, 02:09:52
             17.17.17.0/24 [200/0] via 7.7.7.7 (recursive is directly connected,
R
tunvxlan2), 00:01:42
             127.0.0.0/8 is directly connected, lo.L3VRF2, 02:09:52
С
IP Route Table for VRF "L2VRF2"
Gateway of last resort is not set
PE4# show bgp 12vpn evpn
BGP table version is 3, local router ID is 3.3.3.3
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

N	letwork	Next Hop	Metric	LocPrf	Wei	ght	Path	Peer	Encap
RD[74	400:11]								
*>i	[5]:[0]:[0]:[2	4]:[17.17.17.0]:[0	0.0.0]:	[2000]					
		7.7.7.7	0	100	0	i	7.7.7.7		VXLAN
*>i	[5]:[0]:[0]:[6	4]:[8002::]:[::]:[[2000]						
		7.7.7.7	0	100	0	i	7.7.7.7		VXLAN
הסומס	1000.111								
*>i	[5]•[0]•[0]•[2	41.13 13 13 01.10	0 0 01.	[2000]					
× ±	[0].[0].[0].[2	2.2.2.2	0	100	0	?	2.2.2.2		VXLAN
*>i	[5]:[0]:[0]:[6	4]:[3001::]:[::]:[2000]	200	0	•			
		2.2.2.2	0	100	0	?	2.2.2.2		VXLAN
RD[2	.2.2.2:11]								
*>i	[2]:[0]:[201]:	[48,0010:9400:0003	3]:[0]:[20	01]					
		2.2.2.2	0	100	0	i	2.2.2.2		VXLAN
*>1	[2]:[0]:[201]:	[48,0010:9400:0003	3]:[32 , 13.	.13.13.2]:[2	201]	2			5757T 7 NT
*/:	[2].[0].[20].[20].	Z.Z.Z.Z	U C1 CC1.IV	12 12 11. [7	0	T	2.2.2.2		VXLAN
	[2].[0].[201].	2 2 2 2	1].[J2,1J. N	100	01]	i	2 2 2 2		WXT.AN
*>i	[2]:[0]:[3001]	:[48,0010:9400:000)cl:[0]:[3	30011	0	-			V 23 LL 11 V
	[_].[.].[]	2.2.2.2	0	100	0	i	2.2.2.2		VXLAN
*>i	[2]:[0]:[3001]	:[48,0010:9400:000	c]:[128,3	3001::2][300)1]				
		2.2.2.2	0	100	0	i	2.2.2.2		VXLAN
*>i	[2]:[0]:[3001]	:[48,e8c5:7a76:581	ld]:[128,3	3001 :: 1][300	01]				
		2.2.2.2	0	100	0	i	2.2.2.2		VXLAN
*>i	[3]:[201]:[32,	2.2.2]							
		2.2.2.2	0	100	0	i	2.2.2.2		VXLAN
*>i	[3]:[3001]:[32	,2.2.2.2]	0	100	0				
		2.2.2.2	0	100	0	1	2.2.2.2		VXLAN
RD[3	.3.3.3:11] VRF[L2VRF21:							
* i	[2]:[0]:[201]:	[48,0010:9400:0003	8]:[0]:[20	01]					
		2.2.2.2	0	100	0	i	2.2.2.2		VXLAN
* i	[2]:[0]:[201]:	[48,0010:9400:0003	3]:[32,13.	.13.13.2]:[2	201]				
		2.2.2.2	0	100	0	i	2.2.2.2		VXLAN
*>	[2]:[0]:[201]:	[48,0010:9400:0005	5]:[0]:[20	01]					
		3.3.3.3	0	100	32768	i		_	VXLAN
*>	[2]:[0]:[201]:	[48,0010:9400:0005	5]:[32,14.	.14.14.2]:[2	201]				
WXT.AN	N.	3.3.3.3	0	100	32	2768	i		
* i	[2]:[0]:[201]:	[48,e8c5:7a76:581c	11:[32.13.	.13.13.11:[2	2011				
-		2.2.2.2	0	100	0	i	2.2.2.2		VXLAN
*>	[2]:[0]:[201]:	[48,e8c5:7aa8:7cb3	3]:[32,14.	.14.14.1]:[2	201]				
		3.3.3.3	0	100	32	2768	i		
VXLAI	N			0.011					
* i	2 : 0 : 3001]	: 48,0010:9400:000)c : 0 :[3	3001					

	2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
* i	[2]:[0]:[3001]:[48,0010:9400:0	000c]:[128,3	001::2][3	001]			
	2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
* i	[2]:[0]:[3001]:[48,e8c5:7a76:	581d]:[128,3	001::1][3	001]			
	2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>	[2]:[0]:[3002]:[48,0010:9400:0	000b]:[0]:[3	002]				
	3.3.3.3	0	100	32768	i		VXLAN
*>	[2]:[0]:[3002]:[48,0010:9400:0	000b]:[128,3	002::2][3	002]			
	3.3.3.3	0	100	32768	i		VXLAN
*>	[2]:[0]:[3002]:[48,e8c5:7aa8:	7cb3]:[128,3	002 :: 1][3	002]			
	3.3.3.3	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
*>	[3]:[201]:[32,3.3.3.3]						
	3.3.3.3	0	100	32768	i		VXLAN
* i	[3]:[3001]:[32,2.2.2.2]						
	2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>	[3]:[3002]:[32,3.3.3.3]						
	3.3.3.3	0	100	32768	i		VXLAN

Total number of prefixes 28

ISIS Validation

PE2#show nvo VXLAN Network	vxlan tunnel tunnel Entr:	les									
Source	Destinat	Lon	Status	Up/Do	wn	Update					
2.2.2.2	3.3.3.3		Installed	00:00	:10	00:00:1	10				
Total number of entries are 1 PE2#show clns neighbors Total number of L1 adjacencies: 1 Total number of L2 adjacencies: 1 Total number of adjacencies: 2 Tag 1: VRF : default											
System Id PE5	Interface pol	SNPA b86a.9	9725.a7f2	State Up Up	Holdtime 28 28	e Type L1 L2	Protocol IS-IS IS-IS				
Total number Total number Total number Tag 2: VRF :	of L1 adjacer of L2 adjacer of adjacencie L3VRF2	ncies: (ncies: 1 es: 1)								
System Id Spirent-1	Interface irb2001	SNPA 0010.9	9400.0003	State Up	Holdtime 28	e Type L2	Protocol IS-IS				
Total number Total number Total number Tag 3: VRF :	of L1 adjacer of L2 adjacer of adjacencie L3VRF2	ncies: 0 ncies: 1 es: 1)								
System Id	Interface	SNPA		State	Holdtime	е Туре	Protocol				

```
Spirent-1
              irb3001
                          0010.9400.000c
                                                      28
                                                               L2
                                                                     IS-IS
                                              Up
PE2#
PE2#
PE2#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"
             2.2.2/32 is directly connected, lo, 02:13:57
С
i L2
             3.3.3.3/32 [115/30] via 20.1.1.2, po1, 00:00:32
             7.7.7.7/32 [115/40] via 20.1.1.2, pol, 01:05:49
i Ll
             20.1.1.0/24 is directly connected, po1, 02:13:21
С
i Ll
             50.1.1.0/24 [115/20] via 20.1.1.2, po1, 01:06:05
i Ll
             60.1.1.0/24 [115/30] via 20.1.1.2, po1, 00:00:47
             80.1.1.0/24 [115/30] via 20.1.1.2, po1, 01:05:49
i Ll
             127.0.0.0/8 is directly connected, lo, 02:13:57
С
IP Route Table for VRF "management"
С
             10.12.98.0/24 is directly connected, eth0, 02:13:57
             127.0.0.0/8 is directly connected, lo.management, 02:13:57
С
IP Route Table for VRF "L3VRF2"
             3.3.3/32 [0/0] is directly connected, tunvxlan2, 00:00:28
В
С
             13.13.13.0/24 is directly connected, irb2001, 02:13:57
             14.14.14.0/24 [200/0] via 3.3.3.3 (recursive is directly connected,
В
tunvxlan2), 00:00:28
             127.0.0.0/8 is directly connected, lo.L3VRF2, 02:13:57
С
IP Route Table for VRF "L2VRF2"
Gateway of last resort is not set
PE2# show 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,
              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
               Next Hop
                                   Metric LocPrf
                                                          Weight
                                                                      Path
 Peer
             Encap
```

RD[6	3000:11]						
*>i	[5]:[0]:[24]:[14.14.	14.0]:[0.0.0.0]	:[2000]				
	3.3.3.3	0	100	0	?	3.3.3.3	VXLAN
*>i	[5]:[0]:[0]:[64]:[3002::]:[::]:[2000]					
	3.3.3.3	0	100	0	?	3.3.3.3	VXLAN
RD[2	.2.2.2:11] VRF[L2VRF2]:						
*>	[2]:[0]:[201]:[48,0010:9	400:0003]:[0]:[201]				
	2.2.2.2	0	100	32768	i		VXLAN
*>	[2]:[0]:[201]:[48,0010:9	400:0003]:[32,1	3.13.13.2]	:[201]			
	2.2.2.2	0	100	32768	i		VXLAN
* i	[2]:[0]:[201]:[48,0010:9	400:0005]:[0]:[201]				
	3.3.3.3	0	100	0	i	3.3.3.3	VXLAN
* i	[2]:[0]:[201]:[48,0010:9	400:0005]:[32,1	4.14.14.2]	:[201]			
	3.3.3.3	0	100	0	i	3.3.3.3	VXLAN
*>	[2]:[0]:[201]:[48,e8c5:7	a76:581d]:[32.1	3.13.13.11	:[201]			
	2.2.2.2	0	100	32768	i i		VXLAN
* i	[2]:[0]:[201]:[48.e8c5:7	aa8:7cb3]:[32.1	4.14.14.11	:[201]	_		******
-	3 3 3 3	0	100	0	i	२ २ २ २	VXT.AN
*>	$[2] \cdot [0] \cdot [3001] \cdot [48,0010 \cdot$	9400.000001.001.	[3001]	0	-	0.0.0.0	v / 1111 11 v
-	2 2 2 2	0	100	32768	i		VXT.AN
*>		9400.00001.[128	300121	30011	-		V 711111
	2 2 2 2	0	100	32768	÷		UVT AN
*>	[2].[0].[3001].[48 e8c5.	√ 7∍76•581d1•[128	3001111	30011	Ŧ		VALAN
		/a/0.5010].[120	100	32768	÷		τα τα τ
* :		0400.00061.01.	120021	52700	Т		VIAN
Ϋ́		9400:000b]:[0]:	[3002]	0	-		ταντ λη
* :		U 0400.000bl.[129	100 101	0	T	3.3.3.3	VALAN
^ 1	[2]:[0]:[3002]:[48,0010:	9400:0001:[128	,3002::2][3002]	2		1717 T NT
ч !	3.3.3.3	U 1 0	100 2000 - 11	0	1	3.3.3.3	VXLAN
^ 1	[2]:[0]:[3002]:[48,e8C5:	/aa8:/cb3]:[128	,3002::1][3002]			
	3.3.3.3	0	100	0	1	3.3.3.3	VXLAN
*>	[3]:[201]:[32,2.2.2.2]	0	1.0.0				
	2.2.2.2	0	100	32768	l		VXLAN
* i	[3]:[201]:[32,3.3.3.3]						
	3.3.3.3	0	100	0	i	3.3.3.3	VXLAN
*>	[3]:[3001]:[32,2.2.2.2]						
	2.2.2.2	0	100	32768	i		VXLAN
* i	[3]:[3002]:[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	[2]:[0]:[201]:[48,0010:9	400:0005]:[0]:[201]				
	3.3.3.3	0	100	0	i	3.3.3.3	VXLAN
*>i	[2]:[0]:[201]:[48,0010:9	400:0005]:[32,1	4.14.14.2]	:[201]			
	3.3.3.3	0	100	0	i	3.3.3.3	VXLAN
*>i	[2]:[0]:[201]:[48,e8c5:7	aa8:7cb3]:[32,1	4.14.14.1]	:[201]			
	3.3.3.3	0	100	0	i	3.3.3.3	VXLAN
*>i	[2]:[0]:[3002]:[48,0010:	9400:000b]:[0]:	[3002]				
	3.3.3.3	0	100	0	i	3.3.3.3	VXLAN
*>i	[2]:[0]:[3002]:[48,0010:	9400:000b]:[128	,3002::2][3002]			

	3	.3.3.3	0	10	0 0	i	3.3.3.3	VXLAN
*>i [2	:[0]:[3002]:[48	,e8c5:7aa8	:7cb3]:[128,	3002::1]	[3002]			
	3	.3.3.3	0	10	0 0	i	3.3.3.3	VXLAN
*>i [3	3]:[201]:[32,3.3.	3.3]						
	3	.3.3.3	0	10	0 0	i i	3.3.3.3	VXLAN
*>i [3	3]:[3002]:[32,3.3	.3.3]						
	3	.3.3.3	0	10	0 0	i i	3.3.3.3	VXLAN
Total n PE2#	number of prefixe show nvo vx	s 26 lan arp-						
PE2#	show nvo vx	lan arp-ca	che					
VXLAN A	RP-CACHE Informa	tion						
VNID	Ip-Addr	Mac-Add:	с Туре		Age-Out	Retr	ies-Left	
201	13.13.13.1	e8c5.7a	76.581d Stat	ic Local				
201	13.13.13.2	0010.94	00.0003 Dyna	mic Loca	l			
201	14.14.14.1	e8c5.7aa	a8.7cb3 Stat	ic Remot	e			
201	14.14.14.2	0010.94	00.0005 Dyna	mic Remo	te			
Total n	umber of entries	are 4						
PE2# sh	low evpn irb-stat	us						
IRB is	ACTIVE in Hardwa	re						
PE2#								
PE4#sho	w nvo vxlan tunn	el						
VXLAN N	letwork tunnel En	tries						
Source	Destin	ation	Status	Up/Do	wn	Update		
3.3.3.3	7.7.7.	 7	Installed	00:01	:28	00:01:2	28	
3.3.3.3	2.2.2.	2	Installed	00:01	:28	00:01:2	28	
Total n PE4#sho	number of entries ww clns neighbors	are 2						
Total n Total n Total n Tag 1:	number of L1 adja number of L2 adja number of adjacen VRF : default	cencies: 1 cencies: 1 cies: 2						
System	Id Interfac	e SNPA	71 £10 -	State	Holdtime	e Type	Protocol	
PEO	xes	0000.4)/1.112C	Up Up	25 25	L1 L2	IS-IS IS-IS	
Total n Total n Total n Tag 2:	number of L1 adja number of L2 adja number of adjacen VRF : L3VRF2	cencies: 0 cencies: 1 cies: 1						
System	Id Interfac	e SNPA		State	Holdtime	е Туре	Protocol	
Spirent	irb2001	0010.94	400.0005	Up	28	L2	IS-IS	

```
Total number of L1 adjacencies: 0
Total number of L2 adjacencies: 1
Total number of adjacencies: 1
Tag 3: VRF : L3VRF2
System Id
               Interface
                           SNPA
                                                State Holdtime Type Protocol
Spirent-1
               irb3002
                           0010.9400.000b
                                                       28
                                                                 L2
                                               Up
                                                                      IS-IS
PE4#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"
             2.2.2/32 [115/30] via 60.1.1.1, xe5, 00:01:46
i L2
С
             3.3.3.3/32 is directly connected, lo, 02:09:52
i Ll
             7.7.7.7/32 [115/30] via 60.1.1.1, xe5, 00:01:46
             20.1.1.0/24 [115/30] via 60.1.1.1, xe5, 00:01:46
i Ll
i Ll
             50.1.1.0/24 [115/20] via 60.1.1.1, xe5, 00:01:46
             60.1.1.0/24 is directly connected, xe5, 00:02:02
С
i Ll
             80.1.1.0/24 [115/20] via 60.1.1.1, xe5, 00:01:46
С
             127.0.0.0/8 is directly connected, lo, 02:09:52
IP Route Table for VRF "management"
             10.12.98.0/24 is directly connected, eth0, 02:09:52
С
С
             127.0.0.0/8 is directly connected, lo.management, 02:09:52
IP Route Table for VRF "L3VRF2"
             2.2.2/32 [0/0] is directly connected, tunvxlan2, 00:01:42
В
             7.7.7/32 [0/0] is directly connected, tunvxlan2, 00:01:42
R
             13.13.13.0/24 [200/0] via 2.2.2.2 (recursive is directly connected,
В
tunvxlan2), 00:01:42
С
             14.14.14.0/24 is directly connected, irb2001, 02:09:52
             17.17.17.0/24 [200/0] via 7.7.7.7 (recursive is directly connected,
R
tunvxlan2), 00:01:42
             127.0.0.0/8 is directly connected, lo.L3VRF2, 02:09:52
С
IP Route Table for VRF "L2VRF2"
Gateway of last resort is not set
PE4# show bgp 12vpn evpn
BGP table version is 3, local router ID is 3.3.3.3
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 – 1 5 – 1	Ethernet Segm Prefix Route	ent Route						
N Enca	etwork p	Next Hop	Metric	LocPrf	Weig	ht	Path P	eer
RD[74	400:11]							
*>i	[5]:[0]:[0]:	[24]:[17.17.17.	0]:[0.0.0]:	[2000]				
		7.7.7.7	0	100	0	i	7.7.7.7	VXLAN
*>i	[5]:[0]:[0]:	[64]:[8002::]:[::]:[2000]					
		7.7.7.7	0	100	0	i	7.7.7.7	VXLAN
RD[6]	1000:11]							
*>i	[5]:[0]:[0]:	[24]:[13.13.13.		[2000]				
		2.2.2.2	0	100	0	?	2.2.2.2	VXLAN
*>i	[5]:[0]:[0]:	[64]:[3001::]:[::1:[2000]					
		2.2.2.2	0	100	0	?	2.2.2.2	VXLAN
RD[2	.2.2.2:11]							
*>i	[2]:[0]:[201]:[48,0010:9400	:0003]:[0]:[2	01]				
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>i	[2]:[0]:[201]:[48,0010:9400	:0003]:[32,13	.13.13.2]:	[201]			
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>i	[2]:[0]:[201]:[48,e8c5:7a76	:581d]:[32,13	.13.13.1]:	[201]			
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>i	[2]:[0]:[300	1]:[48,0010:940	0:000c]:[0]:[3001]				
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>i	[2]:[0]:[300	1]:[48,0010:940	0:000c]:[128,	3001::2][30	001]			
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>i	[2]:[0]:[300	1]:[48,e8c5:7a7	6:581d]:[128,	3001::1][30	001]			
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>i	[3]:[201]:[3	2,2.2.2.2]						
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>i	[3]:[3001]:[32,2.2.2.2]						
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
RD[3	.3.3.3:111 VR	F[L2VRF2]:						
* i	[2] · [0] · [201	1 • [48,0010 • 9400	• 0 0 0 3 1 • [0 1 • [2	011				
-	[2] • [0] • [201	2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
* i	[2]:[0]:[20]	1:[48.0010:9400	:00031:[32.13	.13.13.21:	2011	-		******
-	[2] • [0] • [201	2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>	[2]:[0]:[201	1:[48,0010:9400	:00051:[0]:[2	011	0	-		******
	[_] . [.] . [3.3.3.3	0	100	32768	i i		VXLAN
*>	[2]:[0]:[201	1:[48,0010:9400	:00051:[32,14	.14.14.21:	2011	_		
	[2].[0].[201	3.3.3.3	0	100	32768	i i		VXLAN
* i	[2]:[0]:[201	1:[48.e8c5:7a76	:581d]:[32,13	.13.13.11:	2011	_		
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN
*>	[2]:[0]:[201]:[48,e8c5:7aa8	.7cb3]:[32,14	.14.14.11:	2011	-	– . –	
		3.3.3.3	0	100	32768	i i		VXLAN
* i	[2]:[0]:[300	1]:[48,0010:940	1:101:1000c1	30011		-		
		2.2.2.2	0	100	0	i	2.2.2.2	VXLAN

* i	[2]:[0]:[3001]:[48,0010	0:9400:000c]:[1	28,3001::2]	[3001]				
	2.2.2.	2 0	100	0	i	2.2.2.2	VXLAN	
* i	[2]:[0]:[3001]:[48,e8c5	5:7a76:581d]:[1	28,3001::1]	[3001]				
	2.2.2.	2 0	100	0	i	2.2.2.2	VXLAN	
*>	[2]:[0]:[3002]:[48,0010:9400:000b]:[0]:[3002]							
	3.3.3.3	3 0	100	32768	i		VXLAN	
*>	[2]:[0]:[3002]:[48,0010	0:9400:000b]:[1	28,3002::2]	[3002]				
	3.3.3.3	3 0	100	32768	i		VXLAN	
*>	[2]:[0]:[3002]:[48,e8c5:7aa8:7cb3]:[128,3002::1][3002]							
	3.3.3.3	3 0	100	32768	i		VXLAN	
* i	[3]:[201]:[32,2.2.2]							
	2.2.2.	2 0	100	0	i	2.2.2.2	VXLAN	
*>	[3]:[201]:[32,3.3.3.3]							
	3.3.3.3	3 0	100	32768	i		VXLAN	
* i	[3]:[3001]:[32,2.2.2.2]]						
	2.2.2.	2 0	100	0	i	2.2.2.2	VXLAN	
*>	[3]:[3002]:[32,3.3.3.3]]						
	3.3.3.3	3 0	100	32768	i		VXLAN	

Total number of prefixes 28

Abbreviations

The following are some key abbreviations and their meanings relevant to this document:

Acronym	Description
ECMP	Equal-Cost Multipath
EVPN	Ethernet Virtual Private Network
VxLAN	Virtual Extensible LAN
SR	Segment Routing
IRB	Integrated Routing
OSPF	Open Shortest Path First
ISIS	Intermediate System to Intermediate System

Glossary

The following provides definitions for key terms used throughout this document.

Single Home VxLAN	This refers to a Virtual Extensible LAN (VxLAN) deployment where a single data center or network site is connected to a single external network (usually the internet) for connectivity.
IRB	A networking feature that enables the integration of Layer 3 IP routing and Layer 2 MAC address bridging within the same interface, simplifying network management and resource utilization.

OSPF	A dynamic and efficient link-state routing protocol used to determine the best path for data packets in an IP network. It is characterized by rapid convergence and adaptability, making it suitable for large and dynamic networks.
ISIS	A routing protocol designed for scalability and stability in computer networks, commonly used in large Service Provider networks. It provides a robust framework for routing information exchange.
Layer 3 Routing	Network routing operations at the Network Layer (Layer 3) of the OSI model, focusing on routing IP packets between different subnets or networks.
Layer 2 Bridging	Network bridging operations at the Data Link Layer (Layer 2) of the OSI model, handling the forwarding of data frames based on MAC addresses within the same network segment.
EVPN	Ethernet VPN, a technology that provides advanced and efficient methods for Layer 2 and Layer 3 services in Ethernet networks, often used in data centers and service provider environments.

CHAPTER 8 Multi Home VxLAN-EVPN IRB with OSPF or ISIS

Overview

The support for Open Shortest Path First (OSPF) and Intermediate System to Intermediate System (ISIS) protocols on Virtual Extensible LAN (VxLAN) Integrated Routing (IRB) interface is enhanced with multihoming switches that provides the solution for connecting and managing virtual networks within a data center or network infrastructure.

This feature offers flexibility in configuring network topologies, and ensures compatibility and interoperability within diverse network environments.

Note: Configure mutually exclusive secondary IP subnets between each anycast-IRB and CE within the same L2VNI in multi-homing scenarios or when the same IRB anycast interface is configured on multiple nodes. This ensures unique identification of the routing protocol peer.

Feature Characteristics

The OSPF and ISIS support over the IRB Interface with multihoming feature has the following characteristics:

• Connect the host node to two VTEPs with all-active redundancy mode. It helps forward all traffic from VTEP to the host when one VTEP goes down.

Benefits

The OSPF and ISIS support over the IRB Interface has the following benefits:

• Uninterrupted service between host and VTEP.

Prerequisites

- Router must be up and running.
- Maintain synchronization with VRF changes by performing IRB shut/no shut actions when specific events occur within the IPVRF. These events may involve adding or removing Route Targets (RTs), updating Route Distinguishers (RDs), or modifying Layer 3 Virtual Network Identifiers (L3VNIs).

Topology for OSPF

The network topology includes various network elements such as routers, customer edge (CE) devices, Service Aggregator (SA) devices, and Provider Edge (PE) routers. The feature enables OSPF on the IRB interfaces, allowing for efficient routing and communication between network devices within the topology.



Configuration

Perform the following configurations to set up different interfaces, routing protocols, and BGP parameters to enable VXLAN, IRB, and EVPN functionality with multihoming in the network.

Configure OSPF Router

Perform the following configurations to create multiple VxLAN interfaces and set up OSPF routing process on PE1 node.
PE1(config)#vlan database	Enter the VLAN configuration mode.
PE1(config-vlan)# vlan 200-201 bridge 1 state enable	Enable VLAN (200-201) on bridge 1. Specifying the enable state allows forwarding of frames on this VLAN-aware bridge.
PE1(config-vlan)#interface sal	Enter sa1 interface mode.
PE1(config-if)# switchport	Configure port as L2.
PE1(config-if) # bridge-group 1	Associate the interface with bridge group 1.
<pre>PE1(config-if) # switchport mode trunk</pre>	Set the switching characteristics of this interface to trunk mode.
<pre>PE1(config-if) # switchport trunk allowed vlan add 200-201</pre>	Enable VLAN ID 200-201 on this port.
<pre>PE1(config-if) # load-interval 30</pre>	Configures the load-interval for monitoring traffic on the sa1 interface.
PE1(config-if)# exit	Exit from sa1 interface configuration mode.
PE1(config)#interface ce0	Enter ce0 interface mode.
<pre>PE1(config-if) # static-channel-group 1</pre>	Make it member port of sa1
PE1(config-if)#interface lo	Configures the loopback (lo) interface.
<pre>PE1(config-if)# ip address 1.1.1.1/32 secondary</pre>	Assigns a secondary the IP address 1.1.1.1/32 to the loopback interface.
<pre>PE1(config-if)# ipv6 address ::1/128</pre>	Assigns the IPv6 address ::1/128 to the loopback interface.
PE1(config-if)#interface vlan1.200	Enter interface VLAN1.200 configuration mode.
<pre>PE1(config-if)# ip address 101.11.11.1/ 24</pre>	Assigns the primary IP address.
<pre>PE1(config-if) # ip address 16.16.16.1/24 secondary</pre>	Assigns the secondary IP address.
<pre>PE1(config-if) # ip address 17.17.17.1/24 secondary</pre>	Assigns the secondary IP address.
PE1(config-if) # exit	Exit from VLAN interface configuration mode.
PE1(config)#interface xe2	Enter xe2 interface configuration mode.
<pre>PE1(config-if) # load-interval 30</pre>	Configures the load-interval for monitoring traffic on the xe2 interface.
PE1(config-if)#interface xe2.103	Enter VLAN ID 103 interface config mode.
<pre>PE1(config-if) # encapsulation dot1q 103</pre>	Setting Encapsulation to dot1q with VLAN ID 103.
<pre>PE1(config-if)# ip address 20.1.1.1/24</pre>	Assigns the primary IP address.
PE1(config-if) # exit	Exit from xe2 VLAN interface configuration mode.
PE1(config)#interface xe23	Enter xe23 interface configuration mode.
PE1(config-if) # static-channel-group 1	Configure static channel 1 member port
PE1(config)#router ospf 1	Enters the OSPF configuration mode for OSPF process 1.
PE1(config-router)# network 16.16.16.0/ 24 area 0.0.0.0	Advertises the network 16.16.16.0/24 into OSPF area 0.0.0.0.
PE1(config-router)# network 17.17.17.0/ 24 area 0.0.0.0	Advertises the network 17.17.17.0/24 into OSPF area 0.0.0.0.
PE1(config-router) # network 20.1.1.0/24 area 0.0.0.0	Advertises the network 20.1.1.0/24 into OSPF area 0.0.0.0.

Configure ISIS Router

Perform the following configurations to create multiple VxLAN interfaces and set up ISIS routing process on PE2 node.

PE2(config)#vlan database	Enter the VLAN configuration mode.
PE2(config-vlan) # vlan 100-101 bridge 1 state enable	Enable VLAN (100-101) on bridge 1. Specifying the enable state allows forwarding of frames on this VLAN-aware bridge
PE2(config-vlan)#interface po1	Enter po1 interface mode.
PE2(config-if) # switchport	Configure port as L2.
PE2(config-if)# bridge-group 1	Associate the interface with bridge group 1.
<pre>PE2(config-if) # switchport mode trunk</pre>	Set the switching characteristics of this interface to trunk mode.
<pre>PE2(config-if) # switchport trunk allowed vlan add 100-101</pre>	Enable VLAN ID 100-101 on this port.
<pre>PE2(config-if) # load-interval 30</pre>	Configures the load-interval for monitoring traffic on the po1 interface.
PE2(config-if)#interface lo	Configure loopback interface
<pre>PE2(config-if) # ip address 2.2.2.2/32 secondary</pre>	Assign the secondary ip address to lo
PE2(config-if)#interface vlan1.100	Enter interface VLAN1.100 configuration mode.
PE2(config-if) # ip address 11.11.11.1/24	Assign primary IP address
<pre>PE2(config-if) # ip address 12.1.1.1/24 secondary</pre>	Assign secondary IP address towards MH node.
<pre>PE2(config-if)# ip address 13.1.1.1/24 secondary</pre>	Assign secondary address towards MH node
PE2(config-if)# ip router isis 1	Configure the isis
PE2(config-if) # exit	Exit from VLAN interface configuration mode.
PE2(config)#interface xell	Enter xe11 interface configuration mode.
PE2(config-if) # load-interval 30	Configures the load-interval for monitoring traffic on the xe11 interface.
PE2(config-if)#interface xel1.105	Configure subinterface xe11.105.
PE2(config-if) # encapsulation dot1q 105	Setting Encapsulation to dot1q with VLAN ID 105.
PE2(config-if) # load-interval 30	Configures the load-interval for monitoring traffic on the xe11 interface.
PE2(config-if)# ip address 10.1.1.1/24	Assign an IP address
PE2(config-if)# ip router isis 1	Configure interface as ISIS router
PE2(config-if) # exit	Exit from xe11 interface configuration mode.
PE2(config)#interface xe24	Enter xe24 interface configuration mode.
<pre>PE2(config-if) # channel-group 1 mode active</pre>	Configure the member port for po1 interface
PE2(config-if) # exit	Exit from xe24 interface configuration mode.
PE2(config-if)#interface xe26	Enter xe26 interface configuration mode.

PE2(config-if)# channel-group 1 mode active	Configure the member port for po1 interface
PE2(config)#router isis 1	Configure the ISIS router.
PE2(config-router)# is-type level-1-2	Configure level1-2 ISIS mode.
PE2(config-router)# metric-style wide	Configure metric style as wide.
PE2(config-router)# dynamic-hostname	Configure the hostname to be advertised for an ISIS 1 instance.
PE2(config-router)# bfd all-interfaces	Enable the Bidirectional Forwarding Detection (BFD) feature on all the interfaces enabled with this ISIS instance.
PE2(config-router)# net 49.0000.0000.0001.00	Set a Network Entity Title for this instance, specifying the area address and the system ID.
PE2(config-router)# redistribute connected	Redistribute the connected routes.

Configure VxLAN IRB with Multihoming for OSPF and ISIS Router

Perform the following configurations to create VxLAN IRB interfaces with multihoming for OSPF and ISIS routing process on PE7 and PE8 node.

PE7(config)#nvo vxlan enable	Enable VxLAN.
PE7(config)#nvo vxlan irb	Enable VxLAN IRB
PE7(config)#evpn esi hold-time 60	Configure hold time for the tunnels to come up during VxLAN initialization before making the esi up.
PE7(config)#evpn vxlan multihoming enable	Enable VxLAN multihome
PE7(config)#ip vrf management	Enter into VRF configuration mode.
PE7(config-vrf)#ip vrf L3VRF3	Create a VRF routing information base called L3VRF3 for OSPF router.
PE7(config-vrf)# rd 7100:11	Specify a route distinguisher for the VRF.
PE7(config-vrf) # route-target both 100:100	Add import and export route-target extended communities to the VRF.
PE7(config-vrf)# 13vni 1000	Configure the L3 Virtual Network Identifier for an IP VRF.
PE7(config-vrf)#ip vrf L3VRF4	Create a VRF routing information base called L3VRF4 for ISIS router.
PE7(config-vrf)# rd 7400:11	Specify a route distinguisher for the VRF.
PE7(config-vrf)# route-target both 101:101	Add import and export route-target extended communities to the VRF.
PE7(config-vrf)# 13vni 2000	Configure the L3 Virtual Network Identifier for an IP VRF.
PE7(config-vrf)#mac vrf L2VRF1	Create a L2 MAC VRF to use in EVPN routes.
PE7(config-vrf)# rd 7.7.7.7:11	Specify a route distinguisher for the MAC VRF.
PE7(config-vrf)# route-target both 7.7.7.100	Add import and export route-target extended communities to the VRF.
PE7(config-vrf)#mac vrf L2VRF2	Create a L2 MAC VRF to use in EVPN routes.
PE7(config-vrf)# rd 7.7.7.7:12	Specify a route distinguisher for the VRF.

PE7(config-vrf)# route-target both 7.7.7.101	Add import and export route-target extended communities to the VRF
PE7(config-vrf)#exit	Exit the VRF configuration mode.
PE7(config)#evpn irb-forwarding anycast- gateway-mac 0000.0000.1111	Configure common Anycast MAC address for all the IRB interfaces.
PE7(config)#interface irb701	Enter into IRB interface configuration mode to configure IRB interfaces for OSPF router.
PE7(config-irb-if)# ip vrf forwarding L3VRF3	Associate IRB interface with L3VRF3.
PE7(config-irb-if)# evpn irb-if-forwarding anycast-gateway-mac	Map the global anycast IRB MAC address with L3VRF3.
<pre>PE7(config-irb-if)# ip address 17.12.13.1/24 anycast</pre>	Configure an Anycast IP address.
PE7(config-irb-if)# ip address 16.16.16.2/24 secondary	Configure a secondary IP address.
PE7(config-irb-if)#exit	Exit from the IRB interface.
PE7(config-irb-if)#interface irb801	Enter into IRB interface configuration mode to configure IRB interfaces for ISIS router.
PE7(config-irb-if)# ip vrf forwarding L3VRF4	Associate IRB interface with L3VRF4.
PE7(config-irb-if)# evpn irb-if-forwarding anycast-gateway-mac	Map the global anycast IRB MAC address with L3VRF4.
PE7(config-irb-if)# ip address 12.13.14.2/24 anycast	Configure an Anycast IP address.
PE7(config-irb-if)# ip address 13.1.1.2/24 secondary	Configure a secondary IP address.
PE7(config-irb-if)# ip router isis 2	Configure ISIS router on IRB interface.
PE7(config-irb-if)#exit	Exit from the IRB interface.
PE7(config)#nvo vxlan vtep-ip-global 7.7.7.7	Configure the source VTEP IP address of the VxLAN tunnel.
PE7(config)#nvo vxlan id 701 ingress-	Add a tenant L2 VNID to the VxLAN. Specify
replication inner-vid-disabled	• ingress-replication to use head end replication for forwarding BUM traffic
	• inner-vid-disabled to not carry VID out of network port.
PE7(config-nvo) # vxlan host-reachability- protocol evpn-bgp L2VRF1	Associate the L2VRF1reachable protocol to Ethernet- VPN over BGP
PE7(config-nvo)# evpn irb701	Configure default gateway behavior for IRB interface irb701.
PE7(config-nvo) # vni-name VNI-701	Configure VNI name.
PE7(config-nvo)#exit	Exit from NVO mode.
PE7(config-nvo)#nvo vxlan id 801 ingress-	Add a tenant L2 VNID to the VxLAN. Specify
replication inner-vid-disabled	 ingress-replication to use head end replication for forwarding BUM traffic
	 inner-vid-disabled to not carry VID out of network port
PE7(config-nvo)# vxlan host-reachability- protocol evpn-bgp L2VRF2	Associate the L2VRF2reachable protocol to Ethernet- VPN over BGP

PE7(config-nvo)# evpn irb801	Configure default gateway behavior for IRB interface irb801.
PE7(config-nvo)# vni-name VNI-101	Configure VNI name.
PE7(config-nvo)#qos enable	Enable QoS.
PE7(config-nvo)#exit	Exit from NVO mode.
PE7(config)#interface pol	Configure po1 interface.
PE7(config-if)# switchport	Configure port as L2.
PE7(config-if) # load-interval 30	Configures the load-interval for monitoring traffic on the po1 interface.
PE7(config-if) # evpn multi-homed system-mac 0000.0000.7782	Configure system MAC as ESI value for po1 interface. VTEP1 and VTEP2 should have same ESI value.
PE7(config-if)#interface sal	Configure sa1 interface.
PE7(config-if)# switchport	Configure port as L2.
PE7(config-if)# load-interval 30	Configures the load-interval for monitoring traffic on the po1 interface.
PE7(config-if)# evpn multi-homed esi 00:01:02:03:04:05:06:07:08	Configure 9-octet ESI value for sa1 interface.
PE7(config-if-es)#interface sa2	Configure sa2 interface.
PE7(config-if)# load-interval 30	Configures the load-interval for monitoring traffic on the sa2 interface.
PE7(config-if)# ip address 80.1.1.1/24	Configure IP address.
PE7(config-if)# mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE7(config-if)# ip router isis 1	Configure ISIS router on sa2 interface.
PE7(config-if)#exit	Exit from the sa2 interface.
PE7(config)#interface sa3	Configure sa3 interface.
<pre>PE7(config-if) # load-interval 30</pre>	Configures the load-interval for monitoring traffic on the sa3 interface.
PE7(config-if)# ip address 22.1.1.1/24	Configure IP address.
PE7(config-if) # mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE7(config-if)#interface ce50	Configure ce50 interface.
PE7(config-if) # static-channel-group 1	Configure member port for sa3
PE7(config-if)#exit	Exit from ce50 interface configuration mode.
PE7(config)#interface lo	Configure loopback interface.
PE7(config-if)# ip address 7.7.7.7/32 secondary	Configure secondary IP address
PE7(config-if)#exit	Exit from the lo interface.
PE7(config)#interface xel	Configure xe1 interface.
<pre>PE7(config-if) # channel-group 1 mode active</pre>	Configure member port of po1 interface.
PE7(config-if)#interface xe39	Configure xe39 interface.
PE7(config-if)# static-channel-group 3	Configure member port of sa3 interface.
PE7(config-if)#interface xe40	Configure xe40 interface.
PE7(config-if)# static-channel-group 2	Configure member port of sa2 interface.
PE7(config-if)#exit	Exit from the xe40 interface.
PE7(config)#router ospf 1	Configure OSPF router.

PE7(config-router)# ospf router-id 7.7.7.7	Configure router id for OSPF.
PE7(config-router)# network 7.7.7.7/32 area 0.0.0.0	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 7.7.7.7/32
PE7(config-router) # network 22.1.1.0/24 area 0.0.0.0	Enable OSPF routing with area ID 0.0.0.0 on interface with IP address that match the network address 22.1.1.0/24.
PE7(config-router) #router ospf 2 L3VRF3	Configure OSPF on IRB L3VRF3.
PE7(config-router)# redistribute bgp	Redistribute BGP routes.
PE7(config-router)# network 16.16.16.0/24 area 0.0.0.0	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 16.16.16.0/24.
PE7(config-router) #router isis 1	Configure ISIS router.
PE7(config-router)# is-type level-1-2	Configure IS type as level 1 and level 2.
PE7(config-router)# metric-style wide	Configure metric-style as wide.
PE7(config-router)# dynamic-hostname	Configure the hostname to advertise for the ISIS router.
PE7(config-router)# bfd all-interfaces	Enable the Bidirectional Forwarding Detection (BFD) feature on all the interfaces enabled with this ISIS instance.
PE7(config-router)# net 49.0000.0007.0001.00	Set a Network Entity Title for this instance, specifying the area address and the system ID.
PE7(config-router)# redistribute connected	Redistribute connected routes.
PE7(config-router) #router isis 2 L3VRF4	Configure ISIS on IRB L3VRF4.
PE7(config-router)# is-type level-1-2	Configure IS type as level 1 and level 2.
PE7(config-router)# metric-style wide	Configure metric-style as wide.
PE7(config-router)# dynamic-hostname	Configure the hostname to advertise for the ISIS router.
PE7(config-router)# bfd all-interfaces	Enable the Bidirectional Forwarding Detection (BFD) feature on all the interfaces enabled with this ISIS instance.
PE7(config-router)# net 49.0000.0000.0475.00	Set a Network Entity Title for this instance, specifying the area address and the system ID.
PE7(config-router)# redistribute bgp	Redistribute connected routes.
PE7(config-router)#router bgp 700	Start the eBGP router.
PE7(config-router)# bgp router-id 7.7.7.7	Configure BGP router id.
PE7(config-router)# no bgp inbound-route- filter	Disable the VPN/BGP inbound route-target filter.
PE7(config-router) # neighbor 5.5.5.5 remote- as 500	Configure BGP peering relationship with a customer edge router.
PE7(config-router)# neighbor 6.6.6.6 remote- as 600	Configure BGP peering relationship with a customer edge router.
PE7(config-router)# neighbor 6.6.6.6 advertisement-interval 0	Configure a minimum advertisement interval between the sending of BGP routing updates.
PE7(config-router)# address-family 12vpn evpn	Enter to the L2 VPN address family mode to configure the address-family specific parameters.
PE7(config-router-af)# neighbor 5.5.5.5 activate	Enable the exchange of specific address family routes with a neighboring router 5.5.5.5.

PE7(config-router-af)# neighbor 6.6.6.6 activate	Enable the exchange of specific address family routes with a neighboring router 6.6.6.6.
PE7(config-router-af)# exit-address-family	Exit from address family mode.
PE7(config-router)# address-family ipv4 vrf L3VRF3	Enter to the IRB IPv4 VRF address family mode to configure the address-family specific parameters.
PE7(config-router-af)# network 16.16.16.0/ 24	Enable OSPF routing on IRB interface with IP address that match the network address 16.16.16.0/24.
PE7(config-router-af)# redistribute ospf	Redistribute OSPF routes.
PE7(config-router-af)# exit-address-family	Exit from address family mode.
PE7(config-router)# address-family ipv4 vrf L3VRF4	Enter to the IRB IPv4 VRF address family mode to configure the address-family specific parameters.
PE7(config-router-af)# network 12.1.1.0/24	Enable OSPF routing on IRB interface with IP address that match the network address 12.1.1.0/24.
PE7(config-router-af)# redistribute isis	Redistribute ISIS routes.
PE7(config-router-af)# exit-address-family	Exit address family mode.
PE7(config)#nvo vxlan access-if port-vlan pol 100	Map the VLAN port for ISIS switch on po1 interface to identify the VxLAN traffic and to enter NVO access interface mode.
PE7(config-nvo-acc-if)# map vnid 801	Map the I2vnid to an access-port.
PE7(config-nvo-acc-if)#nvo vxlan access-if port-vlan sal 200	Configure access-if port for OSPF switch.
PE7(config-nvo-acc-if)# map vnid 701	Map the I2vnid to an access-port.

PE8(config)#nvo vxlan enable	Enable VxLAN
PE8(config)#nvo vxlan irb	Enable VxLAN IRB
PE8(config)#evpn esi hold-time 60	Configure hold time for the tunnels to come up during VxLAN initialization before making the esi up.
PE8(config)#evpn vxlan multihoming enable	Enable VxLAN multihome
PE8(config)#ip vrf managemen	Enter into VRF configuration mode.
PE8(config-vrf)#ip vrf L3VRF3	Create a VRF routing information base called L3VRF3 for OSPF router.
PE8(config-vrf)# rd 8100:11	Specify a route distinguisher for the VRF.
PE8(config-vrf)# route-target both 100:100	Add import and export route-target extended communities to the VRF.
PE8(config-vrf)# 13vni 1000	Configure the L3 Virtual Network Identifier for an IP VRF.
PE8(config-vrf)#ip vrf L3VRF4	Create a VRF routing information base called L3VRF4 for ISIS router.
PE8(config-vrf)# rd 8400:11	Specify a route distinguisher for the VRF.
PE8(config-vrf)# route-target both 101:101	Add import and export route-target extended communities to the VRF.
PE8(config-vrf)# 13vni 2000	Configure the L3 Virtual Network Identifier for an IP VRF.
PE8(config-vrf)#mac vrf L2VRF1	Create a L2 MAC VRF to use in EVPN routes.
PE8(config-vrf)# rd 8.8.8.8:11	Specify a route distinguisher for the MAC VRF.

PE8(config-vrf)# route-target both 7.7.7.7:100	Add import and export route-target extended communities to the VRF.
PE8(config-vrf)#mac vrf L2VRF2	Create a L2 MAC VRF to use in EVPN routes.
PE8(config-vrf)# rd 8.8.8.8:12	Specify a route distinguisher for the VRF.
PE8(config-vrf)# route-target both 7.7.7.101	Add import and export route-target extended communities to the VRF.
PE7(config-vrf)#exit	Exit the VRF configuration mode.
PE8(config)#evpn irb-forwarding anycast- gateway-mac 0000.0000.1111	Configure common Anycast MAC address for all the IRB interfaces.
PE8(config-if)#interface irb701	Enter into IRB interface configuration mode to configure IRB interfaces for OSPF router.
<pre>PE8(config-irb-if)# ip vrf forwarding L3VRF3</pre>	Associate IRB interface with L3VRF3.
PE8(config-irb-if)# evpn irb-if-forwarding anycast-gateway-mac	Map the global anycast IRB MAC address with L3VRF3.
PE8(config-irb-if)# ip address 17.12.13.1/24 anycast	Configure an Anycast IP address.
<pre>PE8(config-irb-if)# ip address 17.17.17.2/24 secondary</pre>	Configure a secondary IP address. PE7(config-irb-if)#exitExit from the IRB interface.
PE8(config-irb-if)#interface irb801	Enter into IRB interface configuration mode to configure IRB interfaces for ISIS router.
PE8(config-irb-if)# ip vrf forwarding L3VRF4	Associate IRB interface with L3VRF4.
PE8(config-irb-if)# evpn irb-if-forwarding anycast-gateway-mac	Map the global anycast IRB MAC address with L3VRF4.
PE8(config-irb-if)# ip address 12.13.14.2/24 anycast	Configure an Anycast IP address.
PE8(config-irb-if)# ip address 12.1.1.2/24 secondary	Configure an Anycast IP address.
PE8(config-irb-if)# ip router isis 2	Configure ISIS router on IRB interface.
PE7(config-irb-if)#exit	Exit from the IRB interface.
PE8(config)#nvo vxlan vtep-ip-global 8.8.8.8	Configure the source VTEP IP address of the VxLAN tunnel.
PE8(config)#nvo vxlan id 701 ingress- replication inner-vid-disabled	Add a tenant L2 VNID to the VxLAN. Specify ingress-replication to use head end replication for forwarding BUM traffic inner-vid-disabled to not carry VID out of network port
PE8(config-nvo)# vxlan host-reachability- protocol evpn-bgp L2VRF1	Associate the L2VRF1reachable protocol to Ethernet-VPN over BGP
PE8(config-nvo)# evpn irb701	Configure default gateway behavior for IRB interface irb701.
PE8(config-nvo)# vni-name VNI-701	Configure VNI name.
PE7(config-nvo)#exit	Exit from NVO mode.
PE8(config-nvo)#nvo vxlan id 801 ingress- replication inner-vid-disabled	Add a tenant L2 VNID to the VxLAN. Specify ingress-replication to use head end replication for forwarding BUM traffic inner-vid-disabled to not carry VID out of network port
PE8(config-nvo)# vxlan host-reachability- protocol evpn-bgp L2VRF2	Associate the L2VRF2reachable protocol to Ethernet-VPN over BGP

PE8(config-nvo)# evpn irb801	Configure default gateway behavior for IRB interface irb801.
PE8(config-nvo)# vni-name VNI-101	Configure VNI name.
PE8(config-nvo)#qos enable	Enable QoS.
PE8(config-nvo)#exit	Exit from NVO mode.
PE8(config-vlan)#interface pol	Configure po1 interface.
PE8(config-if)# switchport	Configure port as L2.
PE8(config-if)# load-interval 30	Configures the load-interval for monitoring traffic on the po1 interface.
PE8(config-if) # evpn multi-homed system-mac 0000.0000.7782	Configure system MAC as ESI value for po1 interface. VTEP1 and VTEP2 should have same ESI value.
PE8(config-if-es)#interface sal	Configure sa1 interface.
PE8(config-if) # switchport	Configure port as L2.
<pre>PE8(config-if) # load-interval 30</pre>	Configures the load-interval for monitoring traffic on the po1 interface.
PE8(config-if)# evpn multi-homed esi 00:01:02:03:04:05:06:07:08	Configure 9-octet ESI value for sa1 interface.
PE8(config-irb-if)#interface lo	Configure loopback interface
PE8(config-if)# ip address 8.8.8.8/32 secondary	Configure secondary IP address
PE8(config-if)#exit	Exit from the lo interface.
PE8(config)#interface xel	Configure xe1 interface.
PE8(config-if)# static-channel-group 1	Configure member port of sa3 interface.
PE8(config-if)#interface xe2	Configure xe2 interface.
PE8(config-if)# ip address 90.1.1.1/24	Configure IP address
PE8(config-if) # mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE8(config-if)# ip router isis 1	Configure ISIS router on IRB interface.
PE8(config-if)#exit	Exit from the lo interface.
PE8(config)#interface xe12	Configure xe1 interface.
<pre>PE8(config-if) # load-interval 30</pre>	Configures the load-interval for monitoring traffic on the po1 interface.
PE8(config-if)# ip address 21.1.1.1/24	Configure IP address
PE8(config-if) # mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE8(config-if)#exit	Exit from the lo interface.
PE8(config-if)#interface xe26	Configure xe26 interface.
<pre>PE8(config-if) # channel-group 1 mode active</pre>	Configure member port of xe26 interface.
PE8(config)#router ospf 1	Configure OSPF router.
PE8(config-router) # ospf router-id 8.8.8.8	Configure router id for OSPF.
PE8(config-router) # network 8.8.8.8/32 area 0.0.0.0	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 8.8.8/32.
PE8(config-router)# network 21.1.1.0/24 area 0.0.0.0	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 21.1.1.0/ 24.
PE8(config-router) #router ospf 2 L3VRF3	Configure OSPF on IRB L3VRF3.

PE8(config-router) # redistribute bgp	Redistribute BGP routes.
PE8(config-router)# network 17.17.17.0/24 area 0.0.0.0	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 17.17.17.0/ 24
PE8(config-router) #router isis 1	Configure ISIS router.
PE8(config-router)# is-type level-1-2	Configure IS type as level 1 and level 2.
PE8(config-router)# metric-style wide	Configure metric-style as wide.
PE8(config-router)# dynamic-hostname	Configure the hostname to advertise for the ISIS router.
PE8(config-router) # bfd all-interfaces	Enable the Bidirectional Forwarding Detection (BFD) feature on all the interfaces enabled with this ISIS instance.
PE8(config-router)# net 49.0000.0008.0001.00	Set a Network Entity Title for this instance, specifying the area address and the system ID.
PE8(config-router) # redistribute connected	Redistribute connected routes.
PE8(config-router) #router isis 2 L3VRF4	Configure ISIS on IRB L3VRF4.
PE8(config-router)# is-type level-1-2	Configure IS type as level 1 and level 2.
PE8(config-router)# metric-style wide	Configure metric-style as wide.
PE8(config-router)# dynamic-hostname	Configure the hostname to advertise for the ISIS router.
PE8(config-router)# bfd all-interfaces	Enable the Bidirectional Forwarding Detection (BFD) feature on all the interfaces enabled with this ISIS instance.
PE8(config-router)# net 49.0000.0000.0485.00	Set a Network Entity Title for this instance, specifying the area address and the system ID.
PE8(config-router) # redistribute bgp	Redistribute connected routes.
PE8(config-router) #router bgp 800	Start the eBGP router.
PE8(config-router) # bgp router-id 8.8.8.8	Configure BGP router id.
PE8(config-router)# no bgp inbound-route- filter	Disable the VPN/BGP inbound route-target filter.
PE8(config-router) # neighbor 5.5.5.5 remote- as 500	Configure BGP peering relationship with a customer edge router.
PE8(config-router) # neighbor 6.6.6.6 remote- as 600	Configure BGP peering relationship with a customer edge router.
<pre>PE8(config-router)# neighbor 6.6.6.6 update- source lo</pre>	Configure a minimum advertisement interval between the sending of BGP routing updates.
PE8(config-router)# address-family l2vpn evpn	Enter to the L2 VPN address family mode to configure the address-family specific parameters.
<pre>PE8(config-router-af)# neighbor 5.5.5.5 activate</pre>	Enable the exchange of specific address family routes with a neighboring router 5.5.5.5.
PE8(config-router-af)# neighbor 6.6.6.6 activate	Enable the exchange of specific address family routes with a neighboring router 6.6.6.6.
PE8(config-router-af)# exit-address-family	Exit from address family mode.
PE8(config-router)# address-family ipv4 vrf L3VRF3	Enter to the IRB IPv4 VRF address family mode to configure the address-family specific parameters.
PE8(config-router-af)# network 16.16.16.0/ 24	Enable OSPF routing on IRB interface with IP address that match the network address 16.16.16.0/24.
PE8(config-router-af) # redistribute ospf	Redistribute OSPF routes.
PE8(config-router-af)# exit-address-family	Exit from address family mode.
PE8(config-router)# address-family ipv4 vrf L3VRF4	Enter to the IRB IPv4 VRF address family mode to configure the address-family specific parameters.

PE8(config-router-af)# network 12.1.1.0/24	Enable OSPF routing on IRB interface with IP address that match the network address 12.1.1.0/24.
PE8(config-router-af)# redistribute isis	Redistribute ISIS routes.
PE8(config-router-af)# exit-address-family	Exit address family mode.
PE8(config-router)# exit	Exit from router mode configuration.
PE8(config)#nvo vxlan access-if port-vlan pol 100	Map the VLAN port for ISIS switch on po1 interface to identify the VxLAN traffic and to enter NVO access interface mode.
PE8(config-nvo-acc-if)# map vnid 801	Map the I2vnid to an access-port.
PE8(config-nvo-acc-if)#nvo vxlan access-if port-vlan sal 200	Configure access-if port for OSPF switch.
PE8(config-nvo-acc-if)# map vnid 701	Map the I2vnid to an access-port.
PE8(config-nvo-acc-if)#end	End global configuration.

Configure Spine Node with OSPF Router

Perform the following configurations to make the node as spine with routing protocol as OSPF.

PE5(config-if)#interface sa3	Configure sa3 interface.
<pre>PE5(config-if) # load-interval 30</pre>	Configures the load-interval for monitoring traffic on the sa3 interface.
PE5(config-if) # ip address 22.1.1.2/24	Configure IP address
PE5(config-if) # mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE5(config-if)#interface lo	Configure loopback interface
PE5(config-if) # ip address 5.5.5.5/32 secondary	Configure secondary IP address.
PE7(config-if)#exit	Exit from the lo interface.
PE5(config-if)#interface xe8	Configure xe8 interface.
<pre>PE5(config-if) # static-channel-group 3</pre>	Configure member port of sa3 interface.
PE5(config-if)#interface xe12	Configure xe12 interface.
PE5(config-if) # ip address 21.1.1.2/24	Configure IP address
PE5(config-if) # mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE5(config-if)#interface xel4	Configure xe14 interface.
PE5(config-if) # ip address 23.1.1.2/24	Configure IP address
PE5(config-if) # mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE5(config-if)#interface xe25	Configure xe25 interface.
PE5(config-if) # ip address 24.1.1.2/24	Configure IP address
PE5(config-if) # mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE5(config)#router ospf 1	Configure OSPF router.

PE5(config-router)# network 5.5.5.5/32 area 0.0.0	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 5.5.5.5/32.
PE5(config-router) # network 21.1.1.0/24 area 0.0.0.0	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 21.1.1.0/24.
PE5(config-router) # network 22.1.1.0/24 area 0.0.0.0	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 22.1.1.0/24.
PE5(config-router) # network 23.1.1.0/24 area 0.0.0.0	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 23.1.1.0/24.
PE5(config-router) # network 24.1.1.0/24 area 0.0.0.0	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 24.1.1.0/24.
PE5(config-router)#router bgp 500	Start the eBGP router 500.
PE5(config-router)# bgp router-id 5.5.5.5	Configure BGP router id 5.5.5.5.
PE5(config-router)# no bgp inbound-route- filter	Disable the VPN/BGP inbound route-target filter.
PE5(config-router)# neighbor 3.3.3.3 remote- as 300	Configure BGP 3.3.3.3 peering relationship with a customer edge router.
PE5(config-router)# neighbor 4.4.4.4 remote- as 400	Configure BGP 4.4.4.4 peering relationship with a customer edge router.
PE5(config-router)# neighbor 7.7.7.7 remote- as 700	Configure BGP 7.7.7.7 peering relationship with a customer edge router.
PE5(config-router)# neighbor 8.8.8.8 remote- as 800	Configure BGP 8.8.8.8 peering relationship with a customer edge router.
<pre>PE5(config-router)# neighbor 3.3.3.3 update- source lo</pre>	Specifies that loopback interface (lo) is the source for the BGP 3.3.3.3 to establish the TCP connections.
PE5(config-router)# neighbor 4.4.4.4 update- source lo	Specifies that loopback interface (lo) is the source for the BGP 4.4.4.4 to establish the TCP connections.
PE5(config-router)# neighbor 7.7.7.7 update- source lo	Specifies that loopback interface (lo) is the source for the BGP 7.7.7.7 to establish the TCP connections.
<pre>PE5(config-router)# neighbor 8.8.8.8 update- source lo</pre>	Specifies that loopback interface (lo) is the source for the BGP 8.8.8.8 to establish the TCP connections.
PE5(config-router)# address-family l2vpn evpn	Enter to the L2 VPN address family mode to configure the address-family specific parameters.
<pre>PE5(config-router-af)# neighbor 3.3.3.3 activate</pre>	Enable the exchange of specific address family routes with a neighboring router 3.3.3.3.
PE5(config-router-af)# neighbor 4.4.4.4 activate	Enable the exchange of specific address family routes with a neighboring router 4.4.4.4.
<pre>PE5(config-router-af)# neighbor 7.7.7.7 activate</pre>	Enable the exchange of specific address family routes with a neighboring router 7.7.7.7.
<pre>PE5(config-router-af)# neighbor 8.8.8.8 activate</pre>	Enable the exchange of specific address family routes with a neighboring router 8.8.8.8.
<pre>PE5(config-router-af)# exit-address-family</pre>	Exit address family configuration mode.
PE5(config-router)# exit	Exit router configuration mode.
PE5(config)#end	Exit global configuration mode.

Configure Spine Node with ISIS Router

Perform the following configurations to make the node as spine with routing protocol as ISIS.

PE6(config-if)#interface sa2	Configure sa2 interface.
<pre>PE6(config-if) # load-interval 30</pre>	Configures the load-interval for monitoring traffic on the sa2 interface.
PE6(config-if)# ip address 80.1.1.2/24	Configure IP address.
PE6(config-if)# mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE6(config-if)# ip router isis 1	Configure ISIS router on sa2 interface.
PE6(config-if)#interface ce2	Configure ce2 interface.
PE6(config-if)# ip address 101.1.1.1/24	Configure IP address
PE6(config-if) # mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE6(config-if)# ip router isis 1	Configure ISIS router on sa2 interface.
PE6(config-if)#interface lo	Configure loopback interface
<pre>PE6(config-if)# ip address 6.6.6.6/32 secondary</pre>	Configure secondary IP address.
PE6(config-if)# ip router isis 1	Configure ISIS router on sa2 interface.
PE6(config-if)#interface xe5	Configure xe5 interface.
PE6(config-if)# ip address 102.1.1.1/24	Configure IP address
PE6(config-if)# mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE6(config-if)# ip router isis 1	Configure ISIS router on xe5 interface.
PE6(config-if)#interface xe9	Configure xe9 interface.
<pre>PE6(config-if) # static-channel-group 2</pre>	Configure member port of sa2 interface.
PE6(config-if)#interface xe24	Configure xe24 interface.
<pre>PE6(config-if)# ip address 90.1.1.2/24</pre>	Configure IP address
PE6(config-if)# mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE6(config-if) # ip router isis 1	Configure ISIS router on xe24 interface.
PE6(config) #router isis 1	Configure ISIS router on xe24 interface.
PE6(config-router)# is-type level-1-2	Configure IS type as level 1 and level 2.
PE6(config-router) # metric-style wide	Configure metric-style as wide.
PE6(config-router)# dynamic-hostname	Configure the hostname to advertise for the ISIS router.
PE6(config-router)# bfd all-interfaces	Enable the Bidirectional Forwarding Detection (BFD) feature on all the interfaces enabled with this ISIS instance.
PE6(config-router)# net 49.0000.0006.0001.00	Set a Network Entity Title for this instance, specifying the area address and the system ID.
PE6(config-router)#router bgp 600	Start the eBGP router.
PE6(config-router) # bgp router-id 6.6.6.6	Configure BGP router id.
PE6(config-router)# no bgp inbound-route- filter	Disable the VPN/BGP inbound route-target filter.
PE6(config-router) # neighbor 3.3.3.3 remote- as 300	Configure BGP peering relationship with a customer edge router.
PE6(config-router) # neighbor 4.4.4.4 remote- as 400	Configure BGP peering relationship with a customer edge router.

<pre>PE6(config-router)# neighbor 7.7.7.7 remote- as 700</pre>	Configure BGP peering relationship with a customer edge router.
PE6(config-router)# neighbor 8.8.8.8 remote- as 800	Configure BGP peering relationship with a customer edge router.
PE6(config-router)# neighbor 3.3.3.3 update- source lo	Specifies that loopback interface (lo) is the source for the BGP 3.3.3.3 to establish the TCP connections
PE6(config-router)# neighbor 4.4.4.4 update- source lo	Specifies that loopback interface (lo) is the source for the BGP 4.4.4.4 to establish the TCP connections
PE6(config-router)# neighbor 7.7.7.7 update- source lo	Specifies that loopback interface (lo) is the source for the BGP 7.7.7.7 to establish the TCP connections
<pre>PE6(config-router)# neighbor 8.8.8.8 update- source lo</pre>	Specifies that loopback interface (lo) is the source for the BGP 8.8.8.8 to establish the TCP connections
PE6(config-router)# address-family l2vpn evpn	Enter to the L2 VPN address family mode to configure the address-family specific parameters.
PE6(config-router-af)# neighbor 3.3.3.3 activate	Enable the exchange of specific address family routes with a neighboring router 3.3.3.3.
PE6(config-router-af)# neighbor 4.4.4.4 activate	Enable the exchange of specific address family routes with a neighboring router 4.4.4.4.
PE6(config-router-af)# neighbor 7.7.7.7 activate	Enable the exchange of specific address family routes with a neighboring router 7.7.7.7.
PE6(config-router-af)# neighbor 8.8.8.8 activate	Enable the exchange of specific address family routes with a neighboring router 8.8.8.8.
<pre>PE6(config-router-af)# exit-address-family</pre>	Exit address family configuration mode.
PE6(config-router)# exit	Exit router configuration mode.
PE6(config)#end	Exit global configuration mode.

Configure VxLAN IRB with Single Homing OSPF and ISIS Router

Perform the following configurations to create VxLAN IRB interfaces with singlehoming for OSPF and ISIS routing process on PE3 and PE4 nodes.

PE3(config)#nvo vxlan enable	Enable VxLAN.
PE3(config)#nvo vxlan irb	Enable VxLAN IRB
PE3(config)#ip vrf management	Enter into VRF configuration mode.
PE3(config-vrf)#ip vrf L3VRF1	Create a VRF routing information base called L3VRF3 for OSPF router.
PE3(config-vrf)# rd 56000:11	Specify a route distinguisher for the VRF.
PE3(config-vrf)# route-target both 100:100	Add import and export route-target extended communities to the VRF.
PE3(config-vrf)# 13vni 1000	Configure the L3 Virtual Network Identifier for an IP VRF.
PE3(config-vrf)#mac vrf L2VRF1	Create a L2 MAC VRF to use in EVPN routes.
PE3(config-vrf)# rd 4.4.4.4:11	Specify a route distinguisher for the MAC VRF.

PE3(config-vrf)# route-target both 9.9.9.9:100	Add import and export route-target extended communities to the VRF.
PE3(config-if)#interface irb1001	Enter into IRB interface configuration mode to configure IRB interfaces for OSPF router.
PE3(config-irb-if)# ip vrf forwarding L3VRF1	Associate IRB interface with L3VRF3.
PE3(config-irb-if)# ip address 40.1.1.1/24	Configure an Anycast IP address.
PE3(config-irb-if)# ip ospf cost 1	Specify the cost of the link-state metric in a router-LSA.
PE3(config-vrf)#nvo vxlan vtep-ip-global 3.3.3.3	Configure the source VTEP IP address of the VxLAN tunnel.
PE3(config)#nvo vxlan id 102 ingress- replication	Add a tenant L2 VNID to the VxLAN. Specify ingress-replication to use head end replication for forwarding BUM traffic inner-vid-disabled to not carry VID out of network port
PE3(config-nvo)# vxlan host-reachability- protocol evpn-bgp L2VRF1	Associate the L2VRF1 reachable protocol to Ethernet- VPN over BGP
PE3(config-nvo)# evpn irb1001	Configure default gateway behavior for IRB interface irb1001.
PE3(config-nvo)# vni-name VNI-102	Configure VNI name.
PE3(config-nvo)#nvo vxlan id 2002 ingress- replication	Add a tenant L2 VNID to the VxLAN. Specify ingress-replication to use head end replication for forwarding BUM traffic inner-vid-disabled to not carry VID out of network port
PE3(config-nvo) # vxlan host-reachability- protocol evpn-bgp L2VRF1	Associate the L2VRF1 reachable protocol to Ethernet- VPN over BGP
PE3(config-nvo)# evpn irb2002	Configure default gateway behavior for IRB interface irb72002.
PE3(config-nvo)#qos enable	Enable QoS.
PE3(config)#interface sa4	Configure sa4 interface.
PE3(config-if) # switchport	Configure port as L2.
PE3(config-if)# load-interval 30	Configures the load-interval for monitoring traffic on the po1 interface.
PE3(config)#nvo vxlan access-if port-vlan sa4 100	Map the VLAN port for ISIS switch on sa4 interface to identify the VxLAN traffic and to enter NVO access interface mode.
PE3(config-acc-if-evpn)#map vpn-id 102	Map the I2vnid to an access-port.
PE3(config-if)#interface ce3	Configure ce3 interface.
PE3(config-if)# load-interval 30	Configures the load-interval for monitoring traffic on the ce3 interface.
PE3(config-if)# ip address 101.1.1.2/24	Configure IP address.
PE3(config-if)# mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE3(config-if)# ip router isis 1	Configure ISIS router on ce3 interface.
PE3(config-irb-if)#interface lo	Configure loopback interface
PE3(config-if) # ip address 3.3.3.3/32 secondary	Configure secondary IP address
PE3(config-if) # ip router isis 1	Configure ISIS router on ce3 interface.
PE3(config-if)#interface xel0	Configure xe10 interface.
PE3(config-if) # static-channel-group 4	Configure member port of ce3 interface.

PE3(config-if)#interface xel4	Configure xe14 interface.
PE3(config-if) # speed 10g	Set the link speed of the xe14 interface.
PE3(config-if) # ip address 23.1.1.1/24	Configure IP address.
PE3(config-if) # mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE3(config)#router ospf 1	Configure OSPF router.
PE3(config-router) # ospf router-id 3.3.3.3	Configure router id for OSPF.
PE3(config-router)# network 3.3.3.3/32 area 0.0.0.0	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 3.3.3.3/32.
<pre>PE3(config-router)# network 23.1.1.0/24 area 0.0.0.0</pre>	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 23.1.1.0/24.
PE3(config-router)# network 101.1.1.0/24 area 0.0.0.0	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 101.1.1.0/24.
PE3(config-router) #router ospf 2 L3VRF1	Configure OSPF on IRB L3VRF1.
PE3(config-router) # redistribute bgp	Redistribute BGP into OSPF.
PE3(config-router) # network 40.1.1.0/24 area 0.0.0.0	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 40.1.1.0/24.
PE3(config-router) #router isis 1	Configure ISIS router on xe24 interface.
PE3(config-router)# is-type level-1-2	Configure IS type as level 1 and level 2.
PE3(config-router)# metric-style wide	Configure metric-style as wide.
PE3(config-router)# dynamic-hostname	Configure the hostname to advertise for the ISIS router.
PE3(config-router)# bfd all-interfaces	Enable the Bidirectional Forwarding Detection (BFD) feature on all the interfaces enabled with this ISIS instance.
PE3(config-router)# net 49.0000.0003.0001.00	Set a Network Entity Title for this instance, specifying the area address and the system ID.
PE3(config-router)# redistribute connected	Redistribute connected routes.
PE3(config-router)#router bgp 300	Start the eBGP router.
PE3(config-router)# bgp router-id 3.3.3.3	Configure BGP router id.
PE3(config-router)# no bgp inbound-route- filter	Disable the VPN/BGP inbound route-target filter.
PE3(config-router)# neighbor 5.5.5.5 remote- as 500	Configure BGP peering relationship with a customer edge router.
PE3(config-router) # neighbor 6.6.6.6 remote- as 600	Configure BGP peering relationship with a customer edge router.
PE3(config-router)# neighbor 5.5.5.5 update- source lo	Specifies that loopback interface (lo) is the source for the BGP 5.5.5.5 to establish the TCP connections
PE3(config-router)# neighbor 6.6.6.6 advertisement-interval 0	Configure a minimum advertisement interval between the sending of BGP routing updates.
PE3(config-router)# address-family l2vpn evpn	Enter to the L2 VPN address family mode to configure the address-family specific parameters.
PE3(config-router-af)# neighbor 5.5.5.5 activate	Enable the exchange of specific address family routes with a neighboring router 5.5.5.5.

PE3(config-router-af)# neighbor 6.6.6.6 activate	Enable the exchange of specific address family routes with a neighboring router 6.6.6.6.
PE3(config-router-af)# exit-address-family	Exit address family configuration mode.
PE3(config-router)# address-family ipv4 vrf L3VRF1	Enter to the IRB IPv4 VRF address family mode to configure the address-family specific parameters.
<pre>PE3(config-router-af)# redistribute connected</pre>	Redistribute connected routes.
PE3(config-router-af)# redistribute ospf	Redistribute OSPF routes.
PE3(config-router-af)# exit-address-family	Exit address family configuration mode.
PE3(config-router)# exit	Exit router configuration mode.
PE3(config)#end	Exit global configuration mode.

PE4(config)#nvo vxlan enable	Enable VxLAN.
PE4(config)#nvo vxlan irb	Enable VxLAN IRB
PE4(config)#ip vrf management	Enter into VRF configuration mode.
PE4(config-vrf)#ip vrf L3VRF2	reate a VRF routing information base called L3VRF2 for OSPF router.
PE4(config-vrf)# rd 63000:11	Specify a route distinguisher for the VRF.
PE4(config-vrf)# route-target both 101:101	dd import and export route-target extended communities to the VRF.
PE4(config-vrf)# 13vni 2000	Configure the L3 Virtual Network Identifier for an IP VRF.
PE4(config-vrf)#mac vrf L2VRF2	Create a L2 MAC VRF to use in EVPN routes.
PE4(config-vrf)# rd 3.3.3.3:11	Specify a route distinguisher for the MAC VRF.
PE4(config-vrf)# route-target both 10.10.10.10:100	Add import and export route-target extended communities to the VRF.
PE4(config-if)#interface irb2001	Enter into IRB interface configuration mode to configure IRB interfaces for OSPF router.
<pre>PE4(config-irb-if)# ip vrf forwarding L3VRF2</pre>	Associate IRB interface with L3VRF3.
PE4(config-irb-if)# ip address 50.50.50.1/24	Configure an Anycast IP address.
PE4(config-irb-if)# ip router isis 2	Configure ISIS router on IRB interface.
PE4(config-vrf)#nvo vxlan vtep-ip-global 4.4.4.4	Configure the source VTEP IP address of the VxLAN tunnel.
PE4(config)#nvo vxlan id 201 ingress- replication	Add a tenant L2 VNID to the VxLAN. Specify ingress- replication to use head end replication for forwarding BUM traffic
PE4(config-nvo)# vxlan host-reachability- protocol evpn-bgp L2VRF2	Associate the L2VRF1 reachable protocol to Ethernet-VPN over BGP
PE4(config-nvo) # evpn irb2001	Configure default gateway behavior for IRB interface irb2001.
PE4(config-nvo)# vni-name VNI-201	Configure VNI name.
PE4(config-nvo)#nvo vxlan id 3002 ingress- replication	Add a tenant L2 VNID to the VxLAN. Specify ingress- replication to use head end replication for forwarding BUM traffic.

PE4(config-nvo)# vxlan host-reachability- protocol evpn-bgp L2VRF2	Associate the L2VRF2 reachable protocol to Ethernet-VPN over BGP.
PE4(config-nvo)# evpn irb3002	Configure default gateway behavior for IRB interface irb3002.
PE4(config-nvo)#nvo vxlan id 3003 ingress- replication	Add a tenant L2 VNID to the VxLAN. Specify ingress- replication to use head end replication for forwarding BUM traffic.
PE4(config-nvo)#qos enable	Enable QoS.
PE4(config-irb-if)#interface lo	Configure loopback interface
<pre>PE4(config-if)# ip address 4.4.4.4/32 secondary</pre>	Configure secondary IP address
PE4(config-if)# ip router isis 1	Configure ISIS router on lo interface.
PE4(config-if)#interface xe5	Configure xe5 interface.
<pre>PE4(config-if) # load-interval 30</pre>	Configures the load-interval for monitoring traffic on the xe5 interface.
PE4(config-if)# ip address 102.1.1.2/24	Configure IP address.
PE4(config-if)# mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE4(config-if)# ip router isis 1	Configure ISIS router on ce3 interface.
PE4(config-if)#interface xe25	Configure xe25 interface.
PE4(config-if)# ip address 24.1.1.1/24	Configure IP address.
PE4(config-if) # mtu 9000	Configure the Maximum Transmission Unit (MTU).
PE4(config-if)#interface xe26	Configure xe26 interface.
PE4(config-if) # switchport	Configure port as L2.
<pre>PE4(config-if) # load-interval 30</pre>	Configures the load-interval for monitoring traffic on the xe26 interface.
PE4(config)#nvo vxlan access-if port-vlan xe26 200	Map the VLAN port for ISIS switch on xe26 interface to identify the VxLAN traffic and to enter NVO access interface mode.
PE4(config-acc-if-evpn)# map vpn-id 201	Map the I2vnid to an access-port.
PE4(config-if) # exit	Exit the interface configuration mode.
PE4(config) #router ospf 1	Configure OSPF router.
PE4(config-router) # network 4.4.4.4/32 area 0.0.0.0	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 4.4.4.4/32.
<pre>PE4(config-router) # network 24.1.1.0/24 area 0.0.0.0</pre>	Enable OSPF routing with area ID 0.0.0.0 on IRB interface with IP address that match the network address 24.1.1.0/ 24.
PE4(config-router) #router isis 1	Configure ISIS router on xe24 interface.
PE4(config-router)# is-type level-1-2	Configure IS type as level 1 and level 2.
PE4(config-router) # metric-style wide	Configure metric-style as wide.
PE4(config-router)# dynamic-hostname	Configure the hostname to advertise for the ISIS router.
<pre>PE4(config-router) # bfd all-interfaces</pre>	Enable the Bidirectional Forwarding Detection (BFD) feature on all the interfaces enabled with this ISIS instance.
PE4(config-router)# net 49.0000.0004.0001.00	Set a Network Entity Title for this instance, specifying the area address and the system ID.
PE4(config-router) # redistribute connected	Redistribute connected routes.

PE4(config-router)#!	
PE4(config-router)#router isis 2 L3VRF2	Configure ISIS on IRB L3VRF2.
PE4(config-router)# is-type level-1-2	Configure IS type as level 1 and level 2.
PE4(config-router)# metric-style wide	Configure metric-style as wide.
PE4(config-router)# dynamic-hostname	Configure the hostname to advertise for the ISIS router.
PE4(config-router)# bfd all-interfaces	Enable the Bidirectional Forwarding Detection (BFD) feature on all the interfaces enabled with this ISIS instance.
PE4(config-router)# net 49.0000.0000.0441.00	Set a Network Entity Title for this instance, specifying the area address and the system ID.
PE4(config-router)#router bgp 400	Start the eBGP router.
PE4(config-router)# bgp router-id 4.4.4.4	Configure BGP router id.
PE4(config-router)# no bgp inbound-route- filter	Disable the VPN/BGP inbound route-target filter.
PE4(config-router)# neighbor 5.5.5.5 remote- as 500	Configure BGP peering relationship with a customer edge router.
PE4(config-router)# neighbor 6.6.6.6 remote- as 600	Configure BGP peering relationship with a customer edge router.
PE4(config-router)# neighbor 5.5.5.5 update- source lo	Specifies that loopback interface (lo) is the source for the BGP 5.5.5.5 to establish the TCP connections
PE4(config-router)# neighbor 6.6.6.6 advertisement-interval 0	Configure a minimum advertisement interval between the sending of BGP routing updates.
PE4(config-router)# address-family l2vpn evpn	Enter to the L2 VPN address family mode to configure the address-family specific parameters.
PE4(config-router-af)# neighbor 5.5.5.5 activate	Enable the exchange of specific address family routes with a neighboring router 5.5.5.5.
PE4(config-router-af)# neighbor 6.6.6.6 activate	Enable the exchange of specific address family routes with a neighboring router 6.6.6.6.
PE4(config-router-af)# exit-address-family	Exit address family configuration mode.
PE4(config-router)# address-family ipv4 vrf L3VRF2	Enter to the IRB IPv4 VRF address family mode to configure the address-family specific parameters.
<pre>PE4(config-router-af)# redistribute connected</pre>	Redistribute connected routes.
<pre>PE4(config-router-af)# exit-address-family</pre>	Exit address family configuration mode.
PE4(config-router)# exit	Exit router configuration mode.
PE4(config)#end	Exit global configuration mode.

Validation

PE1#show ip ospf neighbor

```
Total number of full neighbors: 2
OSPF process 1 VRF(default):
          Pri
Neighbor ID
               State
                            Dead Time
                                    Address
                                                Interface
                                                              Instance ID
           1 Full/DR
17 12 13 1
                            00.00.35
                                    16.16.16.2
                                                vlan1 200
                                                              0
17.17.17.2
            1 Full/DR
                            00:00:31 17.17.17.2
                                               vlan1.200
                                                              0
PE1#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"
             1.1.1.1/32 is directly connected, lo, 00:23:27
С
O E2
             3.3.3/32 [110/1] via 16.16.16.2, vlan1.200, 00:18:02
                         [110/1] via 17.17.17.2, vlan1.200
O E2
             7.7.7.7/32 [110/1] via 17.17.17.2, vlan1.200, 00:18:45
             8.8.8.8/32 [110/1] via 16.16.16.2, vlan1.200, 00:19:14
O E2
С
             16.16.16.0/24 is directly connected, vlan1.200, 00:21:24
С
             17.17.1.0/24 is directly connected, vlan1.200, 00:21:24
             17.17.17.0/24 is directly connected, vlan1.200, 00:21:24
С
С
             20.1.1.0/24 is directly connected, xe2.103, 00:22:31
O E2
             40.1.1.0/24 [110/1] via 16.16.16.2, vlan1.200, 00:18:02
                          [110/1] via 17.17.17.2, vlan1.200
             101.11.11.0/24 is directly connected, vlan1.200, 00:21:24
С
С
             127.0.0.0/8 is directly connected, lo, 00:23:27
IP Route Table for VRF "management"
С
             10.12.98.0/24 is directly connected, eth0, 00:23:27
С
             127.0.0.0/8 is directly connected, lo.management, 00:23:27
Gateway of last resort is not set
PE1#
PE1#ping 40.1.1.1
Press CTRL+C to exit
PING 40.1.1.1 (40.1.1.1) 56(84) bytes of data.
64 bytes from 40.1.1.1: icmp seq=1 ttl=63 time=0.678 ms
64 bytes from 40.1.1.1: icmp seq=2 ttl=63 time=0.568 ms
64 bytes from 40.1.1.1: icmp seq=3 ttl=63 time=0.567 ms
64 bytes from 40.1.1.1: icmp seq=4 ttl=63 time=0.657 ms
--- 40.1.1.1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 59ms
rtt min/avg/max/mdev = 0.567/0.617/0.678/0.056 ms
PE1#
```

PE2#show clns neighbors Total number of L1 adjacencies: 4 Total number of L2 adjacencies: 4 Total number of adjacencies: 8 Tag 1: VRF : default System Id Interface SNPA State Holdtime Type Protocol PE7 vlan1.100 0000.0000.1111 Uр 21 L1IS-IS Up 21 L2 IS-IS PE8 vlan1.100 0000.0000.1111 20 L1 IS-IS Up 20 L2 IS-IS Up PE7 vlan1.101 0000.0000.1111 Up 21 L1 IS-IS Up 21 L2 IS-IS vlan1.101 0000.0000.1111 20 PE8 Up L1 IS-IS 20 Up L2 IS-IS PE2#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" С 2.2.2/32 is directly connected, lo, 00:25:56 i L2 4.4.4/32 [115/10] via 13.1.1.2, vlan1.100, 00:22:51 [115/10] via 12.1.1.2, vlan1.100 i L2 7.7.7.7/32 [115/10] via 12.1.1.2, vlan1.100, 00:24:20 i L2 8.8.8.8/32 [115/10] via 13.1.1.2, vlan1.100, 00:24:03 С 10.1.1.0/24 is directly connected, xe11.105, 00:25:23 11.11.11.0/24 is directly connected, vlan1.100, 00:25:22 С 12.1.1.0/24 is directly connected, vlan1.100, 00:25:22 С i Ll 12.13.14.0/24 [115/20] via 13.1.1.2, vlan1.100, 00:24:20 [115/20] via 12.1.1.2, vlan1.100 С 13.1.1.0/24 is directly connected, vlan1.100, 00:25:22 i L2 50.50.50.0/24 [115/10] via 13.1.1.2, vlan1.100, 00:22:51 [115/10] via 12.1.1.2, vlan1.100 С 127.0.0.0/8 is directly connected, lo, 00:25:56 IP Route Table for VRF "management" 10.12.98.0/24 is directly connected, eth0, 00:25:56 С С 127.0.0.0/8 is directly connected, lo.management, 00:25:56 Gateway of last resort is not set PE2#ping 50.50.50.1 Press CTRL+C to exit PING 50.50.50.1 (50.50.50.1) 56(84) bytes of data.

64 bytes from64 bytes from64 bytes from64 bytes from	50.50.50.1: 50.50.50.1: 50.50.50.1: 50.50.50.1:	<pre>icmp_seq=1 icmp_seq=2 icmp_seq=3 icmp_seq=4</pre>	ttl=63 ti ttl=63 ti ttl=63 ti ttl=63 ti	me=0.49 me=0.41 me=0.62 me=0.66	01 ms 1 ms 8 ms 11 ms			
50.50.50.1 4 packets trar rtt min/avg/ma PE2#	l ping statis nsmitted, 4 n ax/mdev = 0.4	stics received, 0 411/0.547/0	% packet l .661/0.105	oss, ti ms	me 65ms			
PE7#show clns	neighbors							
Total number of Total number of Total number of Tag 1: VRF : System Id PE6	of L1 adjacer of L2 adjacer of adjacencie default Interface sa2	ncies: 1 ncies: 1 es: 2 SNPA e8c5.7a19	.c3c8	State Up Up	Holdtime 5 5	Type L1 L2	Proto IS-IS IS-IS	col
Total number of Total number of Total number of Tag 2: VRF :	of L1 adjacer of L2 adjacer of adjacencie L3VRF4	ncies: 2 ncies: 2 es: 4						
System Id PE2	Interface irb801	SNPA e8c5.7a76	.581d	State Up Up	Holdtime 5 5	Type L1 L2	Proto IS-IS IS-IS	col
PE2	irb802	e8c5.7a76	.581d	Up Up	5 5	L1 L2	IS-IS IS-IS	
PE7#show ip os	spf neighbor							
Total number of OSPF process 1 Neighbor ID 5.5.5.5	of full neigh L VRF(default Pri State 1 Full,	nbors: 1 z): 9 /Backup	Dead Tim 00:00:34	e Add 22.	lress 1.1.2	Inter sa3	face	Instance ID 0
Total number of OSPF process 2	of full neigh 2 VRF(L3VRF3)	nbors: 1):						
Neighbor ID 1.1.1.1	Pri Stat 1 Full/H	ce Backup	Dead Time 00:00:34	Addr 16.1	ress 6.16.1	Inter irb70	face 1	Instance II O
PE7#show ip ro Fragment packe vrf all	oute 2023 Nov ets received	7 27 13:04: on xe43 (1	32.790 : P packets)	E7 : HS	L : NOTIF	: [IF	_PKT_E	RRORS_4]:

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"
             3.3.3.3/32 [110/3] via 22.1.1.2, sa3, 00:23:42
Ο
0
             4.4.4.4/32 [110/3] via 22.1.1.2, sa3, 00:23:27
0
             5.5.5.5/32 [110/2] via 22.1.1.2, sa3, 00:26:13
             6.6.6/32 [115/20] via 80.1.1.2, sa2, 00:25:44
i Ll
             7.7.7.7/32 is directly connected, lo, 00:29:00
С
             8.8.8.8/32 [110/3] via 22.1.1.2, sa3, 00:26:09
0
0
             21.1.1.0/24 [110/2] via 22.1.1.2, sa3, 00:26:13
             22.1.1.0/24 is directly connected, sa3, 00:27:04
С
0
             23.1.1.0/24 [110/2] via 22.1.1.2, sa3, 00:24:37
0
             24.1.1.0/24 [110/2] via 22.1.1.2, sa3, 00:24:20
С
             80.1.1.0/24 is directly connected, sa2, 00:25:59
             90.1.1.0/24 [115/20] via 80.1.1.2, sa2, 00:25:44
i L1
             101.1.1.0/24 [110/3] via 22.1.1.2, sa3, 00:23:42
\cap
             102.1.1.0/24 [115/20] via 80.1.1.2, sa2, 00:23:31
i L1
С
             127.0.0.0/8 is directly connected, lo, 00:29:00
IP Route Table for VRF "management"
             10.12.93.0/24 is directly connected, eth0, 00:29:00
С
С
             127.0.0.0/8 is directly connected, lo.management, 00:29:00
IP Route Table for VRF "L3VRF3"
             3.3.3/32 [0/0] is directly connected, tunvxlan2, 00:23:42
В
             8.8.8.8/32 [0/0] is directly connected, tunvxlan2, 00:25:09
В
С
             16.16.16.0/24 is directly connected, irb701, 00:29:00
С
             17.12.13.0/24 is directly connected, irb701, 00:29:00
             17.17.17.0/24 [110/2] via 16.16.16.1, irb701, 00:26:33
0
             20.1.1.0/24 [110/2] via 16.16.16.1, irb701, 00:26:33
0
В
           40.1.1.0/24 [20/0] via 3.3.3.3 (recursive is directly connected, tunvxlan2),
00:23:56
С
             127.0.0.0/8 is directly connected, lo.L3VRF3, 00:29:00
IP Route Table for VRF "L3VRF4"
             2.2.2.2/32 [115/10] via 13.1.1.1, irb801, 00:25:22
i L2
В
             4.4.4/32 [0/0] is directly connected, tunvxlan3, 00:23:27
             8.8.8.8/32 [0/0] is directly connected, tunvxlan3, 00:25:09
R
i Ll
             10.1.1.0/24 [115/20] via 13.1.1.1, irb801, 00:25:24
i Ll
             11.11.11.0/24 [115/20] via 13.1.1.1, irb801, 00:25:24
i Ll
             12.1.1.0/24 [115/20] via 13.1.1.1, irb801, 00:25:24
С
             12.13.14.0/24 is directly connected, irb801, 00:29:00
             13.1.1.0/24 is directly connected, irb801, 00:29:00
С
             50.50.50.0/24 [20/0] via 4.4.4.4 (recursive is directly connected,
В
tunvxlan3), 00:23:56
```

127.0.0.0/8 is directly connected, lo.L3VRF4, 00:29:00 С IP Route Table for VRF "L2VRF1" IP Route Table for VRF "L2VRF2" IP Route Table for VRF "evpn-gvrf-1" Gateway of last resort is not set PE7# show nvo vxlan tunnel VXLAN Network tunnel Entries Source Destination Status Up/Down Update _____ ===== 7.7.7.7 8.8.8.8 Installed 00:25:36 00:25:36 7.7.7.7 4.4.4.4 Installed 00:23:53 00:23:53 7.7.7.7 3.3.3.3 Installed 00:24:08 00:24:08 Total number of entries are 3 PE7#show nvo vxlan 13vni-map L2VNI L3VNI IRB-interface _____ 2000 801 irb801 2000 8001 irb802 1000 701 irb701 1000 7001 irb702 PE7#show 2023 Nov 27 13:05:12.791 : PE7 : HSL : NOTIF : [IF PKT ERRORS 4]: Fragment packets received on xe43 (1 packets) nvo vxlan VXLAN Information _____ Codes: NW - Network Port AC - Access Port (u) - Untagged VLAN VNTD VNI-Name VNI-Type Type Interface ESI DF-Status Src-Addr Dst-Addr 701 VNI-701 NW 7.7.7.7 L2 ____ 8.8.8.8 AC sal VNI-701 00:00:01:02:03:04:05:06:07:08 200 701 --DF ____ ____ 801 VNI-101 L2 NW ----7.7.7.7 8.8.8.8 ____ ____ 801 VNI-101 ___ AC pol 00:00:00:00:00:77:82:00:00:00 100 DF ____ ____ 7.7.7.7 1000 ____ τ.3 NW ____ ____ ____ ____ 8.8.8.8 1000 ____ L3 NW ----____ ____ ____ 7.7.7.7 3.3.3.3 ____ ____ 8888 2000 τ.3 NW ____ ____ ____ 7.7.7.7 2000 ____ LЗ NW ____ ____ 4.4.4.4 ____ ____ 7.7.7.7 7001 ____ L2 NW ____ ____ ____ ____ 7.7.7.7 8.8.8.8 7001 ____ _ _ AC sal 00:00:01:02:03:04:05:06:07:08 201 NON-DF ____ ____ 8001 ____ L2 NW ----____ 7.7.7.7 8.8.8.8 00:00:00:00:00:77:82:00:00:00 101 ____ 8001 ___ AC pol NON-DF ____ ____ Total number of entries are 12 PE7#

PE7#show bgp 12vpn evpn prefix-route

Multi Home VxLAN-EVPN IRB with OSPF or ISIS

RD[8100:11]										
ESI	Eth-Tag	Prefix-Length	IP-Address	GW-IPAddress	L3VNII)/LABEL	Nexth	op	Encap	Router-Mac
0	0	24	17.17.17.0	0.0.0.0	1000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	24	17.17.17.0	0.0.0.0	1000		8.8.8	.8	VXLAN	1444:8153:3e9e
0	0	64	30::	::	1000		8.8.8	.8	VXLAN	1444:8153:3e9e
0	0	64	30::	::	1000		8.8.8	.8	VXLAN	1444:8153:3e9e
0	0	64	7102::	::	1000		8.8.8	.8	VXLAN	1444:8f53:3e9e
RD[8400:11]										
ESI	Eth-Tag	Prefix-Length	IP-Address	GW-IPAddress	L3VNII)/LABEL	Nexth	op	Encap	Router-Mac
0	0	24	10.1.1.0	0.0.0.0	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	24	10.1.1.0	0.0.0.0	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	24	11.11.11.0	0.0.0.0	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	24	11.11.11.0	0.0.0.0	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	24	12.1.1.0	0.0.0.0	2000		8.8.8	.8	VXLAN	1444:8153:3e9e
0	0	24	12.1.1.0	0.0.0.0	2000		0.0.0 8 8 8	.0	VALAN	1444:0155:5090
0	0	24	12.13.14.0	0.0.0.0	2000		8 8 8	.0	VXLAN	1444.8f53.3e9e
0	0	2.4	13.1.1.0	0.0.0.0	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	24	13.1.1.0	0.0.0.0	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	32	2.2.2.2	0.0.0.0	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	32	2.2.2.2	0.0.0.0	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	64	2::	::	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	64	2::	::	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	64	40::	::	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	64	40::	::	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	64	50::	::	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	64	50::	::	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
0	0	64	8002::	::	2000		8.8.8	.8	VXLAN	1444:8153:3e9e
0	0	64	8002::		2000		0.0.0	.0	VALAN	1444:8153:3096
0	0	64	8102::	::	2000		8.8.8	.8	VXLAN	1444:8f53:3e9e
RD[56000•11]										
EST	Eth-Tag	Prefix-Length	TP-Address	GW-IPAddress	T.3VNTT)/LABEL	Nexth	ao	Encap	Router-Mac
0	0	24	40 1 1 0	0 0 0 0	1000	, 11000	3 3 3	3	VXLAN	e49d.73b1.c301
0	0	24	40.1.1.0	0.0.0.0	1000		3.3.3	.3	VXLAN	e49d:73b1:c301
0	0	64	2002::	::	1000		3.3.3	.3	VXLAN	e49d:73b1:c301
0	0	64	2002::	::	1000		3.3.3	.3	VXLAN	e49d:73b1:c301
RD[63000:11]										
ESI	Eth-Tag	Prefix-Length	IP-Address	GW-IPAddress	L3VNII)/LABEL	Nexth	op	Encap	Router-Mac
0	0	24	50.50.50.0	0.0.0.0	2000		4.4.4	.4	VXLAN	e8c5:7aa8:7cb3
0	0	24	50.50.50.0	0.0.0.0	2000		4.4.4	.4	VXLAN	e8c5:7aa8:7cb3
0	0	64	3002::	::	2000		4.4.4	.4	VXLAN	e8c5:7aa8:7cb3
0	0	64	3002::	::	2000		4.4.4	.4	VXLAN	e8c5:7aa8:7cb3
PE/#PE0#SI	IOW CII	is nerghbor	5							
Total num	ber of	L1 adjacen	cies: 1							
Total numb	ber of	L2 adiacen	cies: 1							
metal num	om of	adtagangta	a. 0							
IOLAI HUMA	Jer or	adjacencie	S: Z							
Tag 1: VI	RF:de	efault								
System Id	-	Interface	SNPA		State	Hold	time	Tvpe	Protocol	
			- 0 - E 7 - 1 0	- 2 - 1	The	7		- <u>7</u> I T 1		
PE6	2	xez	e8C5./a19.	.0301	Up	/		Ш⊥	18-18	
					Up	7		L2	IS-IS	
Total numb	ber of	L1 adiacen	cies: 2							
Total num		T2 adiagan								
iocal num	Jer OI	uz aujacen	CIES: Z							
Total num	per of	adjacencie	s: 4							
Tag 2: VI	RF : L	3vrf4								
C_{11}		- Tatorford	CNDA		0+ - + -	U ~ 1 -1	+ ima	T	Drotora	
system Id		interiace	SINFA		SLACE	HOTQ.	LTIIE	туре	FIOLOCOL	
PE2	-	irb801	e8c5.7a76.	.581d	Up	7		L1	IS-IS	
					Up	7		L2	IS-IS	
					-					

PE2 irb802 7 IS-IS e8c5.7a76.581d Up T.1 7 Up L2 IS-IS PE8#show ip ospf neighbor Total number of full neighbors: 1 OSPF process 1 VRF(default): Neighbor ID Pri State Dead Time Address Interface Instance ID 5.5.5.5 00:00:31 1 Full/Backup 21.1.1.2 xe12 0 Total number of full neighbors: 1 OSPF process 2 VRF(L3VRF3): Neighbor ID Pri State Dead Time Address Interface Instance ID 1 Full/Backup 17.17.17.1 1.1.1.1 00:00:35 irb701 \cap PE8#terminal width 511 PE8#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" 3.3.3/32 [110/3] via 21.1.1.2, xe12, 00:26:22 0 4.4.4.4/32 [110/3] via 21.1.1.2, xe12, 00:26:07 0 5.5.5/32 [110/2] via 21.1.1.2, xe12, 00:28:59 0 i Ll 6.6.6.6/32 [115/20] via 90.1.1.2, xe2, 00:28:23 7.7.7.7/32 [110/3] via 21.1.1.2, xe12, 00:28:52 Ο С 8.8.8/32 is directly connected, lo, 00:31:21 С 21.1.1.0/24 is directly connected, xe12, 00:29:44 0 22.1.1.0/24 [110/2] via 21.1.1.2, xe12, 00:28:59 23.1.1.0/24 [110/2] via 21.1.1.2, xe12, 00:27:17 0 24.1.1.0/24 [110/2] via 21.1.1.2, xe12, 00:27:00 0 i Ll 80.1.1.0/24 [115/20] via 90.1.1.2, xe2, 00:28:23 90.1.1.0/24 is directly connected, xe2, 00:28:39 С 101.1.1.0/24 [110/3] via 21.1.1.2, xe12, 00:26:22 Ο i Ll 102.1.1.0/24 [115/20] via 90.1.1.2, xe2, 00:26:11 С 127.0.0.0/8 is directly connected, lo, 00:31:21 IP Route Table for VRF "management" 10.12.93.0/24 is directly connected, eth0, 00:31:21 С С 127.0.0.0/8 is directly connected, lo.management, 00:31:21 IP Route Table for VRF "L3VRF3" 3.3.3/32 [0/0] is directly connected, tunvxlan2, 00:26:22 В В 7.7.7/32 [0/0] is directly connected, tunvxlan2, 00:28:17 16.16.16.0/24 [20/0] via 7.7.7.7 (recursive is directly connected, В tunvxlan2), 00:28:17

17.12.13.0/24 is directly connected, irb701, 00:31:21 С С 17.17.17.0/24 is directly connected, irb701, 00:31:21 20.1.1.0/24 [20/0] via 7.7.7.7 (recursive is directly connected, tunvxlan2), В 00:28:17 R 40.1.1.0/24 [20/0] via 3.3.3.3 (recursive is directly connected, tunvxlan2), 00:26:37 С 127.0.0.0/8 is directly connected, lo.L3VRF3, 00:31:21 IP Route Table for VRF "L3VRF4" i T.2 2.2.2/32 [115/10] via 12.1.1.1, irb801, 00:28:44 4.4.4/32 [0/0] is directly connected, tunvxlan3, 00:26:07 В В 7.7.7.7/32 [0/0] is directly connected, tunvxlan3, 00:28:17 10.1.1.0/24 [115/20] via 12.1.1.1, irb801, 00:28:44 i Ll 11.11.11.0/24 [115/20] via 12.1.1.1, irb801, 00:28:44 i Ll С 12.1.1.0/24 is directly connected, irb801, 00:31:21 С 12.13.14.0/24 is directly connected, irb801, 00:31:21 13.1.1.0/24 [115/20] via 12.1.1.1, irb801, 00:28:44 i L1 В 50.50.50.0/24 [20/0] via 4.4.4.4 (recursive is directly connected, tunvxlan3), 00:26:37 С 127.0.0.0/8 is directly connected, lo.L3VRF4, 00:31:21 IP Route Table for VRF "L2VRF1" IP Route Table for VRF "L2VRF2" IP Route Table for VRF "evpn-gvrf-1" Gateway of last resort is not set PE8#show nvo vxlan tunnel VXLAN Network tunnel Entries Destination Source Up/Down Update Status _____ 8.8.8.8 7.7.7.7 Installed 00:28:24 00:28:24 8.8.8.8 3.3.3.3 Installed 00:26:28 00:26:28 8.8.8.8 4.4.4.4 Installed 00:26:13 00:26:13 Total number of entries are 3 PE8#show nvo vxlan VXLAN Information _____ Codes: NW - Network Port AC - Access Port (u) - Untagged VNID VNI-Name VNI-Type Type Interface ESI VI.AN DF-Status Src-Addr Dst-Addr 701 VNI-701 NW 8.8.8.8 7.7.7.7 L2 701 VNT-701 ___ AC 00:00:01:02:03:04:05:06:07:08 200 NON-DF sa1 VNT-101 L2 NW ____ 8.8.8.8 7.7.7.7 801 pol 801 VNI-101 --AC 00:00:00:00:00:77:82:00:00:00 100 NON-DF ____ ____ ____ 8.8.8.8 7.7.7.7 1000 ____ L3 NW ____ ____ ____ ____ 1000 ъ3 ____ ____ ____ 8.8.8.8 3.3.3.3 NW 2000 ____ NW ____ ____ ____ ____ 8.8.8.8 7.7.7.7 LЗ ____ NW ____ ____ ____ 2000 L3 8.8.8.8 4.4.4.4 7001 ____ L2 NW ____ ____ ____ ____ 8.8.8.8 7.7.7.7 7001 ____ ___ AC sa1 00:00:01:02:03:04:05:06:07:08 201 DF ____ 7.7.7.7 T.2 NW 8.8.8.8 8001 ____ ____ ____ ____ 8001 ____ 00:00:00:00:00:77:82:00:00:00 101 --AC po1 DF ____ ____

Total number of entries are 12

PE8#show bgp l2vpn evpn prefix-route

RD[7100:11]								
ESI	Eth-Tag	Prefix-Length	IP-Address	GW-IPAddress	L3VNID/LABEL	Nexthop	Encap	Router-Mac
0	0	24	16.16.16.0	0.0.0.0	1000	7.7.7.7	VXLAN	e001:a666:056d
0	0	24	16.16.16.0	0.0.0.0	1000	7.7.7.7	VXLAN	e001:a666:056d
0	0	24	17.17.17.0	0.0.0.0	1000	7.7.7.7	VXLAN	e001:a666:056d
0	0	24	17.17.17.0	0.0.0.0	1000	7.7.7.7	VXLAN	e001:a666:056d
0	0	24	20.1.1.0	0.0.0.0	1000	7.7.7.7	VXLAN	e001:a666:056d
0	0	24	20.1.1.0	0.0.0.0	1000	7.7.7.7	VXLAN	e001:a666:056d
0	0	64	30::	::	1000	7.7.7.7	VXLAN	e001:a666:056d
0	0	64	30::	::	1000	7.7.7.7	VXLAN	e001:a666:056d
0	0	64	7002::	::	1000	7.7.7.7	VXLAN	e001:a666:056d
0	0	64	7002::	::	1000	7.7.7.7	VXLAN	e001:a666:056d
7400.111								
EST	Eth-Tag	Prefix-Length	IP-Address	GW-IPAddress	I. SVNID / LABEL	Nexthon	Encan	Bouter-Mac
0	0	24	10 1 1 0	0 0 0 0	2000	7 7 7 7	WVI AN	0001:2666:056d
0	0	24	10.1.1.0	0.0.0.0	2000	·····	VALAN	-001.a000.050d
0	0	24	11 11 11 0	0.0.0.0	2000	7.7.7.7	VALAN	e001:a000:0300
0	0	24	11.11.11.0	0.0.0.0	2000	/./././	VALAN	e001:a666:056d
0	0	24	11.11.11.0	0.0.0.0	2000	1.1.1.1	VXLAN	eUU1:a666:U56d
Û	0	24	12.1.1.0	0.0.0.0	2000	/./././	VXLAN	eUU1:a666:U56d
0	0	24	12.1.1.0	0.0.0.0	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	24	12.13.14.0	0.0.0.0	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	24	12.13.14.0	0.0.0.0	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	24	13.1.1.0	0.0.0.0	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	24	13.1.1.0	0.0.0.0	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	32	2.2.2.2	0.0.0.0	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	32	2.2.2.2	0.0.0	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	64	2::	::	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	64	2::	::	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	64	40::	::	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	64	40::	::	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	64	50::	::	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	64	50::	::	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	64	8002::	::	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	64	8002::	::	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	64	8102::	::	2000	7.7.7.7	VXLAN	e001:a666:056d
0	0	64	8102::	::	2000	7.7.7.7	VXLAN	e001:a666:056d
RD[56000:11]								
ESI	Eth-Tag	Prefix-Length	IP-Address	GW-IPAddress	L3VNID/LABEL	Nexthop	Encap	Router-Mac
0	0	24	40.1.1.0	0.0.0.0	1000	3.3.3.3	VXLAN	e49d:73b1:c301
0	0	24	40.1.1.0	0.0.0.0	1000	3.3.3.3	VXLAN	e49d:73b1:c301
0	0	64	2002::	::	1000	3.3.3.3	VXLAN	e49d:73b1:c301
0	0	64	2002::	::	1000	3.3.3.3	VXLAN	e49d:73b1:c301
RD[63000:11]								
ESI	Eth-Tag	Prefix-Length	IP-Address	GW-IPAddress	L3VNID/LABEL	Nexthop	Encap	Router-Mac
0	0	24	50.50.50.0	0.0.0.0	2000	4.4.4.4	VXLAN	e8c5:7aa8:7cb3
0	0	24	50.50.50.0	0.0.0.0	2000	4.4.4.4	VXLAN	e8c5:7aa8:7cb3
0	0	64	3002::	::	2000	4.4.4.4	VXLAN	e8c5:7aa8:7cb3
0	0	64	3002::	::	2000	4.4.4.4	VXLAN	e8c5:7aa8:7cb3

PE8#

PE3#show ip ospf neighbor

Total number	of full	neighbors:	1				
OSPF process	1 VRF(d	efault):					
Neighbor ID	Pri	State	Dead	Time	Address	Interface	Instance ID
5.5.5.5	1	Full/DR	00:00	:29	23.1.1.2	xel4	0

```
Total number of full neighbors: 1
OSPF process 2 VRF(L3VRF1):
Neighbor ID
               Pri
                     State
                                     Dead Time
                                                 Address
                                                             Interface
                                                                             Instance ID
192.0.0.2
                  0 Full/DROther
                                                  40.1.1.2
                                                                               0
                                     00:00:35
                                                             irb1001
PE3#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"
С
             3.3.3.3/32 is directly connected, lo, 00:37:01
0
             4.4.4/32 [110/3] via 23.1.1.2, xe14, 00:35:25
0
             5.5.5.5/32 [110/2] via 23.1.1.2, xe14, 00:35:44
i Ll
             6.6.6.6/32 [115/20] via 101.1.1.1, ce3, 00:36:20
             7.7.7.7/32 [110/3] via 23.1.1.2, xe14, 00:35:44
0
             8.8.8.8/32 [110/3] via 23.1.1.2, xe14, 00:35:44
0
             21.1.1.0/24 [110/2] via 23.1.1.2, xe14, 00:35:44
0
0
             22.1.1.0/24 [110/2] via 23.1.1.2, xe14, 00:35:44
С
             23.1.1.0/24 is directly connected, xe14, 00:36:36
0
             24.1.1.0/24 [110/2] via 23.1.1.2, xe14, 00:35:44
i Ll
             80.1.1.0/24 [115/20] via 101.1.1.1, ce3, 00:36:20
i Ll
             90.1.1.0/24 [115/20] via 101.1.1.1, ce3, 00:36:20
             101.1.1.0/24 is directly connected, ce3, 00:36:35
С
             102.1.1.0/24 [115/20] via 101.1.1.1, ce3, 00:35:30
i Ll
             127.0.0.0/8 is directly connected, lo, 00:37:01
С
IP Route Table for VRF "management"
С
             10.12.98.0/24 is directly connected, eth0, 00:37:01
             127.0.0.0/8 is directly connected, lo.management, 00:37:01
С
IP Route Table for VRF "L3VRF1"
             7.7.7.7/32 [0/0] is directly connected, tunvxlan2, 00:35:44
В
             8.8.8/32 [0/0] is directly connected, tunvxlan2, 00:35:44
В
             16.16.16.0/24 [20/0] via 7.7.7.7 (recursive is directly connected,
В
tunvxlan2), 00:36:15
             17.17.17.0/24 [20/0] via 7.7.7.7 (recursive is directly connected,
В
tunvxlan2), 00:36:15
             20.1.1.0/24 [20/0] via 7.7.7.7 (recursive is directly connected, tu
В
nvxlan2), 00:36:15
С
             40.1.1.0/24 is directly connected, irb1001, 00:37:01
0
             55.0.0.0/24 [110/2] via 40.1.1.2, irb1001, 00:01:38
             55.0.1.0/24 [110/2] via 40.1.1.2, irb1001, 00:01:38
0
             55.0.2.0/24 [110/2] via 40.1.1.2, irb1001, 00:01:38
0
             55.0.3.0/24 [110/2] via 40.1.1.2, irb1001, 00:01:38
0
```

```
55.0.4.0/24 [110/2] via 40.1.1.2, irb1001, 00:01:38
\cap
            55.0.5.0/24 [110/2] via 40.1.1.2, irb1001, 00:01:38
0
            55.0.6.0/24 [110/2] via 40.1.1.2, irb1001, 00:01:38
Ο
            55.0.7.0/24 [110/2] via 40.1.1.2, irb1001, 00:01:38
0
0
            55.0.8.0/24 [110/2] via 40.1.1.2, irb1001, 00:01:38
0
            55.0.9.0/24 [110/2] via 40.1.1.2, irb1001, 00:01:38
С
            127.0.0.0/8 is directly connected, lo.L3VRF1, 00:37:01
IP Route Table for VRF "L2VRF1"
Gateway of last resort is not set
PE3#show nvo vxlan tunnel
VXLAN Network tunnel Entries
Source
               Destination
                                Status
                                              Up/Down
                                                           Update
_____
3.3.3.3
                7.7.7.7
                                              00:35:56
                                                           00:35:56
                                Installed
3.3.3.3
               8.8.8.8
                                Installed
                                            00:35:56
                                                          00:35:56
Total number of entries are 2
PE3#
PE4#show clns neighbors
Total number of L1 adjacencies: 1
Total number of L2 adjacencies: 1
Total number of adjacencies: 2
Tag 1: VRF : default
System Id
             Interface
                        SNPA
                                             State Holdtime Type Protocol
PE6
              xe5
                         e8c5.7a19.c3ae
                                                   21
                                                             L1
                                                                  IS-IS
                                             Up
                                             Up
                                                   21
                                                             L2
                                                                  IS-IS
Total number of L1 adjacencies: 0
Total number of L2 adjacencies: 1
Total number of adjacencies: 1
Tag 2: VRF : L3VRF2
System Id
             Interface
                         SNPA
                                             State Holdtime Type Protocol
Spirent-1
             irb2001
                         0010.9400.0007
                                            Up
                                                   26
                                                             L2
                                                                  IS-IS
Total number of L1 adjacencies: 0
Total number of L2 adjacencies: 1
Total number of adjacencies: 1
Tag 3: VRF : L3VRF2
System Id
             Interface
                                             State Holdtime Type Protocol
                         SNPA
0010.9400.0009 irb3002
                         0010.9400.0009
                                             Up
                                                   25
                                                             L2
                                                                  IS-IS
PE4#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"
             3.3.3.3/32 [110/3] via 24.1.1.2, xe25, 00:36:12
Ο
С
             4.4.4.4/32 is directly connected, lo, 00:37:52
0
             5.5.5/32 [110/2] via 24.1.1.2, xe25, 00:36:12
i L1
             6.6.6.6/32 [115/20] via 102.1.1.1, xe5, 00:36:48
\cap
             7.7.7.7/32 [110/3] via 24.1.1.2, xe25, 00:36:12
             8.8.8.8/32 [110/3] via 24.1.1.2, xe25, 00:36:12
0
             21.1.1.0/24 [110/2] via 24.1.1.2, xe25, 00:36:12
0
0
             22.1.1.0/24 [110/2] via 24.1.1.2, xe25, 00:36:12
             23.1.1.0/24 [110/2] via 24.1.1.2, xe25, 00:36:12
0
             24.1.1.0/24 is directly connected, xe25, 00:37:04
С
            80.1.1.0/24 [115/20] via 102.1.1.1, xe5, 00:36:48
i Ll
i Ll
            90.1.1.0/24 [115/20] via 102.1.1.1, xe5, 00:36:48
            101.1.1.0/24 [110/3] via 24.1.1.2, xe25, 00:36:12
Ο
С
            102.1.1.0/24 is directly connected, xe5, 00:37:04
С
            127.0.0.0/8 is directly connected, lo, 00:37:52
IP Route Table for VRF "management"
             10.12.98.0/24 is directly connected, eth0, 00:37:52
С
             127.0.0.0/8 is directly connected, lo.management, 00:37:52
С
IP Route Table for VRF "L3VRF2"
Gateway of last resort is 7.7.7.7 to network 0.0.0.0
B*
             0.0.0.0/0 [20/0] via 7.7.7.7 (recursive is directly connected, tunv
xlan2), 00:01:50
В
             2.2.2.2/32 [20/0] via 7.7.7.7 (recursive is directly connected, tun
vxlan2), 00:36:41
             7.7.7.7/32 [0/0] is directly connected, tunvxlan2, 00:36:12
В
             8.8.8.8/32 [0/0] is directly connected, tunvxlan2, 00:36:12
R
            10.1.1.0/24 [20/0] via 7.7.7.7 (recursive is directly connected, tu
В
nvxlan2), 00:36:41
            11.11.11.0/24 [20/0] via 7.7.7.7 (recursive is directly connected,
В
tunvxlan2), 00:36:41
            12.1.1.0/24 [20/0] via 7.7.7.7 (recursive is directly connected, tu
В
nvxlan2), 00:36:41
            12.13.14.0/24 [20/0] via 7.7.7.7 (recursive is directly connected,
В
tunvxlan2), 00:36:41
            13.1.1.0/24 [20/0] via 7.7.7.7 (recursive is directly connected, tu
В
nvxlan2), 00:36:41
             50.50.50.0/24 is directly connected, irb2001, 00:37:52
С
С
            127.0.0.0/8 is directly connected, lo.L3VRF2, 00:37:52
IP Route Table for VRF "L2VRF2"
Gateway of last resort is not set
PE4# show nvo vxlan tunnel
VXLAN Network tunnel Entries
Source
                Destination
                                 Status
                                               Up/Down
                                                              Update
  _____
                                                      _____
```

4.4.4.4	7.7.7.7	Installed	00:36:18	00:36:18
4.4.4.4	8.8.8.8	Installed	00:36:18	00:36:18

```
Total number of entries are 2 PE4#
```

Abbreviations

The following are some key abbreviations and their meanings relevant to this document:

Acronym	Description
ECMP	Equal-Cost Multipath
EVPN	Ethernet Virtual Private Netwrok
VxLAN	Virtual Extensible LAN
SR	Segment Routing
IRB	Integrated Routing
OSPF	Open Shortest Path First
ISIS	Intermediate System to Intermediate System

Glossary

The following provides definitions for key terms used throughout this document.

Multi Home VxLAN	This refers to a Virtual Extensible LAN (VxLAN) deployment where a Multi data center or network site is connected to a Multi external network (usually the internet) for connectivity.
IRB	A networking feature that enables the integration of Layer 3 IP routing and Layer 2 MAC address bridging within the same interface, simplifying network management and resource utilization.
OSPF	A dynamic and efficient link-state routing protocol used to determine the best path for data packets in an IP network. It is characterized by rapid convergence and adaptability, making it suitable for large and dynamic networks.
ISIS	A routing protocol designed for scalability and stability in computer networks, commonly used in large Service Provider networks. It provides a robust framework for routing information exchange.
Layer 3 Routing	Network routing operations at the Network Layer (Layer 3) of the OSI model, focusing on routing IP packets between different subnets or networks.
Layer 2 Bridging	Network bridging operations at the Data Link Layer (Layer 2) of the OSI model, handling the forwarding of data frames based on MAC addresses within the same network segment.
EVPN	Ethernet VPN, a technology that provides advanced and efficient methods for Layer 2 and Layer 3 services in Ethernet networks, often used in data centers and service provider environments.

VxLAN - EVPN for Service Provider Network

CHAPTER 1 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.





RTR1/VTEP1

#configure terminal	Enter configure mode.
(config)#interface lo	Enter interface mode for loopback.
<pre>(config-if)#ip address 33.33.33.0/31 secondary</pre>	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 100:11	Assign RD value

<pre>(config-vrf)# route-target export 200:11</pre>	Assign route-target value for export
<pre>(config-vrf)# route-target import 400:11</pre>	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 12vpn 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 I2vpn address family mode
(config-router) #exit	Exit BGP router mode
(config)#nvo vxlan enable	Enable VXLAN
(config) #nvo vxlan vtep-ip-global 33.33.33.0	Configure Source vtep-ip-global configuration
<pre>(config) #nvo vxlan id 1 ingress-replication inner-vid-disabled</pre>	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 12vpn evpn	Enter into I2vpn 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
(config-vrf) #exit	Exit vrf configuration mode
(config)#interface xel3	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
as 200	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 I2vpn 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)#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 ESI PREFIX-ROUTE n State/PfxRcd AD MACIP MCAST 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, 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 Next Hop Metric LocPrf Weight Path Peer Encap RD[100:11] VRF[vrf1]: [2]:[0]:[1]:[48,0000.339a.9397]:[0]:[1] * 34.34.34.0 Ο 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]:[32,33.33.33.1] 33.33.33.0 100 32768 0 i -----VXLAN * [3]:[1]:[32,34.34.34.0] 100 34.34.34.0 0 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] 0 100 0 200 34.34.34.0 300 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" 11.11.11.0/31 is directly connected, xe10/1, 00:36:00 С С 33.33.33.0/31 is directly connected, lo, 00:37:33 В 34.34.34.0/31 [20/0] via 11.11.11.1, xe10/1, 00:27:03 127.0.0.0/8 is directly connected, lo, 23:14:51 С 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 Dst-Addr VLAN DF-Status Src-Addr L2 NW ----1 ____ ____ ---- 33.33.33.0 34.34.34.0 ____ AC xel/1 --- Single Homed Port ---1 ___ 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

 1
 xe1/1
 1000
 2000

 Dynamic Local
 ---- ----

 1
 --- ----

 Dynamic Remote

0000.339a.9abb 33.33.33.0 ------0000.339a.9397 34.34.34.0

```
Total number of entries are : 2 VTEP1#
```

RTR3/VTEP2

```
#show running-config nvo vxlan
T
nvo vxlan enable
Т
nvo vxlan vtep-ip-global 34.34.34.0
T
nvo vxlan id 1 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp vrf1
!
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
                    AD MACIP MCAST ESI PREFIX-ROUTE
  State/PfxRcd
n
12.12.12.1
                        4 200 63
                                           64
                                                           0
                                                                 0 00:26:54
                                                    7
                                      0
              2
                    0
                           1
                                 1
                                                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 Encap Peer 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 VXT.AN *> [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] 34.34.34.0 100 32768 i -0 _____ VXLAN [2]:[0]:[1]:[48,0000.339a.9abb]:[0]:[1] * 33.33.33.0 100 0 200 0 100 i 12.12.12.1 VXLAN [3]:[1]:[32,33.33.33.0] 100 200 33.33.33.0 0 0 100 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"
   12.12.12.0/31 is directly connected, xe13, 00:28:41
С
   33.33.33.0/31 [20/0] via 12.12.12.1, xe13, 00:26:56
В
С
    34.34.34.0/31 is directly connected, lo, 00:29:36
С
   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
                 Dst-Addr
VLAN DF-Status Src-Addr
  ---- L2 NW ----
1
                                 _____
---- 34.34.34.0
                   33.33.33.0
                   AC xe1/1
1
     ____
          __
                                --- Single Homed Port ---
1000 ---- ----
                    ____
Total number of entries are 2
VTEP1#show nvo vxlan tunnel
VXLAN Network tunnel Entries
                             Up/Down
Source
        Destination
                      Status
                                           Update
_____
====
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
                          AccessPortDesc
    Type
                 Status
     ---- ----
1
                          0000.339a.9abb 33.33.33.0
                 _____
                               _____
    Dynamic Remote
     xe6 1000 2000 0000.339a.9397 34.34.34.0
1
                               _____
    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
_____
_____
      Interface VlanId Inner-VlanId Mac-Addr
VNID
                                   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
T
nvo vxlan enable
T
nvo vxlan vtep-ip-global 34.34.34.0
I
nvo vxlan id 1 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp vrf1
T
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 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
(config) #commit	Commit the candidate configuration to the running configuration
(config) #exit	Exit configuration mode

RTR3/VTEP2

```
#show running-config nvo vxlan
Т
nvo vxlan enable
!
nvo vxlan vtep-ip-global 34.34.34.0
Т
nvo vxlan id 1 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp vrf1
Т
nvo vxlan access-if port-vlan xe1/1 3000 inner-vlan 2000
map vnid 1
T
#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 ---- L2 NW ----1 _____ ---- 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 Status Up/Down Update Destination Source _____ 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 _____ _____ Interface VlanId Inner-VlanId Mac-Addr VTEP-Ip/ESI VNID Status AccessPortDesc Туре 1 ---- 0000.339a.9abb 33.33.33.0 _____ Dynamic Remote _____ Total number of entries are : 1

#

CHAPTER 2 EVPN VXLAN E-Tree

Overview

Ethernet VPN Ethernet-Tree (EVPN E-Tree), is a networking solution designed to manage communication within broadcast domains, incorporating redundancy through multi-homing in a network. It optimizes traffic routing and control, especially in scenarios where specific services or devices need controlled communication. It categorizes network nodes based on predefined definitions of EVPN Instances as Leaf or Root, allowing or restricting communication between them.

Feature Characteristics

Implemented Scenario 1 of the EVPN E-Tree solution, as defined by RFC-8317, designates each Provider Edge (PE) node as either a Leaf or a Root site per Virtual Private Network (VPN) for VXLAN EVPN in OcNOS.

Scenario 1: Leaf or Root Site(s) per PE

Scenario 1 involves a topology with three PE nodes: PE-1, PE-2, and PE-3. PE-1 and PE-2 are Multi-Homed nodes (MH-1 and MH-2), with PE-3 acting as the Root node. PE-1 and PE-2 function as Leaf nodes and are part of a single home access interface (SH1 and SH2).



The classification ensures that communication follows specific rules:

 Communication between Leaf hosts is restricted, as indicated by red dotted lines with a cross mark (X) in the topology diagram. However, communication between Leaf and Root nodes, as well as between Root nodes, is permitted, marked by green dotted lines. • Leaf nodes within PE-1 and PE-2 are isolated from each other, preventing intra-PE communication.

The scenario 1 is achieved through two main concepts:

1. Inter-PE Communication

- The inter-PE Route Target (RT) Constraint Method is applicable only to Single-Homing (SH) devices. Two RTs
 per broadcast domain are utilized, with Leaf PEs exporting Leaf RTs and Root nodes exporting Root RTs. Leaf
 nodes import only Root RTs, allowing communication with Root PEs while preventing communication with
 other Leaf nodes. RT constraints limit the import of specific EVPN routes (MAC-IP and IMET routes) to
 designated paths for inter-PE communication.
- IPI employs a proprietary method to support inter-PE connectivity for both SH and MH devices, using BGP extended community to advertise Leaf Indication in BGP routes and influence traffic flow for both Unicast and BUM traffic. This method enables implementation of ARP or ND cache suppression and MAC mobility sub-features specified in RFC-7432.
- 2. **Intra-PE communication:** Local Split Horizon controls intra-PE communication between Attachment Circuits (ACs) within Leaf PE nodes, ensuring that traffic between ACs does not egress to other Leaf ACs.

Note: This functionality depends on hardware capabilities.

Benefits

EVPN E-Tree offers benefits in networking environments by providing efficient traffic control, enhanced security, scalability, and improved performance.

Efficient Traffic Control: EVPN E-Tree allows for efficient control over traffic within network broadcast domains. By segregating nodes into Leaf and Root categories, it enables precise management of communication flows, ensuring the traffic is directed only where needed.

Enhanced Security: The isolation of Leaf hosts from each other adds a layer of security to the network. This prevents unauthorized communication between devices within the same broadcast domain, reducing the risk of data breaches and unauthorized access.

Scalability: EVPN E-Tree is scalable, making it suitable for networks of various sizes and complexities. Whether deploying in small-scale environments or large enterprise networks, EVPN E-Tree offers flexibility and scalability to meet evolving business needs.

Improved Performance: By controlling communication paths and optimizing traffic flows, EVPN E-Tree can improve network performance. This ensures that critical data packets are delivered efficiently, reducing latency and enhancing overall network performance.

Prerequisites

In setting up a VXLAN EVPN network, certain prerequisites are essential to ensure proper functionality and connectivity.

Ensure VXLAN EVPN Configuration: Confirm that VXLAN, EVPN VXLAN, and VXLAN filtering are already enabled in the network as they are required for VXLAN EVPN Multihoming.

Define Interfaces and Loopback Addresses: Configure Layer 2 interfaces, like port channel interfaces (e.g., po1), and assign specific system MAC addresses (Ethernet Segment Identifier (ESI) values) for proper identification and routing. Additionally, assign loopback IP addresses to establish essential points of connectivity. These configurations establish the efficient network routing and communication.

Configure OSPF and BGP for Dynamic Routing: Enable OSPF to facilitate dynamic routing within the network. Define OSPF router IDs to match loopback IP addresses and add network segments to OSPF areas for proper route

distribution. Additionally, establish BGP sessions to advertise routes between different nodes. Set up neighbor relationships using loopback IP addresses, ensuring efficient route advertisement and convergence for optimal network performance.

Leaf Node

1. Enable VXLAN and EVPN MH

Enable features like VXLAN and EVPN Multihoming, VXLAN filtering, and quality of service (QoS) capabilities on all Leaf nodes.

```
!
nvo vxlan enable
!
evpn vxlan multihoming enable
!
qos enable
!
```

2. Configure Interfaces and Loopback

Define a port channel interface (po1) as an L2 interface and assign the system MAC (0000.0000.1111) as the ESI value. Designate an interface (xe7) as a member port of po1. Assign the loopback IP address (1.1.1.1) to Leaf node, and set IP addresses (10.10.10.10.10.11.1) to interfaces (xe45 and xe49/2), respectively, for connectivity with Spine nodes.

```
1
interface pol
 switchport
evpn multi-homed system-mac 0000.0000.1111
T
interface lo
 ip address 1.1.1.1/32 secondary
interface xe7
channel-group 1 mode active
interface xe45
 ip address 10.10.10.1/24
interface xe49/2
 ip address 10.10.11.1/24
exit
L
```

3. Configure OSPF

In OSPF router mode, set the router ID (1.1.1.1), to match the loopback IP address. Add the loopback network (1.1.1.1/32) and networks (10.10.10.0/24) and 10.10.11.0/24 connected to Spine nodes in OSPF area 0. Enable Bidirectional Forwarding Detection (BFD) on all OSPF interfaces for faster convergence.

```
!
router ospf 100
ospf router-id 1.1.1.1
bfd all-interfaces
network 1.1.1.1/32 area 0.0.0.0
network 10.10.10.0/24 area 0.0.0.0
network 10.10.11.0/24 area 0.0.0.0
```

4. Configure BGP

In BGP router mode, set the router ID (1.1.1.1) to match the loopback IP address. Specify the loopback IP address of each Leaf node as neighbors with their respective remote AS numbers. Configure the loopback as the update source for each neighbor and set the advertisement interval (0) for rapid convergence. In L2VPN EVPN address family mode, activate each Leaf node (2.2.2.2, 3.3.3.3, 4.4.4.4) to establish connections within the EVPN address family.

```
I.
router bgp 100
bgp router-id 1.1.1.1
neighbor 2.2.2.2 remote-as 100
neighbor 3.3.3.3 remote-as 100
neighbor 4.4.4.4 remote-as 100
neighbor 2.2.2.2 update-source lo
neighbor 2.2.2.2 advertisement-interval 0
neighbor 3.3.3.3 update-source lo
neighbor 3.3.3.3 advertisement-interval 0
neighbor 4.4.4.4 update-source lo
neighbor 4.4.4.4 advertisement-interval 0
 1
address-family 12vpn evpn
neighbor 2.2.2.2 activate
neighbor 3.3.3.3 activate
neighbor 4.4.4.4 activate
exit-address-family
exit
!
```

5. Configure VRF

In VRF mode, create a MAC routing or forwarding instance (VRF1). Assign the Route Distinguisher (RD) value (1.1.1.1.100) and set both import and export route-target value (100:100). Ensure that the same route-target value is configured on all Leaf nodes for MAC VRF to maintain consistency.

```
!
mac vrf VRF1
rd 1.1.1.1:100
route-target both 100:100
!
```

Spine Node

1. Configure Interfaces and Loopback

Enable QoS and assign specific IP addresses to loopback interfaces. Configure IP addresses for interfaces connected to each Leaf node.

```
!
qos enable
!
interface ce1/2
ip address 40.40.40.2/24
!
interface ce1/4
ip address 10.10.10.2/24
!
interface ce24/1
ip address 30.30.30.2/24
```

```
!
interface ce27/1
ip address 20.20.20.2/24
!
interface lo
ip address 5.5.5/32 secondary
!
```

2. Configure OSPF

In OSPF router mode, set the router ID (5.5.5.5), to match the loopback IP address. Add the loopback network (5.5.5.5/32) and networks (10.10.10.0/24, 20.20.20.0/24, 30.30.30.0/24, and 40.40.40.0/24) connected to Leaf nodes in OSPF area 0. Enable BFD on all OSPF interfaces for faster convergence.

```
!
router ospf 100
ospf router-id 5.5.5.5
bfd all-interfaces
network 5.5.5.5/32 area 0.0.0.0
network 10.10.10.0/24 area 0.0.0.0
network 20.20.20.0/24 area 0.0.0.0
network 30.30.30.0/24 area 0.0.0.0
network 40.40.40.0/24 area 0.0.0.0
```

Configure Switch

Set up an IEEE VLAN bridge, enabling VLANs and associating them with bridge 1. Configure interfaces (xe57, po1, xe46, xe47) to be part of bridge 1, setting them as hybrid ports with VLAN (1000) allowed and egress-tagged enabled. Designate interfaces connected to Leaf nodes (xe46 and xe47) as member ports of po1.

```
bridge 1 protocol ieee vlan-bridge
Т
vlan database
vlan-reservation 4000-4094
vlan 1000 bridge 1 state enable
interface pol
switchport
bridge-group 1
switchport mode hybrid
switchport mode hybrid acceptable-frame-type all
switchport hybrid allowed vlan add 1000 egress-tagged enable
L
interface xe46
channel-group 1 mode active
I.
interface xe47
channel-group 1 mode active
I.
interface xe57
 switchport
bridge-group 1
switchport mode hybrid
switchport mode hybrid acceptable-frame-type all
 switchport hybrid allowed vlan add 1000 egress-tagged enable
!
```

Configuration

Configure various nodes within the topology to set up a VXLAN EVPN E-Tree network.

Topology

The sample topology includes Leaf Nodes (VTEP1, VTEP2, VTEP3, and VTEP4), Spine Nodes (SPINE1 and SPINE2), and Switches (SWITCH1 and SWITCH2).

VTEP1 and VTEP2 belong to Multi-homed group 1 (MH1) with po1, while VTEP3 and VTEP4 are in Multi-homed group 2 (MH2) with po2. VTEP2 and VTEP4 connect to single home access ports SH1 and SH2, respectively. All VTEPs link to Spine nodes SPINE1 and SPINE2. SWITCH1 is multi-homed to VTEP1 and VTEP2, and SWITCH2 connects to VTEP3 and VTEP4.



- Note: Before configuring E-Tree, meet all Prerequisites for the following nodes:
 - Leaf nodes: VTEP1, VTEP2, VTEP3, and VTEP4

- Spine nodes: SPINE1 and SPINE2
- Switches: SWITCH1 and SWITCH2

Enable EVPN E-Tree

The following E-Tree configurations applies to the VTEP nodes within the VXLAN network.

1. Enable EVPN E-Tree on VTEP3 and VTEP4 nodes, allowing them to participate in E-Tree functionality within the VXLAN network, controlling traffic and establishing hierarchical connections between Leaf nodes in the network architecture.

```
(config) #evpn etree enable
```

2. Set the ESI hold time (90 seconds) on all VTEP nodes to allow the tunnel to establish during VXLAN initialization before bringing up the ESI. Configure the source VTEP IP address (3.3.3.3) which serves as the global identifier for VXLAN encapsulation and decapsulation within the network, facilitating proper communication and tunnel establishment.

```
(config)#evpn esi hold-time 90
(config)#nvo vxlan vtep-ip-global 3.3.3.3
```

3. Define VXLAN identifier (10) with ingress replication and disabled inner VLAN ID (VID) for E-Tree leaf nodes (VTEP3 and VTEP4) to support hierarchical connectivity and traffic control within the VXLAN network. This configuration allows for efficient replication of traffic at the ingress point and ensures that inner VLAN IDs are disabled, optimizing the functionality of E-Tree leaf nodes within the network architecture. On the VXLAN tenant node, assign VRF (VRF1) to EVPN-BGP for carrying EVPN routes within the VXLAN network.

```
(config) #nvo vxlan id 10 ingress-replication inner-vid-disabled etree-leaf
(config-nvo) #vxlan host-reachability- protocol evpn-bgp VRF1
(config-nvo) #exit
```

4. Enable port-VLAN mapping (po2) with VLAN ID (1000) to facilitate multi-homed access on all VTEP nodes. Map VXLAN identifier (10) to the access port for VXLAN connectivity.

```
(config) #nvo vxlan access-if port-vlan po2 1000
(config-nvo-acc-if) #map vnid 10
(config-nvo-acc-if) #exit
(config) #commit
```

Validation

Use the show commands described in this section to verify the network for proper VXLAN EVPN E-Tree configuration.

Verify OSPF sessions between the VTEP nodes and the SPINEs within the VXLAN network using the show ip ospf neighbor command. This command displays OSPF neighbor details, including the state of the OSPF neighbor relationship. A State of Full/DR indicates a fully adjacent and operational state between the routers, confirming proper OSPF connectivity within the network.

```
VTEP1#show ip ospf neighbor
Total number of full neighbors: 2
OSPF process 100 VRF(default):
Neighbor ID
                Pri
                      State
                                Dead Time
                                            Address
                                                         Interface
                                                                              Instance ID
5.5.5.5
                  1
                      Full/DR 00:00:32
                                            10.10.10.2
                                                             xe45
                                                                                      0
6.6.6.6
                  1
                       Full/DR 00:00:30
                                            10.10.11.2
                                                             xe49/2
                                                                                      0
```

Verify the BGP session status between VTEPs, using the show bgp l2vpn evpn summary command output. The Up/Down field indicates the duration for which the BGP session has been up or down.

VTEP1#show bgp l2vpn evpn summary BGP router identifier 1.1.1.1, local AS number 100 BGP table version is 9

ESI PREFIX-ROUTE

0

0

0

1

0

0

1

1 BGP AS-PATH entries 0 BGP community entries V
 MsgSen
 TblVer
 InQ
 OutQ
 Up/Down
 State/PfxRcd
 AD
 MACIP
 MCAST

 28
 7
 0
 0
 00:07:37
 9
 3
 4
 1

 33
 8
 0
 0
 00:07:34
 6
 3
 2
 1
 V AS 4 100 4 100 Neighbor MsaRcv 34 2.2.2.2 3.3.3.3 30 4 100 31 28 7 0 0 00:07:37 8 4 4.4.4.4 3

Total number of neighbors 3

Total number of Established sessions 3

To validate the BGP L2VPN output on VTEPs and check MAC-IP routes and ESI information, use the show bqp 12vpn evpn command output. This command verifies routes with status code i (internal) and EVPN route types 2 and 4, displaying detailed information for each VTEP nodes.

VTEP1#show bgp 12vpn evpn BGP table version is 9, local router ID is 1.1.1.1 Status codes: s suppressed, d damped, h history, a add-path, b back-up, * 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 Next Hop Metric LocPrf Weight Path Peer Network Encap

RD[1.1.	1.1:100] VRF[VRF1]:					
*> [1]:	[00:00:00:00:00:11:11:00:00:00]	:[10]:[10]	100			
<u>т</u> .		0	100	327	68 1	- VXLAN
* 1	2.2.2.2	0	100	0	1 2.2.2.2	VXLAN
*> [1]:		:[429496/29	95]:[U]			
	1.1.1.1	0	100	327	68 1	- VXLAN
* 1	2.2.2.2	0	100	0	1 2.2.2.2	VXLAN
* i	2.2.2.2	0	100	0	i 2.2.2.2	VXLAN
* i[1]:	[00:00:00:00:22:22:00:00]	:[10]:[10]				
	3.3.3.3	0	100	0	i 3.3.3.3	VXLAN
* i	4.4.4.4	0	100	0	i 4.4.4.4	VXLAN
* i[1]:	[00:00:00:00:22:22:00:00]	:[429496729	95]:[0]			
	3.3.3.3	0	100	0	i 3.3.3.3	VXLAN
* i	3.3.3.3	0	100	0	i 3.3.3.3	VXLAN
* i	4.4.4.4	0	100	0	i 4.4.4.4	VXLAN
* i	4.4.4.4	0	100	0	i 4.4.4.4	VXLAN
*> [2]:	[00:00:00:00:00:11:11:00:00:00]	:[10]:[48,0	0000:1000:1	L000]:[3	2,100.100.100.1]:	[10]
	1.1.1.1	0	100	327	68 i	- VXLAN
* i	2.2.2.2	0	100	0	i 2.2.2.2	VXLAN
*> [2]:	[00:00:00:00:00:11:11:00:00:00]	:[10]:[48,0	0000:1000:1	L001]:[1	28,1000::1][10]	
	1.1.1.1	0	100	327	68 i	- VXLAN
* i	2.2.2.2	0	100	0	i 2.2.2.2	VXLAN
* i[2]:	[0]:[10]:[48,0000:2000:2000]:[3	2,200.200.2	200.11:[10]			
	2.2.2.2	0	100	0	i 2.2.2.2	VXLAN
* i[2]:	[0]:[10]:[48.0000:2000:2001]:[1	28,2000::11	[10]			
,.	2 2 2 2	0	100	0	i 2222	VXLAN
* i[2]•	[00.00.00.00.00.22.22.00.00.00]	·[10] · [48.0	000.3000.3	• • 1 • 1 0 0 0 8	2.103 103 103 11	.[10]
,.	3 3 3 3	0	100	0	i 3333	VXLAN
* i		0	100	0	i 4 4 4 4	VXT.AN
* 1[2].	[00.00.00.00.00.22.22.00.00.00]	• [10] • [48 (1000.3000.3	20011.11	28 1003111101	V ZI LI IIV
±[2].	3 3 3 3	.[10].[10].	100	001].[1	; 3 3 3 3	VYLAN
* :		0	100	0	± 3.3.3.3	VALM
* 1 [2].	······	2 104 104 1	10.01	0	1 1.1.1.1	VALAN
. T[Z]:		02,104.104.1	104.1]:[10]	0		5757T 3 5T
+	4.4.4.4	0 1004 11	100	0	1 4.4.4.4	VALAN
* 1[2]:		.28,1004::1]	[10]	0		
	4.4.4.4	0	100	0	1 4.4.4.4	VXLAN
*> [3]:	[10]:[32,1.1.1.1]					
	1.1.1.1	0	100	327	68 i	- VXLAN
* i[3]:	[10]:[32,2.2.2]					
	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

EVPN VXLAN E-Tree

* i[3]:[10]:[32,4.4.4.	4]								
	4.4.4.4	0	100	0	i	4.4.4.4	VXLAN		
RD[1.1.1.1:64512] VRF[evpn-gvrf-1]:									
*> [1]:[00:00:00:00:00	:11:11:00:00:00]:[429	4967295]:	[0]						
	1.1.1.1	0	100	32768	8 :	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	8	i	VXLAN		
* i[4]:[00:00:00:00:00	:11:11:00:00:00]:[32,	2.2.2.21							
	2.2.2.2	0	100	0	i	2.2.2.2	VXLAN		
		-		-	_				
RD[2 2 2 2·100]									
*>i[1].[00.00.00.00.00.00	.11.11.00.00.001.101	• [10]							
>1[1].[00.00.00.00.00	2 2 2 2 2	.[10]	100	0	÷	2 2 2 2	WYT AN		
*>	.11.11.00.00.001.001	40072051-1	100	0	Ŧ	2.2.2.2	VALAN		
^>1[1]:[00:00:00:00:00	:11:11:00:00:00]:[429	4967295]:	100	0		0 0 0 0			
	2.2.2.2	0	100		1	2.2.2.2	VXLAN		
*>1[2]:[00:00:00:00:00	:11:11:00:00:00]:[10]	:[48,0000:	:1000:1000]:[32]	,10	0.100.100.1]:[10]	1		
	2.2.2.2	0	100	0	i	2.2.2.2	VXLAN		
*>i[2]:[00:00:00:00:00	:11:11:00:00:00]:[10]	:[48,0000:	:1000:1001]]:[128	8,1	000::1][10]			
	2.2.2.2	0	100	0	i	2.2.2.2	VXLAN		
*>i[2]:[0]:[10]:[48,00	00:2000:2000]:[32,200	.200.200.1	L]:[10]						
	2.2.2.2	0	100	0	i	2.2.2.2	VXLAN		
*>i[2]:[0]:[10]:[48,00	00:2000:2001]:[128,20	00::1][10]							
	2.2.2.2	0	100	0	i	2.2.2.2	VXLAN		
*>i[3].[10].[32 2 2 2	21								
/1[0].[10].[02/2.2.2.	2 2 2 2	0	100	0	÷	2 2 2 2	WYT AN		
	2.2.2.2	0	100	0	Ŧ	2.2.2.2	VALAN		
RD[2.2.2.2:64512]									
*>1[1]:[00:00:00:00:00	:11:11:00:00:00]:[429	4967295]:	[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[3.3.3.3:100]									
*>i[1]:[00:00:00:00:00	:22:22:00:00:00]:[10]	:[10]							
	3.3.3.3	0	100	0	i	3.3.3.3	VXLAN		
*>i[1]:[00:00:00:00:00	:22:22:00:00:001:[429	49672951:	101						
	3 3 3 3	0	100	0	i	3 3 3 3	VXT.AN		
*>i [2] • [00 • 00 • 00 • 00]	.22.22.00.00.001.[10]	• [48 0000	.3000.30001	1 • [3 2	1.0	3 103 103 11•[10]	1		
>1[2].[00.00.00.00.00	.22.22.00.00.00].[10]	.[40,0000.	100	0	, 10.	2 2 2 2 2	1 57577 7 51		
	3.3.3.3	0	100	0		3.3.3.3	VALAN		
*>1[2]:[00:00:00:00:00	:22:22:00:00:00]:[10]	:[48,0000:	:3000:3001]:[120	8, I'	003::1][10]			
	3.3.3.3	0	100	0	1	3.3.3.3	VXLAN		
*>i[3]:[10]:[32,3.3.3.	3]								
	3.3.3.3	0	100	0	i	3.3.3.3	VXLAN		
RD[3.3.3.3:64512]									
*>i[1]:[00:00:00:00:00	:22:22:00:00:00]:[429	4967295]:	[0]						
	3.3.3.3	0	100	0	i	3.3.3.3	VXLAN		
RD[4.4.4.4:100]									
*>i[1].i(00.00.00.00.00.00	.22.22.00.00.001.[10]	• [10]							
, 1[1].[00.00.00.00.00.00		0	100	0	i	4 4 4 4	WXT.AN		
*>;[1]00.00.00.00.00	.22.22.00.00.001.1220	19672951.	100	0	-	1.1.1.1	VALAN		
>1[1].[00.00.00.00.00	.22.22.00.00.00].[429		100	0			5757T T NI		
	4.4.4.4	0	100	0	1.0	4.4.4.4	VALAN		
*>1[2]:[00:00:00:00:00	:22:22:00:00:00]:[10]	:[48,0000:	:3000:3000]:[32]	, 10.	3.103.103.1]:[10	l		
	4.4.4.4	0	100	0	i	4.4.4.4	VXLAN		
*>i[2]:[00:00:00:00:00	:22:22:00:00:00]:[10]	:[48,0000:	:3000:3001]]:[128	8,1	003::1][10]			
	4.4.4.4	0	100	0	i	4.4.4.4	VXLAN		
*>i[2]:[0]:[10]:[48,00	00:4000:4000]:[32,104	.104.104.1	L]:[10]						
	4.4.4.4	0	100	0	i	4.4.4.4	VXLAN		
*>i[2]:[0]:[10]:[48,00	00:4000:4001]:[128,10	04::1][10]							
	4.4.4.4	0	100	0	i	4.4.4.4	VXLAN		
*>i[3]:[10]:[32.4.4 4	41								
	- 4 4 4	0	100	0	i	4 4 4 4	VXT,AN		
		~			-				
PD[4 4 4 4.64512]									
*>:[1].[00.00.00 00 00		40670051	101						
~~T[T]:[00:00:00:00:00	:22:22:00:00:00]:[429	490/295]:	100	0					
	4.4.4.4	U	TOO	U	1	4.4.4.4	VXLAN		
Total number of prefixe	es 42								

Validate the LAG interfaces (pol and po2) are up for MH1 and MH2 by reviewing the show etherchannel summary output. Check the Link and sync fields, where link displays the port channel interface and ID number, and sync indicates whether MAC address synchronization is enabled to forward Layer 3 packets arriving on these interfaces.

```
VTEP1#show etherchannel summary
Aggregator po1 100001
Aggregator Type: Layer2
Admin Key: 0001 - Oper Key 0001
Link: xe7 (5005) sync: 1
```

Validate the status of NVO VXLAN on VTEPs by examining the output of the show nvo vxlan command. The DF-Status field displays the forwarding status of VXLAN tunnels as a Designated Forwarder (DF) or Non-Designated Forwarder (Non-DF).

Code	s: NW - Netwo AC - Acces (u) - Untag	rk Port s Port ged							
/NID	VNI-Name	VNI-Type	Туре	Interface	ESI	VLAN	DF-Status	Src-Addr	Dst-Addr
1.0		T.2	NW					1 1 1 1	4444
10		1.2	NW					1 1 1 1	3 3 3 3
10		1.2	NW					1 1 1 1	2 2 2 2 2
10			AC	pol	00:00:00:00:00:11:11:00:00:00	1000	DF		
Cotal n	umber of entr	ies are 4							
/TEP2#s /XLAN I:	how nvo vxlan nformation								
Code	s: NW - Netwo AC - Acces (u) - Untag	rk Port s Port ged							
/NID	VNI-Name	VNI-Type	Туре	Interface	ESI	VLAN	DF-Status	Src-Addr	Dst-Addr
10		L2	NW					2.2.2.2	4.4.4.4
LO		L2	NW					2.2.2.2	1.1.1.1
LO		L2	NW					2.2.2.2	3.3.3.3
LO			AC	xe37	Single Homed Port	1000			
LO			AC	pol	00:00:00:00:00:11:11:00:00:00	1000	NON-DF		
TEP3#s	umber of entr how nvo vxlan	ies are 5							
	=========								
Code	s: NW - Netwo AC - Acces (u) - Untag	rk Port s Port ged							
NID	VNI-Name	VNI-Type	Туре	Interface	ESI	VLAN	DF-Status	Src-Addr	Dst-Addr
L 0		L2	NW					3.3.3.3	2.2.2.2
LO		L2	NW					3.3.3.3	1.1.1.1
LO		L2	NW					3.3.3.3	4.4.4.4
LO			AC	po2	00:00:00:00:22:22:00:00:00	1000	DF		
fotal n	umber of entr	ies are 4							
VTEP4#s	how nvo vxlan								

Codes: NW - Network Port AC - Access Port

(u) - Untagged

VNID	VNI-Name	VNI-Type	Туре	Interface	ESI	VLAN	DF-Status	Src-Addr	Dst-Addr
10		L2	NW					4.4.4.4	2.2.2.2
10		L2	NW					4.4.4.4	3.3.3.3
10		L2	NW					4.4.4.4	1.1.1.1
10			AC	xe34	Single Homed Port	1000			
10			AC	po2	00:00:00:00:22:22:00:00:00	1000	NON-DF		

Total number of entries are 5

Validate the NVO VXLAN tunnel status on VTEPs by reviewing the output of the show nvo vxlan tunnel command. The Status field indicates the current status of each tunnel. In this case, all three tunnels between VTEPs and their respective destinations are marked as Installed, confirming that these tunnels are successfully established and operating.

VTEP1#show nvo vxlan tunnel VXLAN Network tunnel Entries

Source	Destination	Status	Up/Down	Update
1.1.1.1	4.4.4.4	Installed	00:02:26	00:01:58
1.1.1.1	3.3.3.3	Installed Installed	00:02:26	00:01:55

Total number of entries are 3

Validate the VXLAN access interface status on VTEPs by examining the output of the show nvo vxlan access-if brief command. The up admin and link status confirms that the access port associated with VXLAN is active and functioning properly on the VTEP nodes.

VTEP1#show nvo vxlan access-if brief

		Inner			Admin	Link
Interface	Vlan	vlan	Ifindex	Vnid	status	status
 pol	1000		0x7a120	10	up	 up

Total number of entries are 1

Static MAC-IP Advertisement

Configure static MAC-IP advertisement through SH and MH VTEPs from Root and Leaf nodes. Advertise static MAC addresses for IPv4 and IPv6 from MH1, MH2, SH1, and SH2 VTEPs. Ensure that VTEP1 and VTEP2 in MH1 have the same MAC addresses configured under the port-channel access port. Symmetrical configurations between MH VTEPs should be maintained.

Configure MH1 and MH2 VTEPs

Configure static MAC addresses for IPv4 (100.100.1) and IPv6 (1000::1) under the VXLAN MH access-port (po1) with VLAN ID (1000). Ensure that identical MAC addresses are set up within the MH1-VTEPs for advertisement. Apply similar configurations to MH2-VTEPs for static MAC-IP advertisement.

```
!
nvo vxlan access-if port-vlan pol 1000
map vnid 10
mac 0000.1000.1000 ip 100.100.100.1
mac 0000.1000.1001 ipv6 1000::1
!
```

Configure SH1 and SH2 VTEPs

Configure static MAC addresses for IPv4 (200.200.200.1) and IPv6 (2000::1) under the VXLAN SH access-port (xe37) with VLAN ID (1000) on SH1 (VTEP2). This setup ensures that SH1 advertises these static MAC addresses over the specified VXLAN access-port. Repeat similar configurations for SH2 (VTEP4) using different static MAC addresses for both IPv4 and IPv6.

```
!
nvo vxlan access-if port-vlan xe37 1000
map vnid 10
mac 0000.2000.2000 ip 200.200.200.1
mac 0000.2000.2001 ipv6 2000::1
!
```

Validation

Verify the MAC table entries on MH VTEPs (MH1 and MH2) and the SH VTEPs (VTEP2 and VTEP4). The MAC addresses are advertised using the ESI values from VTEP1 and VTEP2 for MH1, and from VTEP3 and VTEP4 for MH2. Additionally, verify the VTEP IP addresses associated with SH VTEP2 and VTEP4 for MAC advertisement.

In the output of the show nvo vxlan mac-table command on all VTEP nodes, the MAC entries advertised from Leaf VTEPs will have the LeafFlag field status set.

Note:

- MAC IPv4 or IPv6 configured under SH Leaf VTEP access port will be advertised to the Root VTEP and other Leaf VTEPs.
- MAC IPv4 or IPv6 configured under an MH Leaf VTEP access port must be symmetric and will be advertised to both the Root VTEP and other leaf VTEPs.
- MAC IPv4 or IPv6 configured under either SH or MH Root VTEP will be advertised to both the Root VTEP and the Leaf VTEPs.
- The Leaf-to-Leaf communication will display MAC status and tunnel status per VNI as Leaf type. The MAC will be in the discard state in the BCM shell.

VTEP1#show nvo vxlan mac-table

	VXLAN MAC Entries									
VNID	Interface	VlanId	In-VlanId	Mac-Addr	VTEP-Ip/ESI	====== Туре	Status	MAC move	AccessPortDe	sc LeafFlag
10	pol	1000		0000.1000.1000	00:00:00:00:00:11:11:00:00:00	Static	Local	0		
10	pol	1000		0000.1000.1001	00:00:00:00:00:11:11:00:00:00	Static	Local ·	0		
10				0000.2000.2000	2.2.2.2	Static	Remote		0	
10				0000.2000.2001	2.2.2.2	Static	Remote		0	
10				0000.3000.3000	00:00:00:00:00:22:22:00:00:00	Static	Remote		0	- set
10				0000.3000.3001	00:00:00:00:00:22:22:00:00:00	Static	Remote		0	set
10				0000.4000.4000	4.4.4.4	Static	Remote		0	- set
10				0000.4000.4001	4.4.4.4	Static	Remote		0	set
Tota	'otal number of entries are : 8									
VTEP	3#show nvo	vxlan m	ac-table							

===:										
VXLAN MAC Entries										
VNI) Interface	VlanId	In-VlanId	Mac-Addr	VTEP-Ip/ESI	Type Statu	is MAC	move A	ccessPortDesc I	eafFlag
10				0000.1000.1000	00:00:00:00:00:11:11:00:00:00) Static Re	emote -		0	
10				0000.1000.1001	00:00:00:00:00:11:11:00:00:00) Static Re	emote		- 0	
10				0000.2000.2000	2.2.2.2	Static Re	emote		- 0	
10				0000.2000.2001	2.2.2.2	Static Re	emote		- 0	
10	po2	1000		0000.3000.3000	00:00:00:00:22:22:00:00:00) Static Lo	ocal		- 0	set
10	po2 1	000		0000.3000.3001	00:00:00:00:00:22:22:00:00:00) Static Lo	ocal		- 0	set
10				0000.4000.4000	4.4.4.4	Static Re	emote		- 0	set

```
10 ---- --- 0000.4000.4001 4.4.4.4
```

Static Remote ----- 0 ----- set

Total number of entries are : 8

Use the show nvo vxlan arp-cache command to verify the Address Resolution Protocol (ARP) cache information on all VTEP nodes. This command displays entries that map IPv4 addresses to MAC addresses within the specified VXLAN VNID network.

VTEP1#show nvo vxlan arp-cache VXLAN ARP-CACHE Information

VNID	Ip-Addr	Mac-Addr	Туре	Age-Out	Retries-Left
10	100.100.100.1	0000.1000.1000	Static	Local	
10	103.103.103.1	0000.3000.3000	Static	Remote	
10	104.104.104.1	0000.4000.4000	Static	Remote	
10	200.200.200.1	0000.2000.2000	Static	Remote	
Total	number of entries a	are 4			

VTEP3#show nvo vxlan arp-cache VXLAN ARP-CACHE Information

VNID	Ip-Addr	Mac-Addr	Туре	Ag	e-Out	Retries-Left
10	100.100.100.1	0000.1000.1000	Static	Remote		
10	103.103.103.1	0000.3000.3000	Static	Local		
10	104.104.104.1	0000.4000.4000	Static	Remote		
10	200.200.200.1	0000.2000.2000	Static	Remote		
Total	number of entries a	are 4				

Use the show nvo vxlan nd-cache command to verify the Neighbor Discovery (ND) cache information on all VTEP nodes. This command displays entries that map IPv6 addresses to MAC addresses within the specified VXLAN VNID network.

VTEP1#show nvo vxlan nd-cache VXLAN ND-CACHE Information _____ VNID Ip-Addr Mac-Addr Туре Age-Out Retries-Left 10 1000::1 0000.1000.1001 Static Local ____ 10 1003::1 0000.3000.3001 Static Remote ____ 0000.4000.4001 Static Remote 10 1004::1 ____ 10 2000::1 0000.2000.2001 Static Remote ____ Total number of entries are 4 VTEP3#show nvo vxlan nd-cache VXLAN ND-CACHE Information _____ VNID Ip-Addr Mac-Addr Туре Age-Out Retries-Left 0000.1000.1001 Static Remote 10 1000::1 ____ 10 1003::1 0000.3000.3001 Static Local ____ 10 1004::1 0000.4000.4001 Static Remote ____

10 2000::1 Total number of entries are 4 0000.2000.2001 Static Remote ____

Network Topology Snippet Configurations

Here are the snippet configurations for all nodes in the given network topology.

```
nvo vxlan enable
evpn esi hold-time 90
1
evpn vxlan multihoming enable
1
mac vrf VRF1
 rd 1.1.1:100
 route-target both 100:100
1
nvo vxlan vtep-ip-global 1.1.1.1
1
nvo vxlan id 10 ingress-replication inner-vid-disabled
 vxlan host-reachability-protocol evpn-bgp VRF1
!
gos enable
1
interface pol
 switchport
evpn multi-homed system-mac 0000.0000.1111
I.
interface lo
 ip address 1.1.1.1/32 secondary
!
interface xe7
 channel-group 1 mode active
!
interface xe45
 ip address 10.10.10.1/24
1
interface xe49/2
 ip address 10.10.11.1/24
I.
 exit
!
router ospf 100
 ospf router-id 1.1.1.1
bfd all-interfaces
 network 1.1.1.1/32 area 0.0.0.0
 network 10.10.10.0/24 area 0.0.0.0
 network 10.10.11.0/24 area 0.0.0.0
1
router bgp 100
 bgp router-id 1.1.1.1
 neighbor 2.2.2.2 remote-as 100
 neighbor 3.3.3.3 remote-as 100
 neighbor 4.4.4.4 remote-as 100
```

```
neighbor 2.2.2.2 update-source lo
 neighbor 2.2.2.2 advertisement-interval 0
 neighbor 3.3.3.3 update-source lo
 neighbor 3.3.3.3 advertisement-interval 0
 neighbor 4.4.4.4 update-source lo
 neighbor 4.4.4.4 advertisement-interval 0
 1
 address-family 12vpn evpn
 neighbor 2.2.2.2 activate
 neighbor 3.3.3.3 activate
neighbor 4.4.4.4 activate
exit-address-family
 !
exit
1
nvo vxlan access-if port-vlan pol 1000
map vnid 10
mac 0000.1000.1000 ip 100.100.100.1
mac 0000.1000.1001 ipv6 1000::1
!
```

```
1
nvo vxlan enable
evpn esi hold-time 90
evpn vxlan multihoming enable
1
mac vrf VRF1
rd 2.2.2:100
route-target both 100:100
1
nvo vxlan vtep-ip-global 2.2.2.2
1
nvo vxlan id 10 ingress-replication inner-vid-disabled
vxlan host-reachability-protocol evpn-bgp VRF1
1
qos enable
interface pol
switchport
evpn multi-homed system-mac 0000.0000.1111
1
interface lo
 ip address 2.2.2/32 secondary
1
interface xe38
channel-group 1 mode active
1
interface xe49/1
ip address 20.20.20.1/24
interface xe50/1
 ip address 20.20.21.1/24
```

```
!
exit
L
router ospf 100
ospf router-id 2.2.2.2
bfd all-interfaces
network 2.2.2/32 area 0.0.0.0
network 20.20.20.0/24 area 0.0.0.0
network 20.20.21.0/24 area 0.0.0.0
I.
router bgp 100
bgp router-id 2.2.2.2
neighbor 1.1.1.1 remote-as 100
neighbor 3.3.3.3 remote-as 100
 neighbor 4.4.4.4 remote-as 100
 neighbor 1.1.1.1 update-source lo
 neighbor 1.1.1.1 advertisement-interval 0
 neighbor 3.3.3.3 update-source lo
 neighbor 3.3.3.3 advertisement-interval 0
 neighbor 4.4.4.4 update-source lo
 neighbor 4.4.4.4 advertisement-interval 0
 1
 address-family 12vpn evpn
 neighbor 1.1.1.1 activate
 neighbor 3.3.3.3 activate
neighbor 4.4.4.4 activate
exit-address-family
 !
exit
!
nvo vxlan access-if port-vlan xe37 1000
map vnid 10
mac 0000.2000.2000 ip 200.200.200.1
mac 0000.2000.2001 ipv6 2000::1
L
nvo vxlan access-if port-vlan pol 1000
map vnid 10
mac 0000.1000.1000 ip 100.100.100.1
mac 0000.1000.1001 ipv6 1000::1
1
```

```
!
nvo vxlan enable
!
evpn esi hold-time 90
!
evpn vxlan multihoming enable
!
evpn etree enable
!
mac vrf VRF1
rd 3.3.3.3:100
route-target both 100:100
```

```
!
nvo vxlan vtep-ip-global 3.3.3.3
nvo vxlan id 10 ingress-replication inner-vid-disabled etree-leaf
vxlan host-reachability-protocol evpn-bgp VRF1
1
qos enable
1
interface po2
switchport
evpn multi-homed system-mac 0000.0000.2222
interface lo
ip address 3.3.3/32 secondary
1
interface xe53/1
ip address 30.30.30.1/24
1
interface xe54/1
ip address 30.30.31.1/24
1
interface xe55/1
 channel-group 2 mode active
!
exit
router ospf 100
 ospf router-id 3.3.3.3
bfd all-interfaces
network 3.3.3.3/32 area 0.0.0.0
network 30.30.30.0/24 area 0.0.0.0
network 30.30.31.0/24 area 0.0.0.0
L
router bgp 100
bgp router-id 3.3.3.3
neighbor 1.1.1.1 remote-as 100
neighbor 2.2.2.2 remote-as 100
 neighbor 4.4.4.4 remote-as 100
 neighbor 1.1.1.1 update-source lo
 neighbor 1.1.1.1 advertisement-interval 0
 neighbor 2.2.2.2 update-source lo
 neighbor 2.2.2.2 advertisement-interval 0
 neighbor 4.4.4.4 update-source lo
 neighbor 4.4.4.4 advertisement-interval 0
 address-family 12vpn evpn
 neighbor 1.1.1.1 activate
 neighbor 2.2.2.2 activate
 neighbor 4.4.4.4 activate
exit-address-family
1
exit
!
1
nvo vxlan access-if port-vlan po2 1000
map vnid 10
mac 0000.3000.3000 ip 103.103.103.1
```

```
mac 0000.3000.3001 ipv6 1003::1
!
```

```
1
nvo vxlan enable
evpn esi hold-time 90
!
evpn vxlan multihoming enable
1
evpn etree enable
mac vrf VRF1
rd 4.4.4.4:100
route-target both 100:100
!
nvo vxlan vtep-ip-global 4.4.4.4
1
nvo vxlan id 10 ingress-replication inner-vid-disabled etree-leaf
 vxlan host-reachability-protocol evpn-bgp VRF1
!
gos enable
interface po2
 switchport
evpn multi-homed system-mac 0000.0000.2222
!
interface lo
 ip address 4.4.4/32 secondary
!
interface xel1/1
 ip address 40.40.41.1/24
1
interface xe31/1
 channel-group 2 mode active
1
interface xe33
 ip address 40.40.40.1/24
I.
interface xe34
 switchport
!
exit
!
router ospf 100
 ospf router-id 4.4.4.4
bfd all-interfaces
 network 4.4.4.4/32 area 0.0.0.0
 network 40.40.40.0/24 area 0.0.0.0
network 40.40.41.0/24 area 0.0.0.0
!
router bgp 100
 bgp router-id 4.4.4.4
 neighbor 1.1.1.1 remote-as 100
```

```
neighbor 2.2.2.2 remote-as 100
 neighbor 3.3.3.3 remote-as 100
 neighbor 1.1.1.1 update-source lo
 neighbor 1.1.1.1 advertisement-interval 0
 neighbor 2.2.2.2 update-source lo
 neighbor 2.2.2.2 advertisement-interval 0
 neighbor 3.3.3.3 update-source lo
 neighbor 3.3.3.3 advertisement-interval 0
 1
 address-family 12vpn evpn
 neighbor 1.1.1.1 activate
neighbor 2.2.2.2 activate
 neighbor 3.3.3.3 activate
exit-address-family
 !
exit
!
nvo vxlan access-if port-vlan xe34 1000
map vnid 10
mac 0000.4000.4000 ip 104.104.104.1
mac 0000.4000.4001 ipv6 1004::1
I.
nvo vxlan access-if port-vlan po2 1000
map vnid 10
mac 0000.3000.3000 ip 103.103.103.1
mac 0000.3000.3001 ipv6 1003::1
!
```

SPINE1

```
!
qos enable
!
interface ce1/2
ip address 40.40.40.2/24
1
interface ce1/4
ip address 10.10.10.2/24
L
interface ce24/1
ip address 30.30.30.2/24
Т
interface ce27/1
ip address 20.20.20.2/24
interface lo
 ip address 5.5.5/32 secondary
!
exit
!
router ospf 100
ospf router-id 5.5.5.5
bfd all-interfaces
network 5.5.5.5/32 area 0.0.0.0
network 10.10.10.0/24 area 0.0.0.0
 network 20.20.20.0/24 area 0.0.0.0
```

```
network 30.30.30.0/24 area 0.0.0.0
network 40.40.40.0/24 area 0.0.0.0
!
```

SPINE2

```
I.
qos enable
1
interface ce5/1
ip address 20.20.21.2/24
1
interface ce10/1
ip address 30.30.31.2/24
1
interface cel1/1
ip address 40.40.41.2/24
1
interface ce14/2
ip address 10.10.11.2/24
!
interface lo
ip address 6.6.6/32 secondary
!
exit
!
router ospf 100
ospf router-id 6.6.6.6
bfd all-interfaces
network 6.6.6.6/32 area 0.0.0.0
network 10.10.11.0/24 area 0.0.0.0
network 20.20.21.0/24 area 0.0.0.0
network 30.30.31.0/24 area 0.0.0.0
network 40.40.41.0/24 area 0.0.0.0
!
```

SWITCH1

```
1
bridge 1 protocol ieee vlan-bridge
vlan database
vlan-reservation 4000-4094
vlan 1000 bridge 1 state enable
!
interface pol
switchport
bridge-group 1
switchport mode hybrid
switchport mode hybrid acceptable-frame-type all
switchport hybrid allowed vlan add 1000 egress-tagged enable
T
interface xe46
channel-group 1 mode active
!
interface xe47
```

```
channel-group 1 mode active
!
interface xe57
switchport
bridge-group 1
switchport mode hybrid
switchport mode hybrid acceptable-frame-type all
switchport hybrid allowed vlan add 1000 egress-tagged enable
!
exit
!
```

SWITCH2

```
bridge 1 protocol ieee vlan-bridge
vlan database
 vlan-reservation 4000-4094
 vlan 1000 bridge 1 state enable
interface po2
 switchport
 bridge-group 1
 switchport mode hybrid
 switchport mode hybrid acceptable-frame-type all
 switchport hybrid allowed vlan add 1000 egress-tagged enable
T
interface xe33
 switchport
 bridge-group 1
 switchport mode hybrid
 switchport mode hybrid acceptable-frame-type all
 switchport hybrid allowed vlan add 1000 egress-tagged enable
!
interface xe49/1
 channel-group 2 mode active
1
interface xe51/1
 channel-group 2 mode active
T
 exit
!
```

Implementation Examples

Here is an example scenario and a solution for implementing EVPN E-Tree.

Scenario 1: Specific traffic isolation and control measures are essential in a network of EVPN L2VPN services or instances. Within a broadcast domain, services communicating with each other may result in flooding BUM traffic to all services within the domain. Moreover, hosts are learned and advertised between different sites/services.

Use Case 1: Implementing an EVPN E-Tree solution defines the network topology with distinct Root and Leaf classifications, BUM traffic flooding can be minimized, and traffic isolation can be achieved. This ensures efficient communication between services while preventing unnecessary traffic propagation and maintaining network integrity.

Scenario 2: An Internet Service Provider (ISP) provides services to multiple subscribers and aims to facilitate communication with them. However, the ISP needs to ensure that subscribers exclusively communicate with the ISP and not among themselves.

Use Case 2: Implementing EVPN E-Tree is essential to fulfill this requirement. By categorizing ISP services as Root and subscribers as Leaf, traffic isolation can be enforced. This configuration enables the ISP to communicate with subscribers while preventing inter-subscriber communication. As a result, network security is enhanced, and the ISP maintains control over communication within its network.

E-Tree CLI Commands

The EVPN E-Tree introduces the following configuration commands in OcNOS.

evpn etree

Use this command to enable E-Tree functionality within the EVPN configuration.

Command Syntax

evpn etree enable

Parameters

None

Default

Disabled

Command Mode

Configure mode

Applicability

Introduced in OcNOS version 6.5.1.

Example

The following example illustrates how to activate E-Tree functionality for EVPN:

```
OcNOS#configure terminal
OcNOS(config)#evpn etree enable
```

Revised CLI Commands

The following is the revised command for configuring VXLAN EVPN E-Tree

nvo vxlan id

- The existing syntax now includes the newly added parameter for E-Tree, namely etree-leaf.
- The command nvo vxlan id <VNID> ingress-replication inner-vid-disabled etree-leaf allows users to tailor VXLAN behavior on a network device, specifying VXLAN parameters and indicating its

participation as a leaf node in an E-Tree deployment. For more details, refer to the nvo vxlan id command in the VXLAN Commands chapter in the OcNOS VXLAN Guide.

Troubleshooting

- 1. When traffic, whether unicast (UC) or broadcast, is passed to the Intra Leaf site:
 - Check the sub-interface or physical interface counters to monitor traffic throughput and potential issues.
 - Verify the Leaf status of the corresponding VNI to ensure proper functionality.
 - Use packet sniffing tools to analyze packets in the egress direction for any anomalies or errors.
 - MAC entries learned via leaf access port should include the set keyword in the MAC table output.
- 2. If UC traffic is routed within inter-PE leaf sites:
 - Check the Leaf status of the VNI at both participating PE devices to confirm operational status.
 - Check if the advertised MAC is in discard or non-discard status using the show mac table command and 12 show in the BCM shell.
- 3. Investigate UC traffic drops from the Root to MH Leaf PE:
 - Check if MAC addresses are not installed in discard status within the MH peer's access port. This status could indicate issues with MAC learning or forwarding.
- 4. Evaluate traffic between Root and Leaf:
 - Confirm the establishment of both UC and BUM tunnels.
 - Ensure that unicast MAC addresses are not marked with a discard status in the MAC table.
- 5. Validate the exchange of routes between two BGP L2VPN peers:
 - Monitor BGP (Border Gateway Protocol) sessions to verify successful route exchange and propagation between the peers.
- 6. Convergence: Assess convergence by checking BFD configuration between BGP sessions.

Glossary

The following provides definitions for key terms or abbreviations and their meanings used throughout this document:

Key Terms/Acronym	Description
Ethernet VPN Ethernet- Tree (EVPN E-Tree)	A networking solution designed to manage communication within broadcast domains, incorporating redundancy through multi-homing in a network. It optimizes traffic routing and control, categorizing network nodes based on predefined definitions of EVPN Instances as Leaf or Root, allowing or restricting communication between them.
Virtual Extensible LAN (VXLAN)	A technology that provides encapsulation techniques to create virtualized Layer 2 networks over Layer 3 infrastructure, facilitating scalable and flexible network designs.
Ethernet Virtual Private Network (EVPN)	A Layer 2 VPN technology that extends Ethernet services across data centers and wide-area networks using BGP.

Multi-homing (MH)	The ability of a device to connect to multiple network segments simultaneously to increase network availability and redundancy.
Provider Edge (PE) Node	A device at the edge of a service provider network that connects to customer premises equipment (CE) and participates in providing services to customers.
Leaf Node	In the context of EVPN E-Tree, a network node categorized to handle communication within specific broadcast domains and may connect to Root nodes.
Root Node	A network node within EVPN E-Tree that serves as the central point of communication and handles BUM traffic distribution.
Ethernet Segment Identifier (ESI)	A unique identifier used to identify Ethernet segments within a VXLAN network.

CHAPTER 3 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.



RTR1/VTEP1

VTEP1#configure terminal	Enter configuration terminal
VTEP1(config) #hostname VTEP1	Configure hostname
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)#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 pol	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
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 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 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 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 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 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 activate	Activate neigbors
VTEP1(config-router-af)#neighbor 6.6.6.6 activate	Activate neigbors
VTEP1(config-router-af)#exit-address-family	Exit address-family mode.
VTEP1(config-router)#neighbor 2.2.2.2 remote-as 100	Configure BGP remote-as 100 with neighbor IP
VTEP1(config-router)#neighbor 2.2.2.2 update-source lo	Define BGP neighbors, to update the source routes with lo
VTEP1(config-router)#neighbor 2.2.2.2 advertisement-interval 0	Configure advertisement-interval as 0 for fast convergence for VTEP2
VTEP1(config-router)#neighbor 6.6.6.6 remote-as 100	Configure BGP remote-as 100 with neighbor IP
VTEP1(config-router)#neighbor 6.6.6.6 update-source lo	Define BGP neighbors, to update the source routes with lo
VTEP1(config-router)#neighbor 6.6.6.6 advertisement-interval 0	Configure advertisement-interval as 0 for fast convergence for VTEP3
VTEP1(config-router)#address-family l2vpn evpn	Enter in to BGP L2VPN EVPN address-family
VTEP1(config-router-af)#neighbor 2.2.2.2 activate	Activate neigbors
VTEP1(config-router-af)#neighbor 6.6.6.6 activate	Activate neigbors
VTEP1(config-router-af)#exit-address-family	Exit from BGP L2VPN EVPN address-family
VTEP1(config-router)#nvo vxlan vtep-ip- global 1.1.1.1	Configure VXLAN global IP
VTEP1(config)#nvo vxlan id 1 ingress- replication inner-vid-disabled	Create VNID 1
VTEP1(config-nvo)#vxlan host-reachability- 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 pol 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 2.2.2:12	Configure RD for vrf2
VTEP2(config-vrf)#route-target both 10.10.10.10:102	Configure RT for vrf2
VTEP2(config)#nvo vxlan enable	Enable VXLAN
VTEP2(config)#evpn vxlan multihoming enable	Enable EVPN VXLAN multihoming
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 pol	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.
<pre>VTEP2(config-if)#switchport trunk native vlan 49</pre>	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 spanningtree 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 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)#load-interval 30 VTEP2(config-if)#spanning-tree edgeport	Configure load period in multiple of 30 seconds Set the port as an edge-port to enable rapid transitions
<pre>VTEP2(config-if)#load-interval 30 VTEP2(config-if)#spanning-tree edgeport VTEP2(config-if)#interface xe9</pre>	Configure load period in multiple of 30 seconds Set the port as an edge-port to enable rapid transitions Enter interface mode
<pre>VTEP2(config-if)#load-interval 30 VTEP2(config-if)#spanning-tree edgeport VTEP2(config-if)#interface xe9 VTEP2(config-if)#switchport</pre>	Configure load period in multiple of 30 seconds Set the port as an edge-port to enable rapid transitions Enter interface mode Set the interface as Layer2 port
<pre>VTEP2(config-if)#load-interval 30 VTEP2(config-if)#spanning-tree edgeport VTEP2(config-if)#interface xe9 VTEP2(config-if)#switchport VTEP2(config-if)#bridge-group 1 spanning- tree disable</pre>	Configure load period in multiple of 30 seconds Set the port as an edge-port to enable rapid transitions Enter interface mode Set the interface as Layer2 port Associate the interface with bridge group 1 and disable spanning tree
<pre>VTEP2(config-if)#load-interval 30 VTEP2(config-if)#spanning-tree edgeport VTEP2(config-if)#interface xe9 VTEP2(config-if)#switchport VTEP2(config-if)#bridge-group 1 spanning- tree disable VTEP2(config-if)#switchport mode trunk</pre>	Configure load period in multiple of 30 seconds Set the port as an edge-port to enable rapid transitions Enter interface mode Set the interface as Layer2 port Associate the interface with bridge group 1 and disable spanning tree Set the switching characteristics of this interface to trunk mode.
<pre>VTEP2(config-if)#load-interval 30 VTEP2(config-if)#spanning-tree edgeport VTEP2(config-if)#interface xe9 VTEP2(config-if)#switchport VTEP2(config-if)#bridge-group 1 spanning- tree disable VTEP2(config-if)#switchport mode trunk VTEP2(config-if)#switchport trunk allowed vlan add 50,59</pre>	Configure load period in multiple of 30 seconds Set the port as an edge-port to enable rapid transitions Enter interface mode Set the interface as Layer2 port Associate the interface with bridge group 1 and disable spanning tree Set the switching characteristics of this interface to trunk mode. Enable VLAN's allowed on this interface.
<pre>VTEP2(config-if)#load-interval 30 VTEP2(config-if)#spanning-tree edgeport VTEP2(config-if)#interface xe9 VTEP2(config-if)#switchport VTEP2(config-if)#bridge-group 1 spanning- tree disable VTEP2(config-if)#switchport mode trunk VTEP2(config-if)#switchport trunk allowed vlan add 50,59 VTEP2(config-if)#switchport trunk native vlan 59</pre>	Configure load period in multiple of 30 seconds Set the port as an edge-port to enable rapid transitions Enter interface mode Set the interface as Layer2 port Associate the interface with bridge group 1 and disable spanning tree Set the switching characteristics of this interface to trunk mode. Enable VLAN's allowed on this interface. Configure native VLAN
<pre>VTEP2(config-if)#load-interval 30 VTEP2(config-if)#spanning-tree edgeport VTEP2(config-if)#interface xe9 VTEP2(config-if)#switchport VTEP2(config-if)#bridge-group 1 spanning- tree disable VTEP2(config-if)#switchport mode trunk VTEP2(config-if)#switchport trunk allowed vlan add 50,59 VTEP2(config-if)#switchport trunk native vlan 59 VTEP2(config-if)#load-interval 30</pre>	Configure load period in multiple of 30 seconds Set the port as an edge-port to enable rapid transitions Enter interface mode Set the interface as Layer2 port Associate the interface with bridge group 1 and disable spanning tree Set the switching characteristics of this interface to trunk mode. Enable VLAN's allowed on this interface. Configure native VLAN Configure load period in multiple of 30 seconds
<pre>VTEP2(config-if)#load-interval 30 VTEP2(config-if)#spanning-tree edgeport VTEP2(config-if)#interface xe9 VTEP2(config-if)#switchport VTEP2(config-if)#bridge-group 1 spanning- tree disable VTEP2(config-if)#switchport mode trunk VTEP2(config-if)#switchport trunk allowed vlan add 50,59 VTEP2(config-if)#switchport trunk native vlan 59 VTEP2(config-if)#load-interval 30 VTEP2(config-if)#spanning-tree edgeport</pre>	Configure load period in multiple of 30 seconds Set the port as an edge-port to enable rapid transitions Enter interface mode Set the interface as Layer2 port Associate the interface with bridge group 1 and disable spanning tree Set the switching characteristics of this interface to trunk mode. Enable VLAN's allowed on this interface. Configure native VLAN Configure load period in multiple of 30 seconds Set the port as an edge-port to enable rapid transitions
<pre>VTEP2 (config-if) #load-interval 30 VTEP2 (config-if) #spanning-tree edgeport VTEP2 (config-if) #interface xe9 VTEP2 (config-if) #switchport VTEP2 (config-if) #bridge-group 1 spanning- tree disable VTEP2 (config-if) #switchport mode trunk VTEP2 (config-if) #switchport trunk allowed vlan add 50,59 VTEP2 (config-if) #switchport trunk native vlan 59 VTEP2 (config-if) #load-interval 30 VTEP2 (config-if) #spanning-tree edgeport VTEP2 (config-if) #interface xe41</pre>	Configure load period in multiple of 30 seconds Set the port as an edge-port to enable rapid transitions Enter interface mode Set the interface as Layer2 port Associate the interface with bridge group 1 and disable spanning tree Set the switching characteristics of this interface to trunk mode. Enable VLAN's allowed on this interface. Configure native VLAN Configure load period in multiple of 30 seconds Set the port as an edge-port to enable rapid transitions Enter interface mode
<pre>VTEP2 (config-if) #load-interval 30 VTEP2 (config-if) #spanning-tree edgeport VTEP2 (config-if) #interface xe9 VTEP2 (config-if) #switchport VTEP2 (config-if) #bridge-group 1 spanning- tree disable VTEP2 (config-if) #switchport mode trunk VTEP2 (config-if) #switchport trunk allowed vlan add 50,59 VTEP2 (config-if) #switchport trunk native vlan 59 VTEP2 (config-if) #load-interval 30 VTEP2 (config-if) #spanning-tree edgeport VTEP2 (config-if) #interface xe41 VTEP2 (config-if) #interface xe41</pre>	Configure load period in multiple of 30 seconds Set the port as an edge-port to enable rapid transitions Enter interface mode Set the interface as Layer2 port Associate the interface with bridge group 1 and disable spanning tree Set the switching characteristics of this interface to trunk mode. Enable VLAN's allowed on this interface. Configure native VLAN Configure load period in multiple of 30 seconds Set the port as an edge-port to enable rapid transitions Enter interface mode Map the interface to po1

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	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 neigbors
VTEP2(config-router-af)#neighbor 6.6.6.6 activate	Activate neigbors
VTEP2(config-router-af)#exit-address-family	Exit address-family mode.
VTEP2(config-router-af)#exit-address-family VTEP2(config-router)#neighbor 1.1.1.1 remote-as 100	Exit address-family mode. Configure BGP remote-as 100 with neighbor IP
<pre>VTEP2(config-router-af)#exit-address-family VTEP2(config-router)#neighbor 1.1.1.1 remote-as 100 (config-router)#neighbor 1.1.1.1 advertisement-interval 0</pre>	Exit address-family mode. Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP1
<pre>VTEP2(config-router-af)#exit-address-family VTEP2(config-router)#neighbor 1.1.1.1 remote-as 100 (config-router)#neighbor 1.1.1.1 advertisement-interval 0 VTEP2(config-router)#neighbor 1.1.1.1 update-source lo</pre>	Exit address-family mode. Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP1 Define BGP neighbors, to update the source routes with lo
VTEP2 (config-router-af) #exit-address-family VTEP2 (config-router) #neighbor 1.1.1.1 remote-as 100 (config-router) #neighbor 1.1.1.1 advertisement-interval 0 VTEP2 (config-router) #neighbor 1.1.1.1 update-source lo VTEP2 (config-router) #neighbor 6.6.6.6 remote-as 100	Exit address-family mode. Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP1 Define BGP neighbors, to update the source routes with lo Configure BGP remote-as 100 with neighbor IP
<pre>VTEP2 (config-router-af) #exit-address-family VTEP2 (config-router) #neighbor 1.1.1.1 remote-as 100 (config-router) #neighbor 1.1.1.1 advertisement-interval 0 VTEP2 (config-router) #neighbor 1.1.1.1 update-source lo VTEP2 (config-router) #neighbor 6.6.6.6 remote-as 100 (config-router) #neighbor 6.6.6.6 advertisement-interval 0</pre>	Exit address-family mode. Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP1 Define BGP neighbors, to update the source routes with lo Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP3
<pre>VTEP2(config-router-af)#exit-address-family VTEP2(config-router)#neighbor 1.1.1.1 remote-as 100 (config-router)#neighbor 1.1.1.1 advertisement-interval 0 VTEP2(config-router)#neighbor 1.1.1.1 update-source lo VTEP2(config-router)#neighbor 6.6.6.6 remote-as 100 (config-router)#neighbor 6.6.6.6 advertisement-interval 0 VTEP2(config-router)#neighbor 6.6.6.6 update-source lo</pre>	Exit address-family mode. Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP1 Define BGP neighbors, to update the source routes with lo Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP3 Define BGP neighbors, to update the source routes with lo
<pre>VTEP2 (config-router-af) #exit-address-family VTEP2 (config-router) #neighbor 1.1.1.1 remote-as 100 (config-router) #neighbor 1.1.1.1 advertisement-interval 0 VTEP2 (config-router) #neighbor 1.1.1.1 update-source lo VTEP2 (config-router) #neighbor 6.6.6.6 remote-as 100 (config-router) #neighbor 6.6.6.6 advertisement-interval 0 VTEP2 (config-router) #neighbor 6.6.6.6 update-source lo VTEP2 (config-router) #neighbor 6.6.6.6 update-source lo</pre>	Exit address-family mode. Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP1 Define BGP neighbors, to update the source routes with lo Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP3 Define BGP neighbors, to update the source routes with lo Enter in to BGP L2VPN EVPN address-family
<pre>VTEP2 (config-router-af) #exit-address-family VTEP2 (config-router) #neighbor 1.1.1.1 remote-as 100 (config-router) #neighbor 1.1.1.1 advertisement-interval 0 VTEP2 (config-router) #neighbor 1.1.1.1 update-source lo VTEP2 (config-router) #neighbor 6.6.6.6 remote-as 100 (config-router) #neighbor 6.6.6.6 advertisement-interval 0 VTEP2 (config-router) #neighbor 6.6.6.6 update-source lo VTEP2 (config-router) #neighbor 6.6.6.6 update-source lo VTEP2 (config-router) #neighbor 1.1.1.1 activate</pre>	Exit address-family mode. Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP1 Define BGP neighbors, to update the source routes with lo Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP3 Define BGP neighbors, to update the source routes with lo Enter in to BGP L2VPN EVPN address-family Activate neigbors
<pre>VTEP2 (config-router-af) #exit-address-family VTEP2 (config-router) #neighbor 1.1.1.1 remote-as 100 (config-router) #neighbor 1.1.1.1 advertisement-interval 0 VTEP2 (config-router) #neighbor 1.1.1.1 update-source lo VTEP2 (config-router) #neighbor 6.6.6.6 remote-as 100 (config-router) #neighbor 6.6.6.6 advertisement-interval 0 VTEP2 (config-router) #neighbor 6.6.6.6 update-source lo VTEP2 (config-router) #address-family 12vpn evpn VTEP2 (config-router-af) #neighbor 1.1.1.1 activate VTEP2 (config-router-af) #neighbor 6.6.6.6 activate</pre>	Exit address-family mode. Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP1 Define BGP neighbors, to update the source routes with lo Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP3 Define BGP neighbors, to update the source routes with lo Enter in to BGP L2VPN EVPN address-family Activate neigbors Activate neigbors
<pre>VTEP2 (config-router-af) #exit-address-family VTEP2 (config-router) #neighbor 1.1.1.1 remote-as 100 (config-router) #neighbor 1.1.1.1 advertisement-interval 0 VTEP2 (config-router) #neighbor 1.1.1.1 update-source lo VTEP2 (config-router) #neighbor 6.6.6.6 remote-as 100 (config-router) #neighbor 6.6.6.6 advertisement-interval 0 VTEP2 (config-router) #neighbor 6.6.6.6 update-source lo VTEP2 (config-router) #address-family 12vpn evpn VTEP2 (config-router-af) #neighbor 1.1.1.1 activate VTEP2 (config-router-af) #neighbor 6.6.6.6 activate VTEP2 (config-router-af) #neighbor 6.6.6.6</pre>	Exit address-family mode. Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP1 Define BGP neighbors, to update the source routes with lo Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP3 Define BGP neighbors, to update the source routes with lo Enter in to BGP L2VPN EVPN address-family Activate neigbors Activate neigbors
<pre>VTEP2 (config-router-af) #exit-address-family VTEP2 (config-router) #neighbor 1.1.1.1 remote-as 100 (config-router) #neighbor 1.1.1.1 advertisement-interval 0 VTEP2 (config-router) #neighbor 1.1.1.1 update-source 10 VTEP2 (config-router) #neighbor 6.6.6.6 remote-as 100 (config-router) #neighbor 6.6.6.6 advertisement-interval 0 VTEP2 (config-router) #neighbor 6.6.6.6 update-source 10 VTEP2 (config-router) #address-family 12vpn evpn VTEP2 (config-router-af) #neighbor 1.1.1.1 activate VTEP2 (config-router-af) #neighbor 6.6.6.6 activate VTEP2 (config-router-af) #neighbor 6.6.6.6 activate VTEP2 (config-router-af) #neighbor 6.6.6.6 activate</pre>	Exit address-family mode. Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP1 Define BGP neighbors, to update the source routes with lo Configure BGP remote-as 100 with neighbor IP Configure advertisement-interval as 0 for fast convergence for VTEP3 Define BGP neighbors, to update the source routes with lo Enter in to BGP L2VPN EVPN address-family Activate neigbors Activate neigbors Exit from BGP L2VPN EVPN address-family

VTEP2(config-nvo)#vxlan host-reachability- protocol evpn-bgp vrf1	Associate VNID with EVPN and vrf1
VTEP2(config-nvo)#nvo vxlan id 1000 ingress- replication inner-vid-disabled	Create VNID 1000
VTEP2(config-nvo)#vxlan host-reachability- protocol evpn-bgp vrf2	Associate VNID with EVPN and vrf2
VTEP2(config-nvo)#nvo vxlan access-if port 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 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 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

Pl#configure terminal	Enter configuration terminal
P1(config)#hostname P1	Configure hostname
P1(config)#bfd interval 3 minrx 3 multiplier 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 xel	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
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
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.
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	Enable EVPN VXLAN multihoming
VTEP3(config)#evpn vxlan multihoming enable	Enable statistics on VXLAN tunnel interface
VTEP3(config)#nvo vxlan enable	Enable VXLAN
VTEP3(config)#qos enable	Enable qos
VTEP3(config) #qos statistics	Enable qos statistics
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
<pre>VTEP3(config-if)#bridge-group 1 spanning- tree disable</pre>	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 area 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 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 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 unicast	Add the lo network to BGP route
VTEP3(config-router)#network 6.6.6/32	Activate neighbors
VTEP3(config-router-af)#neighbor 1.1.1.1 activate	Activate neigbors
VTEP3(config-router-af)#neighbor 2.2.2.2 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 remote-as 100	Configure BGP remote-as 100 with neighbor IP
VTEP3(config-router)#neighbor 1.1.1.1 update-source lo	Define BGP neighbors, to update the source routes with lo
VTEP3(config-router)#neighbor 2.2.2.2 remote-as 100	Configure BGP remote-as 100 with neighbor IP
VTEP3(config-router)#neighbor 2.2.2.2 update-source lo	Configure advertisement-interval as 0 for fast convergence for VTEP2
(config-router)#neighbor 2.2.2.2 advertisement-interval 0	Configure advertisement-interval as 0 for fast convergence for VTEP1
(config-router)#neighbor 1.1.1.1 advertisement-interval 0	Define BGP neighbors, to update the source routes with lo
VTEP3(config-router)#address-family l2vpn evpn	Enter in to BGP L2VPN EVPN address-family

VTEP3(config-router-af)#neighbor 1.1.1.1 activate	Activate neigbors
VTEP3(config-router-af)#neighbor 2.2.2.2 activate	Activate neigbors
VTEP3(config-router-af)#exit-address-family	Exit from BGP L2VPN EVPN address-family
VTEP3(config-router)#nvo vxlan vtep-ip- global 6.6.6	Configure VXLAN global IP
VTEP3(config)#nvo vxlan id 1 ingress- replication inner-vid-disabled	Create VNID 1
VTEP3(config-nvo)#vxlan host-reachability- protocol evpn-bgp vrf1	Associate VNID with EVPN and vrf1
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-vlan)#interface pol	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(c	lefault):				
Neighbor ID Instance ID	Pri	State	Dead Tin	me Address	Interface	
2.2.2.2	1	Full/DR	00:00:30	12.1.1.2	vlan1.10	0
3.3.3.3	1	Full/DR	00:00:31	13.1.1.2	vlan1.20	0
4.4.4.4	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(c	lefault):				
Neighbor ID Instance ID	Pri	State	Dead Time	e Address	Interface	
1.1.1.1 0	1	Full/Backup	00:00:38	12.1.1.1	vlan1.10	
3.3.3.3	1	Full/DR	00:00:39	23.1.1.2	vlan1.40	C
4.4.4.4	1	Full/DR	00:00:39	24.1.1.2	vlan1.50	C
D1 - 1	C					

Pl#sh ip ospf neighbor

Total number	of full	neighbors: 4				
OSPF process	1 VRF(d	lefault):				
Neighbor ID Instance ID	Pri	State	Dead Time	Address	Interface	
1.1.1.1 0	1	Full/Backup	00:00:39	13.1.1.1	vlan1.20	
2.2.2.2	1	Full/Backup	00:00:38	23.1.1.1	vlan1.40	
4.4.4.4	1	Full/DR	00:00:40	34.1.1.2	vlan1.100	0
5.5.5.5	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 Instance	ID ID	Pri	Stat	е		Dea	d Time	Addre	SS		Inte	rface	
1.1.1.1 0		1	Full/	Backı	ıp	00:00):30	14.1.1.	1	v	lan1.3	0	
2.2.2.2		1	Full/	Backı	μ	00:00):38	24.1.1.	1	v	lan1.5	0	
3.3.3.3 0		1	Full/	Backı	ıp	00:00):33	34.1.1.	1	v	lan1.1	00	
5.5.5.5		1	Full/I	DR		00:00	:30	45.1.1.2		vl	an1.70)	0
6.6.6.6		1	Full/	DR		00:00	:34	46.1.1.2		vl	an1.90)	0
P2#													
P3#sh ip	ospf	neighb	or										
Total num	ber o	f full	neigh	bors	: 3								
USPF proc	ess l Tr		erault):		2	1				- ·	c	
Neighbor Instance	ID ID	Pri	Stat	e		Dea	d Time	Addre	SS		Inte	riace	
3.3.3.3 0		1	Full/	Backı	μ	00:00):34	35.1.1.	1	v	lan1.6	0	
4.4.4.4 0		1	Full/	Backı	μ	00:00):34	45.1.1.	1	v	lan1.7	0	
6.6.6.6 P3#		1	Full/	DR		00:00	:33	56.1.1.2		vl	an1.80)	0
BGP route BGP table 1 BGP AS- 0 BGP com	r ide vers PATH munit	ntifie: ion is entrie: y entri	r 1.1. 4 s ies	1.1,	loca	l AS nu	mber 10	0					
		-											
Neighbor PfxRcd	AD	MACIP	V MCAS	AS T	Mso ESI	JRCV PREFIX	MsgSen -ROUTE	TblVer	InQ	Ou	tQ	Up/Down	State/
2.2.2.2		0	4	100	23	<u> </u>	22	4	0	0	00:07:	:34	
2 0		0	2	0	0.1	0	0.0	4	0	0	00 07	2.4	
2 0		0	2	0	21	0	22	4	0	0	00:07:	34	
Total num	ber o	f neig	hbors	2									
Total num	ber o	of Estal	blishe	d se	ssion	s 2							
VTEP1#													
VTEP2#sh 1	bgp l	2vpn e	vpn su	mmar	Y	. .							
BGP route	r ide	ntifie	r 2.2.	2.2,	loca	l AS nu	mber 10	0					
BGP table	vers	ion is	5										
I BGP AS-	PA'ſH	entrie	s										
U BGP com	munit	y entr	les										
Neighbor PfxRcd	AD	MACIP	V MCAS	AS T	Mso ESI	JRCV PREFIX	MsgSen -ROUTE	TblVer	InQ	Ou	tQ	Up/Down	State/
1.1.1.1 2 0		0	4	100 0	22	0	24	5	0	0	00:07:	:41	
6.6.6.6 2 0		0	4 2	100 0	24	0	27	5	0	0	00:08:	:51	

Total number of neighbors 2 Total number of Established sessions 2 VTEP2# VTEP3#sh bgp 12vpn 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 V AS MsgRcv MsgSen TblVer InQ OutQ Up/Down State/ AD MACIP MCAST PfxRcd ESI PREFIX-ROUTE 5 0 00:07:44 100 23 21 0 1.1.1.1 4 2 0 0 2 0 0 4 100 26 5 2.2.2.2 24 0 0 00:08:54 0 2 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 Interface VlanId Inner-VlanId Mac-Addr VTEP-Ip/ESI Type Status AccessPortDesc po1 0000.1111.1111 00:aa:22:33:44:55:66:00:00:00 1000 ----1 Static Local _____ 1 po1 1000 ----0000.1111.1112 00:aa:22:33:44:55:66:00:00:00 Static Local _____ 1 po1 1000 ----0000.1111.1113 00:aa:22:33:44:55:66:00:00:00 Static Local _____ _____ 1000 ----0000.1111.1114 00:aa:22:33:44:55:66:00:00:00 1 po1 Static Local _____ _____ po1 1000 ----0000.1111.1115 00:aa:22:33:44:55:66:00:00:00 1 Static Local _____ _____ a82b.b57c.4470 00:aa:22:33:44:55:66:00:00:00 1000 ----1 po1 Dynamic Local _____ _____ 1000 a82b.b57c.4476 00:aa:22:33:44:55:66:00:00:00 ____ ____ ____ Dynamic Remote Total number of entries are : 7 VTEP1# VTEP2#sh nvo vxlan mac-table

_____ ______ VXLAN MAC Entries _____ _____ VNID Interface VlanId Inner-VlanId Mac-Addr VTEP-Ip/ESI Type Status AccessPortDesc 0000.1111.1111 00:aa:22:33:44:55:66:00:00:00 ____ ____ ____ 1 Static Remote _____ 1 ____ 0000.1111.1112 00:aa:22:33:44:55:66:00:00:00 Static Remote _____ 0000.1111.1113 00:aa:22:33:44:55:66:00:00:00 1 ____ ____ ____ Static Remote _____ ____ 0000.1111.1114 00:aa:22:33:44:55:66:00:00:00 ____ 1 ____ Static Remote _____ 0000.1111.1115 00:aa:22:33:44:55:66:00:00:00 1 ____ ____ ____ Static Remote _____ ____ a82b.b57c.4470 00:aa:22:33:44:55:66:00:00:00 1 ____ ____ _____ Dynamic Remote 1000 po1 a82b.b57c.4476 00:aa:22:33:44:55:66:00:00:00 2000 ----Dynamic Local _____ Total number of entries are : 7 VTEP2# VTEP3#sh nvo vxlan mac-table _____ ______ VXLAN MAC Entries _____ _____ VNTD Interface VlanId Inner-VlanId Mac-Addr VTEP-Ip/ESI Status Туре AccessPortDesc 0000.1111.1111 00:aa:22:33:44:55:66:00:00:00 1 ____ ____ ____ _____ Static Remote _____ 0000.1111.1112 00:aa:22:33:44:55:66:00:00:00 ____ 1 ____ ____ 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 _____ ____ 0000.1111.1115 00:aa:22:33:44:55:66:00:00:00 1 ____ ____ Static Remote _____ ____ ____ ____ a82b.b57c.4470 00:aa:22:33:44:55:66:00:00:00 1 Dynamic Remote _____ 1000 ____ a82b.b57c.4476 00:aa:22:33:44:55:66:00:00:00 ____ ____ Dynamic Remote _____ _____

Total number of entries are : 7

VTEP1#show nvo vxlan access-if brief Inner Admin Link Interface Vlan vlan Ifindex Vnid status status _____ _____ 1 --- --- 500000 xe46 up up 2000 --- 500001 1000 po1 up up 2001 --- 500002 1000 po1 up up Total number of entries are 2 VTEP1# VTEP2#show nvo vxlan access-if brief Inner Admin Link Interface Vlan vlan Ifindex Vnid status status _____ 1 xe47 ___ ___ 500000 up up po1 2001 --- 500001 1000 up up 2000 --- 500002 1000 po1 up up Total number of entries are 3 VTEP2# VTEP3#show nvo vxlan access-if brief Inner Admin Link Interface Vlan vlan Ifindex Vnid status status _____ 3001 --- 500000 1 xe45 up up --- --- 500001 1000 up xe46 up Total number of entries are 2 VTEP3# VTEP1#sh nvo vxlan tunnel VXLAN Network tunnel Entries Status Up/Down Update Source Destination ______ 1.1.1.1 6.6.6.6 Installed 00:03:59 00:03:59 2.2.2.2 00:03:59 1.1.1.1 Installed 00:03:59 Total number of entries are 2 VTEP1#sh nvo vxlan VXLAN Information _____ Codes: NW - Network Port AC - Access Port (u) - Untagged

VTEP3#

VXLAN Tunnel Over SVI

VNID Status	VNI-Name Src-Addr	e VNI I	-Type Typ Dst-Addr	e Interfac	e ESI			VLAN DF-
1	 1.1.1.1	L2	NW 6.6.6.6					
1	 1.1.1.1	L2	NW 2.2.2.2					
1000			AC pol	(00:aa:22:33:	:44:55:60	5:00:00:00 200) DF
1000			AC pol	(00:aa:22:33	:44:55:60	5:00:00:00 2003	1 DF
1000	 1 1 1 1	L2	NW 6666					
1000	 1 1 1 1	L2	NW 2 2 2 2 2					
1000	 		AC	xe46	Singl	e Homed	Port	
Total : VTEP1#	number of e	entries a	are 10					
VTEP2# VXLAN Sourc	sh nvo vxla Network tum e	an tunnel nnel Enti Destina	ries ation	Status	Up/D	own	Update	
2.2.2.	2	1.1.1.1		Installed	00:0	3:59	00:03:59	
2.2.2.	2	6.6.6.6		Installed	00:0	5:09	00:05:09	
Total VTEP2# VXLAN ======	number of e sh nvo vxla Information	entries a an n =	are 2					
Cod	es: NW - Ne AC - Ac (u) - Un	etwork Po ccess Po ntagged	ort st					
VNID Status	VNI-Name Src-Addr	e VNI I	-Type Typ Dst-Addr	e Interfac	e ESI			VLAN DF-
1		L2	NW					
1	2.2.2.2	L2	1.1.1.1 NW					
 1	2.2.2.2		6.6.6.6 AC	xe47	Singl	e Homed	Port	
 1000		L2	 NW					
 1000	2.2.2.2	L2	1.1.1.1 NW					
 1000	2.2.2.2		6.6.6.6 AC	pol	00:aa:2	22:33:44:	55:66:00:00:0	0 2001 NON-
DF								

1000 DF			AC	pol	00:aa:22:33:44:55:66	5:00:00:00 2000 NON-	
Total nu VTEP2#	mber of	entries are 1	L1				
VTEP3#sh VXLAN Ne Source	n nvo vxl etwork tu	an tunnel nnel Entries Destinatior	1	Status	Up/Down Up	date	
6.6.6.6 6.6.6.6		1.1.1.1 2.2.2.2		Installed Installed	00:03:58 0 00:05:08 0	0:03:58 0:04:03	
Total number of entries are 2 VTEP3#sh nvo vxlan VXLAN Information							
Codes	s: NW - N AC - A (u) - U	- etwork Port ccess Port ntagged					
VNID Src-Addr	VNI-Name	e VNI-Type Dst-Addr	е Тур	e Interface	e ESI	VLAN DF-Status	
1 6.6.6.6		L2 1.1.1.1	NW				
1		L2 2 2 2 2	NW				
1			AC	xe45	Single Homed port	- 3001	
1000 6 6 6 6		L2 1 1 1 1	NW				
1000		L2 2 2 2 2 2	NW				
1000			AC	xe46	Single Homed Port		

Total number of entries are 10 VTEP3#

VxLAN Command Reference

CHAPTER 1 VXLAN Commands

This chapter describes the VXLAN commands:

- access-if-vxlan
- arp-cache disable
- arp-nd flood-suppress
- arp-nd refresh timer
- clear mac address table dynamic vxlan
- clear nvo vxlan counters
- clear nvo vxlan tunnels
- clear nvo vxlan mac-stale-entries
- description
- dynamic-learning disable
- encapsulation
- evpn esi holdtime
- evpn-mac-holdtime
- evpn multi-homed
- evpn-vlan-service
- garp-gna enable
- load-balance rtag7 vxlan inner-l2
- load-balance rtag7 vxlan inner-l3
- mac
- mac-ageing
- mac vrf
- mac-holdtime
- map vnid
- nd-cache disable
- no nvo vxlan
- nvo vxlan
- nvo vxlan id
- nvo vxlan access-if
- nvo vxlan mac-ageing-time
- nvo vxlan max-cache-disable
- nvo vxlan mh-mac-relocate-scan
- nvo vxlan vtep-ip-global
- 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 mac-table
- show nvo vxlan nd-cache
- show nvo vxlan static host state
- show nvo vxlan tunnel
- show nvo VxLAN vlan-vnid
- show running-config nvo vxlan
- show evpn multi-homing all
- show evpn multihoming-status
- show nvo vxlan route-count
- show nvo vxlan vni-name
- show hsl evpn multihoming esi
- shutdown
- vxlan host-reachability-protocol evpn-bgp
- vlan-xlate-1 large

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

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xe1 2
(config-nvo-acc-if)#arp-cache disable
(config-nvo-acc-if)#exit
```

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

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xe1 2
(config-nvo-acc-if)#arp-nd flood-suppress
(config-nvo-acc-if)#exit
```

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 secs Use the no form of this command to remove the configuration.

Command Syntax

```
nvo vxlan arp-nd refresh-timer <3-190> mac (XX-XX-XX-XX-
XX|XX:XX:XX:XX:XX|XXXX.XXXX)
```

no nvo vxlan arp-nd refresh-timer

Parameters

<3-190> refresh time in seconds

XX-XX-XX-XX-XX

v-mac is mandatory for MH

Command Mode

Config mode

Applicability

This command was introduced before OcNOS version 1.3.

Example

```
#config mode
(config)#nvo vxlan arp-nd refresh-timer 100
(config)#no nvo vxlan arp-nd refresh-timer
```

Example to configure in MH node

(config) #nvo vxlan arp-nd refresh-timer 100 mac 0000.1111.2222

clear mac address table dynamic vxlan

Use this command to clear dynamically learned MACs.

Command Syntax

clear mac address table dynamic vxlan

Parameters

None

Command Mode

Exec mode

Applicability

This command was introduced before OcNOS version 1.3.

Example

#clear mac address table dynamic vxlan

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 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

Note: clear nvo vxlan tunnels This command will clear all the VXLAN tunnels destination.

clear nvo vxlan tunnels dst-ip A.B.C.D - This command to clear individual tunnel destination(i.e A.B.C.D).

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.

```
#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
```

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

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xe1 2
(config-nvo-acc-if)#dynamic-learning disable
(config-nvo-acc-if)#exit
```

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.

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.

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xel 2
(config-nvo-acc-if)#encapsulation 0x9100
(config-nvo-acc-if)#exit
```

evpn esi holdtime

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 multi-homing.

Use the no form of this command to make the esi up immediately when configuring the access-if cli.

Command Syntax

```
evpn esi holdtime <10-300>
no evpn esi holdtime <10-300>
```

Parameters

<10-300> Hold time in seconds

Default

Default value is 0.

Command Mode

Configuration Mode

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
(config) # evpn esi holdtime 100
(config) # exit
```

evpn-mac-holdtime

Use this command to delay route withdraw during downlink failure. Configure it under parrent access interface.

Command Syntax

```
evpn-mac-holdtime <1-600>
```

Parameters

<1-600> MAC Hold time range from 1 to 600 in seconds.

Default

Default value is 0.

Command Mode

Interface Mode

Applicability

This command was introduced before OcNOS version 6.5.3.

```
#configure terminal
(config-if) # interface xel
(config-if) # evpn-mac-holdtime 100
(config-if) # exit
```
evpn vxlan multi-homing enable

Use this command to enable evpn vxlan multi-homing

Use the no form of this command to disable evpn vxlan multi-homing.

Note: Node will have to be restarted for this to be applicable. If there are some nodes in topology which have multihomed CEs, then nodes which do not have multi-homed CEs should also enable multihoming so, that they can load share traffic to the multi-homed CEs.

Command Syntax

evpn vxlan multihoming enable

no evpn vxlan multihoming enable

Parameters

None

Default

By Default Multi-homing will be d]isabled

Command Mode

Configuration Mode

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
#(config)# evpn vxlan multihoming enable
#(config)# exit
```

evpn multi-homed

Use this command to configure interfaces as multi-homed and configure esi-value in case of physical and static lag and system-mac in case of Dynamic lag.

Use the no parameter of this command to unconfigure multi-homed on the interface.

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:XX:XX:XX)
```

no evpn multi-homed (esi | system-mac)

Parameters

octet format

xx-xx-xx-xx-xxHost MAC address (Option 1)xx:xx:xx:xx:xxHost MAC address (Option 2)xxxx.xxxx.xxxHost MAC address (Option 3)

Default

Default value is 0.

Command Mode

Interface Mode

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
(config) # interface xe1
(config) # evpn multi-homed esi 00:11:22:33:44:55:66:77:88
(config) # exit
configure terminal
(config) # interface po1
(config) # evpn multi-homed system-mac 0000.0000.1111
(config) # exit
```

evpn-vlan-service

Use this command to configure 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-aware-bundle | vlan-based)
no evpn-vlan-service
```

Parameters

```
vlan-based VLAN-based mapping of a mac-vrf to single VNI (1 to 1)
```

vlan-aware-bundle

VLAN-aware-bundle mapping of a mac-vrf to multiple VNI (1 to many)

Default

By default, vlan-aware-bundle service is applied when we no evpn-vlan-service configuration is specified explicitly.

Command Mode

MAC vrf mode

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
(config)#mac vrf vrf1
(config-vrf)# evpn-vlan-service vlan-based
(config-vrf)# no evpn-vlan-service vlan-based
```

garp-gna enable

Use this command to enable GARP/GNA packets per vxlan on the outgoing access interfaces where it is configured.

Use the no form this command to disable GARP/GNA packets on the outgoing access interfaces.

By default it will be disable

Command Syntax

```
garp-gna enable
garp-gna enable
```

Parameters

None

Command Mode

config-nvo-acc-if mode

Applicability

This command is introduced in OcNOS version 1.3.6.

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xel 10
config-nvo-acc-if)#garp-gna enable
```

load-balance rtag7 vxlan inner-l2

Use this command to enable RTAG7 load balancing for VxLAN for inner-L2 packets on the access side for load sharing of traffic on tunnel paths. This command also enables random UDP source port generation for the VxLAN UDP tunnels based on the L2 frame being received on the VxLAN access port.

Use the no parameter of this command to disable load balance for RTAG7 for VxLAN for inner-L2 frames.

Command Syntax

```
load-balance rtag7 vxlan inner-l2 (dest-mac | src-mac)
no load-balance rtag7 vxlan inner-l2 (dest-mac | src-mac)
```

Parameter

dest-mac	Destination MAC Address.		
src-mac	Source MAC Address.		

Default

By default, the load-balance rtag7 vxlan inner-I2 default is src-mac.

Command Mode

Configure mode

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
(config)#load-balance rtag7 vxlan inner-12 dest-mac
(config)#no load-balance rtag7 vxlan inner-12 dest-mac
```

load-balance rtag7 vxlan inner-I3

Use this command to enable RTAG7 load balancing for VxLAN for inner-L3 IPv4 and IPv6 packets on the access side for load sharing of traffic on tunnel paths. This command also enables random UDP source port generation for the VxLAN UDP tunnels based on the L3 frame being received on the VxLAN access port.

Use the no parameter of this command to disable load balance for RTAG7 for VxLAN for inner-L3 IPv4 and IPv6 frames.

Command Syntax

```
load-balance rtag7 vxlan inner-13 (dest-ip | dest14-port | protocol-id | src-ip |
    src14-port)
no load-balance rtag7 vxlan inner-13 (dest-ip | dest14-port | protocol-id | src-ip
    | src14-port)
```

Parameter

dest-ip	Destination IP.
destl4-port	Destination I4 port.
protocol-id	Protocol (IPv4).
src-ip	Source IP.
srcl4-port	Source I4 port.

Default

By default, the load-balance rtag7 vxlan inner-I3 default is src-ip.

Command Mode

Configure mode

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
(config)#load-balance rtag7 vxlan inner-13 dest-ip
```

```
(config)#no load-balance rtag7 vxlan inner-13 dest-ip
```

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 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

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xel 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
```

mac-ageing

Use this command to enable or disable MAC ageing based on either "src or dest" hit or "src only" hit

Command Syntax

mac-ageing (dst-src|src)

Parameter

dst-src	Enable destination-or-source MAC hit based ageing
src	Enable source MAC hit based ageing

Default

Source

Command Mode

Configure mode

Applicability

This command was introduced before OcNOS version 6.6.0.

```
#configure terminal
(config)#mac-ageing src
```

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 parameter 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.

Default

No default value is specified for mac vrf WORD command.

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 vnid 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 mode and NVO_ACC_IF_MODE mode
```

Note: When configured in both modes, then the NVO_ACC_IF_MODE 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.

```
#configure terminal
(config)#nvo vxlan id 3 ingress-replication inner-vid-disabled
(config-nvo)#mac-holdtime -1
(config-nvo)#exit
```

map vnid

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 vnid <1-16777215>
no map vnid <1-16777215>
```

Parameters

<1-16777215> VxLAN network identifier.

Default

No default value is specified for map vnid command.

Command Mode

NVO access interface mode

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xel 2
(config-nvo-acc-if)#map vnid 100
(config-nvo-acc-if)#exit
```

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

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xe1 2
(config-nvo-acc-if)#nd-cache disable
(config-nvo-acc-if)#exit
```

no nvo vxlan

Use this command to delete a given tenant or all tenants/VPNs.

Command Syntax

no nvo vxlan (id <1-16777215>|all-vnids)

Parameters

<1-16777215>	VXLAN Network Identifier.
all-vnids	Delete all VxLAN network identifiers.

Command Mode

Configure mode

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
(config)#no nvo vxlan id 100
```

nvo vxlan

Use this command to enable or disable VxLAN.

Command Syntax

nvo vxlan (enable | disable)

Parameters

None

Default

By default, the nvo vxlan option 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 id

Use this command to add a tenant and the type of VPN. This command changes the mode to NVO mode.

Use no form of this command to unconfigure the VXLAN ID.

Before using this command, enable VXLAN by using the nvo vxlan command.

Command Syntax

```
nvo vxlan id <1-16777215> (etree-leaf|) ((ingress-replication (inner-vid-disabled |
    bridge-vlan VLAN-ID | etree-leaf)
no nvo vxlan id <1-16777215>
```

Parameters

vxaln id <1- 16777215>	Specifies the VXLAN Network Identifier (VNID) to identify the virtual VXLAN overlay network segment.
multicast	(Optional) Specifies a multicast mode (point to multipoint) used for transmitting VXLAN encapsulated multicast packets.
ingress- replication	(Optional) Enables head-end replication for forwarding BUM traffic.
bridge-vlan VLAN-ID	(Optional) Specifies the VLAN ID.
inner-vid- disabled	(Optional) Disables the transmission of the VLAN ID (VID) with traffic leaving the network port.
etree-leaf	(Optional) Configures the device as a leaf node within the E-Tree topology, implying its role in forwarding BUM traffic within the E-Tree service model.

Command Mode

Configure mode

Applicability

This command was introduced before OcNOS version 1.3. Introduced the etree-leaf parameter in the OcNOS version 6.5.1

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
```

To configure a VXLAN instance with VXLAN ID for ingress replication, with inner VLAN ID disabled, and as an E-Tree leaf node:

```
(config) #nvo vxlan id 10 ingress-replication inner-vid-disabled etree-leaf
(config-nvo) #exit
```

To configure a VXLAN instance with VLAN-VNID mapping for ingress replication on the leaf node:

(config) #nvo vxlan id 101 ingress-replication bridge-vlan 101

(config-nvo) #exit

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

port	A physical port.
IFNAME	Interface name (Physical/Static lag/Dynamic lag)
default	Default access interface
port-vlan	The physical port on which VLANs are configured
IFNAME	Interface name (Physical/Static lag/Dynamic lag)
VLAN_RANGE	Configure VlanId or Vlan-Range for outer vlan
Inner-vlan	Inner-vlan id
<2-4094>	VLAN id

Default

By default, the nvo vxlan access-if option is port VLAN ID and VLAN_RANGE option is introduced in OcNOS version 5.0..

Command Mode

Configure mode

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
(config)#nvo vxlan access-if port-vlan xel 2-10
(config-nvo-acc-if)#exit
```

```
#configure terminal
```

(config)#nvo vxlan access-if port xel (config-nvo-acc-if)#exit

#configure terminal
(config)#nvo vxlan access-if port xel 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 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> Ageing 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.

```
#configure terminal
(config)#nvo vxlan mac-ageing-time 10
```

nvo vxlan max-cache-disable

Use this command to configure the maximum number of ARP and ND cache disables on access ports configured with the port+VLAN options. This command does not limit the ARP and ND cache disables on access ports created with only the port option.

Use the no form of this command to set the maximum number of ARP and ND cache disables to its default (0).

Note: If any MAC is in conflict when the max cache disable is being unconfigured, then the corresponding caches will not be enabled. This can be enabled after manually, removing the conflict. Caches where there is no conflict, will be enabled.

Command Syntax

```
nvo vxlan max-cache-disable <1-200>
no nvo vxlan max-cache-disable
```

Parameters

<-1-200> Number of ARP/ND cache disable allowed

Default

The default maximum number of ARP and ND cache disables is 0.

Command Mode

Configuration mode

Applicability

This command was introduced before OcNOS version 1.3.

```
#configure terminal
(config)#nvo vxlan max-cache-disable 10
(config-nvo)#exit
```

nvo vxlan mh-mac-relocate-scan

Use this command to monitor the BCM MAC table in the control plane for MAC addresses nearing age-out and learned as Dynamic Remote. The identified MAC addresses are updated in the BCM to prevent their expiration, ensuring seamless traffic flow. This avoids traffic loss in scenarios where a MAC relocates to a Multi-Homed (MH) pair, but reverse traffic for the MAC continues to arrive at the original node.

Use either mac-ageing dst-src or nvo vxlan mh-mac-relocate-scan enable for multihoming. recommended.

Command Syntax

nvo vxlan mh-mac-relocate-scan (disable|enable)

Parameters

None

Default

Disable.

Command Mode

Config Mode

Applicability

This command was introduced before OcNOS version 6.6.0.

Example

(config) #nvo vxlan mh-mac-relocate-scan enable

nvo vxlan vtep-ip-global

Use this command to set the source IP address of the VxLAN tunnels.

Use the ${\tt no}$ form of this command to remove the source IP address of the VxLAN tunnels.

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 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					

Total number of entries are 6

Table 1-1 explains the fields in the output.

Table 1-1: VxLAN field	ls
------------------------	----

Field	Description
VNID	VXLAN network identifier.
Туре	NW - Network Port: VxLAN tunnel AC - Access Port: Host connection

Field	Description
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.

Table 1-1: VxLAN fields

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,

Added new cli "garp-gna enable" under access-if cli in OcNOS version 1.3.6.

```
#show nvo vxlan access-if-config
nvo vxlan access-if port-vlan xel 2
map vnid 100
garp-gna enable
access-if-description member-port with xel as vlan 2
dynamic-learning disable
arp-nd flood-suppress
arp-cache disable
nd-cache disable
shutdown
mac 0000.0000.1111
mac 0000.0000.aaaa ip 12.12.12.1
mac 0000.0000.bbbb ipv6 1201::1
map qos-profile ingress 100
cos 2 egress
     Į.
      nvo vxlan access-if port-vlan pol 6 inner-vlan 5
      encapsulation 0x9100
      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>|summary|)

Parameters

<1-16777215> VXLAN network identifier.

Command Mode

Exec mode

Applicability

This command was introduced before OcNOS version 1.3, modified to include new fields – Age-Out and Retries-Left in OcNOS version 1.3.5.

Remote Static and Dynamic keyword got changed to Static and Dynamic Remote in MAC table in OcNOS version 1.3.6.

Example

#sh nvo vxlan arp-cache VXLAN ARP-CACHE Information							
ND Timeout : 300 sec Random-Jitter-Max : 640							
VNID	Ip-Addr	Mac-Addr	Туре	Age-Out	Retries-Left		
10 10 Total num	11.11.11.2 11.11.11.1 nber of entries	0000.0000.bbbb 0000.0000.aaaa are 2	Dynamic Loca Dynamic Remo	1 224 te	2		

Table 1-6 explains the output fields.

Table 1-2: ARP cache fields

Field	Description
VNID	VXLAN network identifier
lp-Addr	IP address of the vxlan
Mac-Addr	Device MAC address
Туре	How a host learns a MAC/IP pair: Dynamic: Learned by data plane source learning Evpn: Learned by EVPN Type 2 (MAC/IP) routes
	Static Remote: Statically configured for remote; used only for static VxLAN, not with EVPN Static Local: Configured on local VTEP

Field	Description
Age=Out	ARP entry expire time
Total number of entries	The total number of entries listed.

Table 1-2: ARP cache fields

show nvo vxlan counters access-port

Use this command to display the receive and transmit counters of an access port including ARP, ND and GARP counters in the same command.

Note: Due to a limitation in the hardware, the transmit packet counters includes the BUM traffic received on that port.

Command Syntax

show nvo vxlan counters access-port (port IFNAME | port-vlan IFNAME VLAN_ID)

Parameters

port	Port Mapping
IFNAME	Access port name
port-vlan	Port-vlan Mapping
IFNAME	Access port name
VLAN_ID_F	ANGEVIan Id or VIan Range <2-4094
INNER_VLA	N_ID Inner-Vlan Id
all	All ports and VLANs

Command Mode

Exec mode

Applicability

This command was introduced before OcNOS version 1.3 and added Control packet (ARP, ND and GARP) counters in OcNOS version 1.3.5. The VLAN_RANGE option is introduced in OcNOS version 5.0.

```
#show nvo vxlan counters access-port port-vlan xe1 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 : 2774939
                   : 210553516
          bytes
     TX: packets : 4322274
          bytes
                  : 326026474
    Control Packets:
     *ARP/ND uplifted and sent/replied from control plane:
    Rx Vxlan Arp discard count
                                        : 0
                                         : 2
    Rx Vxlan Nd discard count
                                         : 0
    Tx Vxlan Arp discard count
                                         : 0
    Tx Vxlan Nd discard count
    Rx Vxlan Arp Request count
                                         : 2
                                         : 0
    Tx Vxlan Arp Request count
    Rx Vxlan Arp Reply count
                                         : 5
    Tx Vxlan Arp Reply count
                                         : 1
    Rx Vxlan Neighbor Solicitation count : 6
    Tx Vxlan Neighbor Solicitation count : 0
```

```
Rx Vxlan Neighbor Advertisement count: 0
Tx Vxlan Neighbor Advertisement count: 4
Rx Vxlan Gratuitous ARP count : 0
Tx Vxlan Gratuitous ARP count : 0
Rx Vxlan Gratuitous Neighbor Advertisement count: 3
Tx Vxlan Gratuitous Neighbor Advertisement count: 0
```

Table 1-3 explains the fields in the output.

Rx Vxlan

Neighbor Advertisement

count

Field Description **RX:** packets Number of packets received. RX: bytes Number of bytes received. TX: packets Number of packets transmitted. TX: bytes Number of bytes transmitted. Rx Vxlan Nd Number of discarded ND that is received from neighbor. discard count Tx Vxlan Arp Number of discarded Arp that is transmitted to peer. discard count Rx Vxlan Nd Number of discarded ND that is transmitted to peer. discard count Rx Vxlan Arp Number of request ARP that is received from neighbor. Request count Tx Vxlan Arp Number of request ARP that is transmitted to peer. Request count Rx Vxlan Arp Number of replied ARP that is received from neighbor. Reply count Tx Vxlan Arp Number of replied ARP which is transmitted to peer. Reply count Rx Vxlan Number of request ND that is received from neighbor. Neighbor Solicitation count Tx Vxlan Number of replied ND that is transmitted to peer. Neighbor Solicitation count

Table 1-3: access port counters

Number of Neighbor Advertisement that is received from neighbor.

Field	Description			
Tx Vxlan Neighbor Advertisement count	Number of Neighbor Advertisement that is transmitted to peer			
Rx Vxlan Gratuitous ARP count	Number of Gratuitous ARP that is received from neighbor.			
Tx Vxlan Gratuitous ARP count	Number of Gratuitous ARP which is transmitted to peer.			
Rx Vxlan Gratuitous Neighbor Advertisement count	Number of Gratuitous Neighbor Advertisement that is received from neighbor.			
Tx Vxlan Neighbor Gratuitous Advertisement count	Number of Gratuitous Neighbor Advertisement which is transmitted to peer.			

Table 1-3: access port counters (Continued)

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 in the same command.

Command Syntax

show nvo vxlan counters network-port dst A.B.C.D

Parameters

A.B.C.D Tunnel IPv4 address

Command Mode

Exec mode

Applicability

This command was introduced before OcNOS version 1.3 and added control packets (ARP, ND, and GARP) counters in OcNOS version 1.3.5.

Example

```
VTEP1#sh nvo vxlan counters network-port dst 100.2.2.2
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 : 814327
               : 92833544
       bvtes
   TX: packets : 1508023
        bvtes
               : 171914622
Control Packets:
 *ARP/ND uplifted and sent/replied from control plane:
                                       : 0
  TX VXLAN Arp discard count
                                       : 0
  TX VXLAN ND discard count
  Tx Vxlan Arp Request count
                                       : 0
                                       : 0
  Tx Vxlan Arp Reply count
  Tx Vxlan Neighbor Solicitation count : 0
  Tx Vxlan Neighbor Advertisement count: 0
  Rx Vxlan Gratuitous ARP count: 0
  Tx Vxlan Gratuitous ARP count: 0
  Rx Vxlan Gratuitous Neighbor Advertisement count: 0
  Tx Vxlan Gratuitous Neighbor Advertisement count: 0
```

Table 1-4 explains each network entry fields.

Field	Description
RX: packets	Number of hello packets received from neighbor.
RX: bytes	Number of hello packets received from neighbor in bytes received.
TX: packets	Number of hello packets transmitted to neighbor.
TX: bytes	Number of hello packets transmitted to neighbor in 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.
Rx 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 transmitted to peer.
Rx Vxlan Neighbor Advertisement count	Number of Neighbor Advertisement that is received from neighbor.
Tx Vxlan Neighbor Advertisement count	Number of Neighbor Advertisement that is transmitted to peer.
Rx Vxlan Gratuitous ARP count	Number of Gratuitous ARP that is received from neighbor.
Tx Vxlan Gratuitous ARP count	Number of Gratuitous ARP which is transmitted to peer.
Rx Vxlan Gratuitous Neighbor Advertisement count	Number of Gratuitous Neighbor Advertisement that is received from neighbor.
Tx Vxlan Neighbor Gratuitous Advertisement count	Number of Gratuitous Neighbor Advertisement which is transmitted to peer.

show nvo vxlan mac-table

Use this command to display the host MAC address table. Use the hardware option to see the age out time for dynamically learned macs.

Command Syntax

show nvo vxlan mac-table (vnid <1-16777215>|) (summary | hardware |)

Parameters

<1-16777215>	VXLAN network identifier.
summary	Count the MAC addresses.

Command Mode

Exec mode

Applicability

This command was introduced before OcNOS version 1.3.

Remote Static and Dynamic keyword got changed to Static and Dynamic Remote in MAC table in OcNOS version 1.3.6.

```
#show nvo vxlan mac-table
 VXLAN MAC Entries
_____
_____
    Interface VlanId Inner-VlanId Mac-Addr
VNTD
                           VTEP-Ip/
                    Status
ESI
                              AccessPortDesc
           Туре
    ce21/1
          2
10
                   0000.0000.1111
1.1.1.1
              Static Local
                         _____
partner-port
             ____
                   0000.0000.2222
10
    ____
          ____
3.3.3.3
              Static Remote
                         _____
                                   ____
20
          3
    ce21/1
             ____
                   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 1.1.1.1	ce21/1	2	0000.0000.1111 Static Local	
partner-p 10 3.3.3.3			0000.0000.2222 Static Remote	
10 3.3.3.3			0000.0000.aa11 Static Remote	
10 1.1.1.1 partner-r	ce21/1	2	0000.0000.bb11 Dynamic Local	300
10 1.1.1.1 partner-r	ce21/1	2	0000.0000.bb12 Dynamic Local	277
20 1.1.1.1	ce21/1		0000.0000.cccc Static Local Discard	
20			0000.0000.dddd Static Remote	

Total number of entries are 7

Table 1-5 explains the fields in the output.

Table 1-5: MAC table fields

Field	Description			
VNID	VXLAN network identifier			
Interface	Interface name			
VlanId	VLAN identifier			
Mac-Addr	MAC address			
VTEP-lp	VTEP identifier/Ethernet Segment Identifier			
Туре	How a host learns a MAC/IP pair:			
	Remote: Statically configured for remote; used only for static VxLAN, not with EVPN Static Local: Configured on local VTEP 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.			
	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.			

Field	Description
AccessPortDesc	Access port description.
Total number of entries	The total number of entries listed.

Table 1-5: MAC table fields (Continued)

show nvo vxlan nd-cache

Use this command to display the Neighbor Discovery cache.

Command Syntax

show nvo vxlan nd-cache (vnid <1-16777215>|summary|)

Parameters

<1-16777215> VXLAN network identifier.

Command Mode

Exec mode

Applicability

This command was introduced before OcNOS version 1.3, modified to include new fields – Age-Out and Retries-Left in OcNOS version 1.3.5.

Remote Static and Dynamic keyword got changed to Static and Dynamic Remote in ND table in OcNOS version 1.3.6.

Example

#show VXLAN 	#show nvo vxlan nd-cache VXLAN ND-CACHE Information				
ND Tir	meout : 300 sec	Random-Jitter-N	Max : 640		
VNID	Ip-Addr	Mac-Addr	Туре	Age-Out	Retries-Left
10	2001::1	0000.0000.1111	Dynamic Local	274	2
10	2001::2	0000.0000.2222	Dynamic Remote	е	
Total	number of entrie	s are 2			

Table 1-6 explains the output fields.

Table 1-6: ND cache fields

Field	Description		
VNID	VXLAN network identifier		
lp-Addr	IP address		
Mac-Addr	MAC address		
Туре	How a host learns a MAC/IP pair:		
	Static Remote: Statically configured for remote; used only for static VxLAN, not with EVPN Static Local: Configured on local VTEP Dynamic: Learned by data plane source learning Evpn: Learned by EVPN Type 2 (MAC/IP) routes		
Table 1-6: ND cache fields

Field	Description
Age-Out	ND entry expire Time
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

#sh r	nvo vxlan	static	host	: state			
VNID	Ifname	Vlan		Ip-Addr	Mac-Add	r Status	
100	xel		2	12.12.12.1	00		 Inactive
100	xe2		2	1201::1	0 (00.0000.bbbb	Conflict
100	xe3		2	120.120.12	0.1 00)00.0000.bb11	Active

Table 1-7 explains the output fields.

Table 1-7: Static host fields

Field	Description
VNID	VXLAN network identifier
Ifname	Interface name
Vlan	VLAN name
lp-Addr	IP address

Field	Description
Mac-Addr	MAC address
Status	Status of the MAC/IP on the host:
	Conflict: 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.
	Learnt Conflict: 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.
	Inactive: 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.
	Active: Operating host MAC/IP.

Table 1-7: Static host fields

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.

Table 1-8 explains the output fields.

Table 1-8: VxLAN tunnel fields

Field	Description
Source	Tunnel source IP address.
Destination	Tunnel destination IP address.
Status	Installed: Tunnel Installed in the hardware and operating.
	Resolved: Tunnel destination IP is reachable, but VxLAN tunnel not installed in hardware. Therefore, not operating.
	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 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 and added few CLIs for IRB and ARP-ND refresh timer for OcNOS version 1.3.5.

```
#show running-config nvo vxlan
!
     nvo vxlan multihoming enable
1
     nvo vxlan enable
     nvo vxlan vtep-ip-global 1.1.1.1
     nvo vxlan max-cache-disable 10
     1
     nvo vxlan tunnel qos-map-mode cos-dscp ingress QUE DSCP
     nvo vxlan tunnel gos-map-mode cos-dscp egress DSCP QUE
     1
     nvo vxlan id 100 ingress-replication inner-vid-disabled
      vxlan host-reachability-protocol evpn-bgp vrf1
      mac-holdtime 20
     1
     nvo vxlan access-if port-vlan xel 2
      map vnid 100
access-if-description member-port with xel as vlan 2
dynamic-learning disable
arp-nd flood-suppress
arp-cache disable
nd-cache disable
shutdown
mac 0000.0000.1111
mac 0000.0000.aaaa ip 12.12.12.1
mac 0000.0000.bbbb ipv6 1201::1
map qos-profile cos-to-queue COS QUE
map qos-profile queue-color-to-cos QUE COS
     nvo vxlan access-if port-vlan pol 6 inner-vlan 5
      encapsulation 0x9100
```

no shutdown map vnid 100 !

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

Table 1-9 explains the output fields.

Table 1-9: show evpn multi-homing all output details

Field	Description
ESI	An Ethernet segment has an 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 nvo vxlan route-count

Use this command to display the vxlan active route (MAC-IP.MAC-IPv6 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 new fields – GW-IPv4, GW_IPv6, Prefix IPv4 and Prefix IPv6 in OcNOS version 1.3.5.

Example

#show nvo vxlan route-count VXLAN Active route count information 								
Max route count : 32768 Active route count: 7								
Note: Pre It	fix count does not	refers o include e	nly local vpn prefi	routes x routes				
VNID Prefix IPv6	- Total	MACONLY	MACIPv4	MACIPv6	GW MACIPv4	GW MACIPv6	Prefix IPv4	
2000 0 1000 0 10002 1	- 3 0 4	1 0 0	1 0 0	1 0 0	0 0 1	0 0 1	0 0 1	

Total number of entries are 3

Table 1-10 explains the output fields.

Field	Description
Max route count	Maximum number of route count in vxlan.
Active route count	Number of active route count in the interface.

Field	Description
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.

Table 1-10: show nvo vxlan route-count output details

show nvo vxlan vni-name

Use this command to display the vxlan results bashed on vni-name.

Command Syntax

show nvo vxlan vni-name (WORD)

Parameters

WORD

VNI name of max size 10 character and should not be only numeric.

Command Mode

Exec mode

Applicability

This command was introduced before OcNOS version 1.3.

```
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 Homed port - 2 ----- ----
1 SITEA-PRO AC xe1 - Single Homed port - 1010 ----- ----
1 SITEA-PRO AC xe1 - Single Homed port - 100 ----- ----
1 SITEA-PRO AC xe1 - Single Homed port - 2020 ----- ----
1 SITEA-PRO AC pol - Single Homed port - 100 ----- ----
1 SITEA-PRO AC pol - Single Homed port - 2 ----- ----
1 SITEA-PRO AC pol - Single Homed port - 200 ----- ----
1 SITEA-PRO AC xe8 - Single Homed port - ---- -----
1 SITEA-PRO AC po2 - Single Homed port - ---- ----- ----
Total number of entries are 16
```

show hsl evpn multihoming esi

Use this command to display the hsl status of evpn multihome esi.

Command Syntax

show hsl evpn multihoming esi (mac-list | vni)

Parameters

mac-list	Mac address list.		
vni	VNID.		

Command Mode

Exec mode

Applicability

This command was introduced before OcNOS version 6.6.0.

<pre>##show hsl evpn mu L-means ESI Local</pre>	ltihoming esi , R-means ESI	i I Remote			
ESI Tunnels	T-port	ESI-Status Tun-egrobj-io	 If d	Ifstatus	VpLag
00:00:00:aa:aa:bb: 00:00:00:aa:aa:bb: 101.1.1.1 #show hsl evpn mul L-means ESI Local	bb:00:00:00(I 0x00000000 bb:00:00:00(F 0x80000004 tihoming esi , R-means ESI	L) Up 0x000000000 R) 0x000186AA I Remote	po10 	Up 	
ESI Tunnels	T-port	ESI-Status Tun-egrobj-id	 If d	Ifstatus	VpLag
<pre>00:00:00:aa:aa:bb:) 101.1.1.1 102.1.1.1 00:00:00:cc:cc:dd:d #show hsl even mult</pre>	bb:00:00:00 (F 0x80000004 0x80000002 dd:00:00:00 (I	<pre>x) 0x000186AC 0x000186A9 L) Down </pre>	 po10	 Down	2113 2113
VNID ESI Tunnels	<pre>T-port</pre>	I Remote ESI-S Tun-egrobj-id	tatus If	Ifstat	us VpLag

102	00:00:00:aa	a:aa:bb:bb:00 0x00000000):00:00(L) 0x000000	Up 00	po10	Up		
102 102 1 1	00:00:00:aa	a:aa:bb:bb:00	0:00:00(R)	 A.F.				
103	00:00:00:aa	a:aa:bb:bb:00 0x00000000	0:00:00(L)	Up 00	po10	Up		
103 102.1.1.	00:00:00:aa	a:aa:bb:bb:00 0x80000006	0:00:00 (R)	 AF.				
104	00:00:00:aa	a:aa:bb:bb:00 0x00000000):00:00(L) 0x000000	Up 00	po10	Up		
104 102.1.1.	00:00:00:aa .1	a:aa:bb:bb:00 0x80000006	0:00:00(R) 0x0001862	 AE				
#show hs L-means	sl evpn mult s ESI Local,	ihoming esi R-means ESI	vni Remote					
VNID Tunnels	ESI	T-port	ES Tun-egobj	I-Status I -id	_ [f	Ifstatus	VpL	ag
 102 101.1.1.	00:00:00:aa	a:aa:bb:bb:00 0x80000005	0:00:00(R) 0x000186	 AC			211	.3
102.1.1.	.1	0x80000002	0x000186	A 9			211	3
103 101.1.1.	00:00:00:aa 1	a:aa:bb:bb:00 0x80000005	0:00:00(R) 0x0001862	AC			211	_3
102.1.1.	.1	0x80000002	0x0001862	A9			211	3
104 101.1.1.	00:00:00:aa .1	a:aa:bb:bb:00 0x80000005	0:00:00(R) 0x0001862	AC			211	_3
102.1.1.	.1	0x80000002	0x0001862	A 9			211	3
150 	00:00:00:cc	c:cc:dd:dd:00):00:00(L) 	Down	po10	Down		
#show hs	sl evpn mult	ihoming esi	mac-list					
MAC id		VNI	VPNID	ESI				vplag-
aa:aa:bk	 :bb:00:00:0	00 102	28674	00:00:00:	aa:aa:bb	:00:00:00	:00	2113
aa:aa:bk aa:aa:bk	b:bb:00:00:0 b:bb:00:00:0)1 102)2 102	28674 28674	00:00:00:	aa:aa:bb aa:aa:bb	:bb:00:00: :bb:00:00:	: 00 : 00	2113 2113

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.

```
#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 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.

Default

No default value is specified for vxlan host-reachability-protocol command.

Command Mode

NVO mode

Applicability

This command was introduced before OcNOS version 1.3.

```
(config) #nvo vxlan id 3
(config-nvo) #vxlan host-reachability-protocol evpn-bgp Blue
```

vlan-xlate-1 large

Use this command to increase the size of the VLAN_XLATE_1_DOUBLE table to 20k. Internally, the BCM maintains VLAN_XLATE_1_DOUBLE table for access interfaces, L2vnid, and L3vnid. The default size of the table is 16k. After configuring the CLI, the table size is increased to 20k.

Use the no form of this command to change the VLAN_XLATE_1_DOUBLE table size to default.

Note: Reboot the system after configuring the CLI.

Command Syntax

```
vlan-xlate-1 large
no vlan-xlate-1 large
```

Parameters

None

Default

None

Command Mode

Configuration Mode

Applicability

This command was introduced before OcNOS version 6.5.3.

```
(config)#vlan-xlate-1 large
OcNOS(config)#commit
%% System Reboot required, please save the config and reboot the board.
OcNOS(config)#end
OcNOS#
```

CHAPTER 2 VXLAN - IRB Commands

This chapter describes the VXLAN - IRB commands: These commands are applicable for TR3 and Maverick platform only.

- evpn irb
- evpn irb-forwarding anycast-gateway-mac
- evpn irb-if-forwarding anycast-gateway-mac
- interface irb
- I3vni
- nvo vxlan irb
- show interface irb
- show evpn I3vni-map
- show evpn irb-status
- show running-config interface irb

evpn irb

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 in OcNOS version 5.1.

```
#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 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	Source MAC address (Option 1)
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 in OcNOS version 5.1.

```
#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 00-00-00-13-13
(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 in OcNOS version 5.1.

```
#configure teminal
(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
```

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 <1-80000>
no interface irb <1-80000>
```

Parameters

<1-80000> IRB interface number

Command Mode

Configure mode

Applicability

This command was introduced in OcNOS version 5.1.

```
#configure teminal
(config)#interface irb1
(config)#no interface irb1
```

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 5.1.

```
#configure teminal
(config)#ip vrf vrfip
(config-vrf)#l3vni 10002
(config-vrf)#no l3vni 10002
```

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 in OcNOS version 5.1.

```
#configure terminal
(config)#nvo vxlan irb
(config)#no nvo vxlan irb
```

show interface irb

Use this command to display the current running configuration of IRB interface.

Command Syntax

show interface irb <1-80000>

Parameters

None

Command Mode

Exec mode

Applicability

This command was introduced in OcNOS version 5.1.

```
rtrl#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
  ТΧ
    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 evpn I3vni-map

Use this command to display the L3 VNI, L2 VNI and IRB interface mapping.

Command Syntax

show evpn 13vni-map

Parameters

None

Command Mode

Exec mode

Applicability

This command was introduced in OcNOS version 5.1.

Example

rtr3#show L3VNI	evpn 13vni-map L2VNI	IRB-interface
======= 45001 45001	10 20	irb1 irb2

rtr3#

show evpn irb-status

Use this command to display the status of the IRB on a VTEP.

Command Syntax

show evpn irb-status

Parameters

None

Command Mode

Exec mode

Applicability

This command was introduced before OcNOS version 5.1.

Example

#show evpn irb-status
IRB is ACTIVE in Hardware

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 OcNOS version 5.1.

```
#show running-config interface irb1
!
interface irb1
ip vrf forwarding vrfip
ip address 144.144.1/24
ipv6 address 1201::1/48
evpn irb-if-forwarding anycast-gateway-mac
mac-address 0000.0000.1234
gos map-profile dscp-to-queue DSCP_QUE
gos map-profile queue-color-to-dscp QUE_DSCP
shutdown
!
```

CHAPTER 3 VXLAN Quality of Service Commands

This chapter describes the VXLAN commands for QoS (Quality of Service):

- clear nvo vxlan tunnels
- cos queue
- dscp queue
- map qos-profile
- map qos-profile cos-to-queue
- map qos-profile queue-color-to-cos
- nvo vxlan disable-arp-storm-control-for-cpu
- nvo vxlan tunnel qos-map-mode cos-dscp
- qos profile cos-to-queue
- qos profile dscp-to-queue
- qos profile queue-color-to-cos
- qos profile queue-color-to-dscp
- queue cos
- queue dscp

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 1.3.

Example

#clear nvo vxlan tunnels dst-ip 2.2.2.2

Note: clear nvo vxlan tunnels This command will clear all the VXLAN tunnels destination.

clear nvo vxlan tunnels dst-ip A.B.C.D - This command to clear individual tunnel destination(i.e A.B.C.D).

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 1.3.

```
(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 1.3.

```
(config) #qos profile dscp-to-queue nw_profile
(config-ingress-dscp-map) #dscp 50 queue 1
(config-ingress-dscp-map) #no dscp 50
```

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.

Use the following qos profile type for mapping from/to on the IRB interface.

- dscp-to-queue for ingress traffic and
- queue-color-to-dscp profile for egress traffic

Removing the map qos-profile, applies the default profile to the IRB interface.

Note: Default profile is applied to all the IRB interface only when qos is enabled.

Command Syntax

```
map qos-profile (dscp-to-queue | queue-color-to-dscp) <NAME>
no map qos-profile (dscp-to-queue | queue-color-to-dscp) <NAME>
```

Parameters

NAME

Profile name

Default

By default, the default dscp-to-queue and queue-color-to-dscp profile is attached to all IRB interface.

Changing the value in the default profile, will impact both the IRB interfaces and L3 interfaces.

Command Mode

IRB_IF_Mode

Default

Default mapping between queue and DSCP value is one-one.

Applicability

This command is introduced in OcNOS version 5.1.

```
#configure terminal
(config)#interface irb 1
(config-irb-if)# map qos-profile queue-color-to-dscp QUE_DSCP
(config-irb-if)# no map qos-profile queue-color-to-dscp QUE_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 in OcNOS version 4.2.

```
(config)#nvo vxlan access-if port-vlan xe1 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 in OcNOS version 4.2.

```
(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 disable-arp-storm-control-for-cpu

Use this command to uplift the ARP/ND packet to CPU if packet is marked for DROP by storm control.

Use the no form of this command not to uplift the ARP/ND packet to CPU if marked for drop by storm-control. This is the default behavior.

Command Syntax

nvo vxlan disable-arp-storm-control-for-cpu
no nvo vxlan disable-arp-storm-control-for-cpu

Parameters

None

Command Mode

Configure mode

Applicability

This command was introduced in OcNOS version 6.5.3.

Example

(config) #nvo vxlan disable-arp-storm-control-for-cpu

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 <code>egress/ingress</code>.

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 1.3.

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 1.3.

```
(config)#qos profile cos-to-queue ac_port_ingress
(config)#no qos profile cos-to-queue ac_port_ingress
```

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 1.3.

```
(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 1.3.

```
(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.

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 1.3.

```
(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 1.3.

```
(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 1.3.

```
(config) #qos profile queue-color-to-dscp nw_profile
(config-egress-dscp-map) # queue 1 dscp 63
(config-egress-dscp-map) #no queue 1
```

Index

A

arp-cache disable 493 arp-nd flood-suppress 494, 580

В

begin modifier 15 BGP community value command syntax 13 braces command syntax 12

С

clear mac address table dynamic vxlan 495 clear nvo vxlan counters 497, 578 command abbreviations 11 command completion 11 command line errors 11 help 10 keyboard operations 14 command modes 18 configure 18 exec 18 interface 18 privileged exec 18 router 18 command negation 12 command syntax ? 13 . 13 () 12 {} 12 | 12 A.B.C.D/M 13 AA:NN 13 BGP community value 13 braces 12 conventions 12 curly brackets 12 HH:MM:SS 13 **IFNAME 13** interface name 13 IPv4 address 13 IPv6 address 13 LINE 13 lowercase 12 MAC address 13 monospaced font 12 numeric range 13 parantheses 12 parentheses 12 period 13

question mark 13 square brackets 13 time 13 uppercase 12 variable placeholders 13 vertical bars 12 WORD 13 X:X::X:X 13 X:X::X:X/M 13 XX:XX:XX:XX:XX 13 configure mode 18 curly brackets command syntax 12

D

dynamic-learning disable 501, 558, 569

Ε

evpn esi holdtime 503, 504 evpn multi-homing enable 504, 561, 574 exec command mode 18

I

IFNAME 13 Interface irb 508 interface mode 18 IPv4 address command syntax 13 IPv6 address command syntax 13

L

LINE 13 load-balance rtag7 vxlan inner-l2 509 load-balance rtag7 vxlan inner-l3 510

Μ

mac 511, 563 MAC address command syntax 13 mac vrf 512, 513, 563 mac-holdtime 514, 563 map vnid 515

Ν

nd-cache disable 532, 565 no nvo vxlan 517 nvo 521 nvo vxlan 518 nvo vxlan id 519, 523 nvo vxlan irb 526 nvo vxlan mac-ageing-time 542, 567 nvo vxlan tunnel qos-map-mode 526 nvo vxlan vtep-ip-global 525, 526

Ρ

parantheses command syntax 12 parentheses command syntax 12 period command syntax 13 port breakout configuration 252 privileged exec mode 18

Q

question mark command syntax 13

R

router mode 18

S

show commands 15 exclude modifier 16 include modifier 16 redirect modifier 17 show interface irb 552 show nvo vxlan 527, 564 show nvo vxlan arp-cache 530 show nvo vxlan counters access-port 532, 565 show nvo vxlan counters network-port 535, 565 show nvo vxlan interface counters 537 show nvo vxlan mac-table 537, 565 show nvo vxlan nd-cache 540, 567 show nvo vxlan static host state 542, 567 show nvo vxlan static host state 542, 567 show nvo vxlan tunnel 544 show running-config nvo vxlan 545 shutdown 514, 552, 554, 563 square brackets command syntax 13

Т

time command syntax 13 Tunnel End Point 24

V

vertical bars command syntax 12 VXLAN Architecture 23 VXLAN Commands 491, 557, 568 vxlan host-reachability-protocol evpn-bgp 555 VXLAN Unicast Configuration 26

W

WORD 13