

VALIDATED REFERENCE DESIGN GUIDE AOS-CX 10.3 MULTICAST GUIDE

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INTRODUCTION

This guide provides information on IP multicast networking capabilities, use cases, and configuration best practices with Aruba AOS-CX switching platforms running code version 10.3. The tested scenario used in this document were focused on Data Center Network Spine-Leaf design, however, many of the technologies described here can be leveraged and deployed in Campus networks also. The intended audience for this document is IT administrators and solution architects planning on deploying IP Multicast features.

WHAT IS MULTICAST NETWORKING?

In computer networking, IP multicast is method used to enable data transmission to be addressed to a group of destination computers at the same time.

By enabling high-efficiency point-to-multipoint data transmission over a network, multicast is able to greatly save network bandwidth and reduces the network load. By using multicast technology, a network operator can easily provide bandwidthcritical and time-critical information services. These services include live webcasting, Web TV, distance learning, telemedicine, Web radio, and real-time video conferencing.

When some hosts on the network need multicast information, the multicast source sends only one copy of the information. On the network, Multicast distribution trees are built through multicast routing protocols, and the packets are replicated only on the nodes where the trees branch.

In the image below, the multicast source sends a single copy to the first hop switch. The switches and routers in the group will forward the flow to devices that only have hosts (receivers) that are interested in receiving the stream.





To summarize, multicast has the following advantages:

- Advantages over unicast—Multicast data is replicated and distributed until it flows to the farthest-possible node from the source. The increase of receiver hosts will not remarkably increase the load of the source or the usage of network resources.
- Advantages over broadcast—Multicast data is sent only to the receivers that need it. This saves network

bandwidth and enhances network security. In addition, multicast data is not confined to the same subnet.

MULTICAST PROTOCOLS

Protocol Independent Multicast (PIM)

PIM is a family of routing protocols that form multicast trees to forward traffic from multicast sources to subnets that have used a protocol such as IGMP to request the traffic. PIM relies on the unicast routing tables created by any of several unicast routing protocols to identify the path back to a multicast source (reverse path forwarding, or RPF). With this information, PIM sets up the distribution tree for the multicast traffic.

In a PIM-SM network, a Rendezvous Point (RP) acts as a central source of information for sources and receivers of multicast data. Sources send traffic to the RP which then forwarded the MC traffic to receivers down a distribution tree.

AOS-CX switches support PIM-Sparse Mode (PIM-SM). PIM-SM assumes that most hosts do not want to receive multicast traffic, and it uses a non-flooding multicast model to direct traffic for a particular multicast group from the source to the interface where there are multicast receivers that have joined the group. As a result, this model sends traffic only to the routers that have specifically requested it.

In this model if the RP router has interested receivers in the PIM sparse-mode domain, it sends a PIM join message toward the source to build a shortest-path tree (SPT) back to the source

IGMP

Internet Group Management Protocol (IGMP) establishes and maintains the multicast group memberships between a Layer 3 multicast device and the subnet with directly connected hosts. The AOS-CX switches support IGMPv1, IGMPv2, and IGMPv3.

Additionally, IGMP snooping runs on the AOS-CX switches as a multicast constraining mechanism to help improve multicast forwarding efficiency. It creates Layer 2 multicast forwarding entries from the IGMP packets that are exchanged between the hosts and the router. When IGMP snooping is not enabled, the Layer 2 switch floods multicast packets to all hosts in a VLAN or VSI. When IGMP snooping is enabled, the Layer 2 switch forwards multicast packets of known multicast groups to only the receivers within that subnet.

Multicast Source Discovery Protocol (MSDP)

MSDP is used to connect multicast routing domains. It typically runs on the same router as PIM-SM rendezvous point (RP). Each MSDP router establishes adjacencies with internal and external MSDP peers similar to the way BGP establishes peers. These peer routers inform each other about active sources within the domain. When they detect active sources, the routers can send PIM sparse-mode explicit join messages to the active source.

MULTICAST CONFIGURATION EXAMPLE

The topology as shown in the Figure below and sample configurations are described in this section.



Figure 2. Multicast Network Example Scenario

The above example solution is a Spine and Leaf solution with 2 racks - each rack contains 1 host and 2 Leaf switches. The Spine and Leaf solution shown uses OSPF as the Interior Gateway Protocol (IGP), and BGP to share routes to the other autonomous system (AS). This example solution also shows a device in another AS which is also interested in the multicast source streams.

Within the Spine and Leaf Pod the 2 Leaf switches in each rack are deployed in a highly available (HA) solution using Aruba VSX and Link Aggregation on the interfaces attached to the hosts. Each physical Leaf switch has an uplink connection to each Spine switch and uses OSPF as the Interior Gateway Protocol to share routes. Equal Cost Multipathing (ECMP) is used to load-balance unicast traffic across the Spine switches.

IGMP Snooping is configured on the VLANs and interfaces facing the attached hosts to ensure that those segments are listed as having hosts that are interested in the multicast stream. PIM-SM is used to share those multicast streams across the L3 OSPF fabric.

The Spine and Leaf Pod also connects to a L3 Core in a different AS. BGP is used for Route peering between these 2 AS numbers and Multicast Source Discovery Protocol (MSDP) is used to share Multicast PIM tree information for each PIM domain.

In the tests shown in this document, Rack 1 and the L3Core each have a host which is interested in the multicast source. Rack 2 connects to a host which is acting as the source for 5 multicast address groups. Configuration recommendations and guidelines

- PIM-Sparse Mode (PIM-SM) must be configured on L3 physical interfaces, VLAN interfaces, and/or loopback interfaces that require Multicast traffic forwarding.
- The default PIM setting enables the spt-threshold setting. This ensures that the PIM domain will shift to the shortest path tree after learning the multicast traffic via the RPT.
- In 10.3:
 - BSR/Candidate-RP can only be used in a multicast domain without MSDP
 - As MSDP is used between different AS (#65000 and #65001), the Leafs in #65000 should utilize static RP
 - Do not create more than one MSDP session between two devices on the same VRF
- Ensure IGMP and IGMP Snooping are enabled on VLANs and VLAN interfaces facing host and clients that may be interested in receiving a multicast stream.
- When using VSX and IGMP Snooping, the switch with the lower SVI IP Address will become the IGMP querier to forward multicast traffic. The other VSX switch will become the IGMP proxy, waiting to forward multicast traffic in case the IGMP querier goes down.
- Within a VSX pair, one of the VSX switches will be the active forwarder. In case of switch failure, the PIM "activeactive" configuration allows for faster failover to the other VSX switch.

CONFIGURATIONS DETAILS

Below are the configurations with details about the tested solutions.

The tested scenario used in this document is focused on Data Center Network Spine-Leaf design, however, many of the technologies described here can be leveraged and deployed in Campus networks also.

The next figure shows detailed solution.



As shown in the image:

Rack 1 and Rack 2 (AS#65000)

- Rack 1 Leafs are connected to a single host.
 - Link Aggregation 10 is used to multi-chassis bundle interfaces 1/1/51 from both switches
 - o LAG10 and the Host use VLAN 10, and the VSX switches are the default gateway
 - The Host in Rack 1 is interested in receiving multicast traffic
- Rack 2 Leafs are connected to a single host
 - Link Aggregation 11 is used to multi-chassis bundle interfaces 1/1/51 from both switches
 - o LAG11 and the Host use VLAN 11, and the VSX switches are the default gateway
 - The Host in Rack 2 is the Multicast source
- The Leafs in each rack form a VSX pair using 1/1/48 as the ISL, and 1/1/47 as the Keepalive
- Each Leaf has a connection to each spine using ports 1/1/49 and 1/1/50
- /31 interfaces are used to provide direct IP connectivity between Leafs and Spines
- OSPF is used to share the rack to rack routes
- The Leaf VLANs and Loopbacks are distributed into the OSPF domain
- IGMP and IGMP Snooping is configured to ensure hosts in a segment can receive a multicast stream

- PIM-SM is used to ensure source multicast traffic can get routed to the interested receiving segments
- Rack 2 switches use BGP to share routes between the different AS numbers (65000 & 65001)
- Each rack points to Spine 1 (1.1.1.1) as the PIM RP

Spines (AS#65000)

- Each switch uses /31 interfaces on connections to each Leaf using ports 1/1/1 to 1/1/4
- Uses OSPF to share unicast routes between the racks
- Uses iBGP to peer with directly connected Leafs
- Configured as BGP Route Reflectors to allow iBGP peering between Leafs
- Spine 1 is configured as the RP
- PIM-SM is used to ensure source multicast traffic can get routed to the interested receiving segments
- MSDP is used to share Multicast RP information to share Multicast traffic between AS numbers 65000 & 65001

L3 Core (AS#65001)

- L3 Core device in the separate AS is connected to a single host
 - The Host uses VLAN 31
 - The Host is interested in receiving multicast traffic
- Uses /31 interfaces to connect to the Leafs in Rack 2 using ports 1/1/1 and 1/1/2
- Uses BGP to share routes between the different AS numbers 65000 & 65001
- The Leaf VLANs and Loopbacks are distributed into BGP domain
- IGMP and IGMP Snooping is configured to ensure hosts in a segment can receive a multicast stream
- PIM-SM is used to ensure source multicast traffic can get routed to the interested receiving segments
- MSDP is used to share Multicast RP information to share Multicast traffic between AS numbers 65000 & 65001
- A multicast generator is running and sending 5 multicast group addresses as available for interested listeners (239.0.5.1, 239.0.5.2, 239.0.5.3, 239.0.5.4, 239.0.5.5)

1) INITIAL SETUP (OOB, INITIAL CONFIGS)

In the DC, we recommend switches connect their management ports to an Out Of Band (OOB) management network as shown in Figure 2, this allows the switches to be manageable if there is an issue with In Band network connectivity.

Figure 2. OOB connectivity

Figure 4. OOB Network



In order for NetEdit to manage each switch, initial configs should be added via one of these options:

- Aruba CX mobile app
- Console cable
- Zero Touch Provisioning (ZTP)

Sample Initial Configuration

```
hostname LEAF1
user admin group administrators password ciphertext AQBapUz+
!
!
ssh server vrf mgmt
!
!
!
!
interface mgmt
   no shutdown
    ip static 10.6.8.19/24
    default-gateway 10.6.8.1
!
! interface group 1 contains ports 1/1/1-1/1/12
system interface-group 1 speed 10g
! interface group 4 contains ports 1/1/37-1/1/48
system interface-group 4 speed 10g
!
https-server rest access-mode read-write
https-server vrf mgmt
```

Once the switches are configured and physically connected, ensure NetEdit has IP connectivity to switch management IPs and add all devices into NetEdit [Devices -> Action -> Add Device(s) or Add Multiple Devices]

Figure 5. Adding devices

Devic	res 4 ame Add raf1 10.1 raf2 <u>10.1</u>	Devices + /	Enter Search Obrev of June (HELP) Add Device(s)	E	ACTION ~ Model
N Le	ame Add aaf1 <u>10.1</u> aaf2 <u>10.1</u>	+ 4	Add Device(s)		Model
Le	eaf1 <u>10.1</u> eaf2 <u>10.1</u>	1			
🗹 Le	af2 <u>10.1</u>				
Sp		1			8325
	oine1 <u>10.1</u>		Please specify the credentials of the device to add		
	oine2 <u>10.1</u>	Address			
		10.10.1	0.75		
		Usernam	e		
		admin			

You should now see all managed devices.

Figure 6. Devices added

≡	ar	ub	O Devices						admir	8 9	
		De	vices	5 Devices		ch Query or Typ	e 'HELP'		E	ACTION	
-			Name	Address	Status	MAC	Serial	Current Firmware		Model	R
			Leaf1	<u>10.10.10.165</u>	0	548028-fd	тw93км0	GL.10.03.0020		8325	0
Ð			Leaf2	<u>10.10.10.163</u>	0	548028-fd	тw93км0	GL.10.03.0020		8325	0
**			Leaf3	<u>10.10.10.75</u>	0	548028-fd	тw93км0	GL.10.03.0020		8325	0
≔			Spine1	<u>10.10.10.41</u>	9	548028-fe	TW8BKM	GL.10.03.0020		8325	0
2			Spine2	10.10.10.40	9	548028-fe	TW8BKM	GL.10.03.0020		8325	0

2) MODIFY CHANGE VALIDATION SETTINGS

You can add or modify the change validation commands used by NetEdit to enable or disable additional validation commands that could assist with specific deployments.

To help with available change validation captures,

This is done in NetEdit [Settings -> Validation -> Change Validation -> Command Scripts]

🖍 Edit		
Name		
Additional commands		
Description		
Commands		
show hap l2mp gypp		
show lacp interfaces		
show ip pim		
show ip pim interface		
show ip pim neighbor		
show ip igmp		
show in mroute		
show ip mode		
show ip msdp sa-cache		
	UPDATE	CANCEL

Figure 7. Adding additional commands to Change Validation

Enable and create the additional commands in NetEdit as needed [Settings -> Validation -> Change Validation -> Command Mapping]

3) CONFIGURE VSX AND FABRIC INFRASTRUCTURE (OSPF, BGP)

NetEdit Plan For Spine Switches

Create a plan for the spine switches in NetEdit [Devices -> select spines -> Action -> Edit Running Config]

Figure 8. Select devices for plan

										Add Device(s)
De	vices 11 De	vices Enter Search Q							Đ	Delete Device(s)
8	Name	Address	Status	MAC	Serial	Current Firmware	Model	Running Config Modifie		
	8325-R1-RU25	10.10.10.190		548028-fefa00	TW8BKM304D	GL.10.03.0030M	8325	08/12/19 14:20:21	~	Change Credential
	L3Core-RU37	10.10.10.123	۲	d06726-e23670	TW87KCW00X	TL.10.03.0020	8320	08/15/19 13:29:05		Change Firmware
	R1L1-8325-RU29	10.10.10.165		548028-fda400	TW93KM001Y	GL.10.03.0030M	8325	08/15/19 13:19:14		Edit Running Conf
	R1L2-8325-RU30	10.10.10.163	0	548028-fd2800	TW93KM0026	GL.10.03.0030M	8325	08/15/19 13:19:16		rda Davana Carda
	R2L1-8325-RU31	10.10,10.75	۲	548028-fde700	ТW93КМ0009	GL.10.03.0030M	8325	08/15/19 13:19:14		Edit Startup Comiç
	R2L2-8325-RU32	10.10.10.162	۲	548028-fdf400	тw93км000к	GL.10.03.0030M	8325	08/15/19 13:19:14	1	Edit Attributes
	R3L1-8325-RU33	10.10.10.153	0	548028-fd1900	TW93KM002N	GL.10.03.0030M	8325	08/12/19 14:29:59	Ê	View Plans
	R4L1-8325-RU34	10.10.10.81	0	548028-fd5400	TW93KM0034	GL.10.03.0030M	8325	08/14/19 12:25:59	÷	Columo Sattinor
	Server1	10.10.10.124	۲	d06726-e2b6d2	TW87KCW01H	TL.10.02.0020	8320	08/07/19 11:43:37	Ξ.	constant sectarilys
	Spine1-8325-R1-RU21	10.10,10.41		548028-fe2900	TW8BKM3030	GL.10.03.0030M	8325	08/15/19 13:26:01	٥	Export Data
2	Spine2-8325-R1-RU22	10.10.10.40	0	548028-fef900	TW8BKM301F	GL.10.03.0030M	8325	08/15/19 13:26:00		26

Give the plan a name and click "Create".

Figure	9. Cr	eate S	pine	plan

+ Create Plan	
Spines	
Description	
Plan Attributes	~
CREATE	CANCEL

You should see the initial configs for your Spine switches in NetEdit.

The common configurations across the switches are shown as "white", while the "blue" variables such as "HOSTNAME" and "A.B.C.D/M" have unique settings/values.

Figure 10. Common base configuration

= (arub	Calitor		
		Devices (2/2)	Spines	🏭 VIEWS 📋 RETURN TO PLAN 🛷 VALIDATE
		Spine1	1 h	ostname HOSTNAME
Ê		(<u>10.10.41</u>) <u>Spine2</u>	2 u:	ser admin group administrators password c
Ē		<u>(10.10.10.40)</u>	3 s:	sh server vrf mgmt
			4 v.	lan 1
-			5 ii	nterface mgmt
				no shutdown
*				ip static A.B.C.D/M
\$				default-gateway 10.10.10.254
-			9 ht	tps-server rest access-mode read-write
			10 ht	tps-server vrf mgmt

If you hover over "HOSTNAME" or "A.B.C.D/M" config (in blue), you can view the unique settings assigned to each switch. Figure 11. Variables used for Spine mgmt



If you right click "HOSTNAME" or "A.B.C.D/M" (in blue), you will be able to modify the settings when in editing view.

Figure 12. Modify variables



To begin the fabric infrastructure plan add the following OSPF and loopback configurations and right click to modify the loopbacks and router-IDs assigned to each spine.

```
router ospf 1
router-id 1.1.1.1
area 0.0.0.0
interface loopback 0
ip address 1.1.1.1/32
ip ospf 1 area 0.0.0.0
```

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Figure 13. Adding OSPF/Loopbacks to Spines



Figure 14. Modifying router-IDs



Figure 15. Modifying loopbacks



Next, configure the downlinks towards leaf switches and right click to modify the IPs for each downlink (not shown).

```
interface 1/1/1
   no shutdown
    ip address 101.1.1.0/31
    ip ospf 1 area 0.0.0.0
    ip ospf network point-to-point
interface 1/1/2
   no shutdown
    ip address 101.1.1.4/31
    ip ospf 1 area 0.0.0.0
    ip ospf network point-to-point
interface 1/1/3
   no shutdown
    ip address 101.1.1.8/31
    ip ospf 1 area 0.0.0.0
    ip ospf network point-to-point
interface 1/1/4
   no shutdown
    ip address 101.1.1.10/31
    ip ospf 1 area 0.0.0.0
    ip ospf network point-to-point
```

Figure 16. Adding Fabric Interfaces

Devices (2/2)	Spines	Spine1-8325-R1-RU21 (10.10.10.41): ip address
Spine1-8325- R1-RU21		default-gat 101.1.1.0/31
(10.10.10.41) Spine2-8325-	12 inte	erface 1/1/1 Spine2-8325-R1-RU22 (10.10.10.40): ip address
<u>R1-RU22</u> \blacklozenge (10.10.10.40)		no shutdown 101.1.1.2/31
		ip address A.B.C.D/M
		ip ospf 1 area 0.0.0.0
		ip ospf network point-to-point
	17 inte	erface 1/1/2
		no shutdown
		ip address A.B.C.D/M
		ip ospf 1 area 0.0.0.0
		ip ospf network point-to-point
	22 inte	erface 1/1/3
		no shutdown
		ip address A.B.C.D/M
		ip ospf 1 area 0.0.0.0
		ip ospf network point-to-point
	27 inte	erface 1/1/4
		no shutdown
	29	ip address A.B.C.D/M
		ip ospf 1 area 0.0.0 .0
		ip ospf network point-to-point
	32 inte	erface loopback 0
		ip address A.B.C.D/M
		in osnf 1 area 0 0 0 0

Next, add IBGP peering configurations towards all leaf switches and right click to modify the router-ID for each switch. The spine switches will act as Route Reflectors.

```
router bgp 65000
bgp router-id 1.1.1.1
neighbor 1.1.1.3 remote-as 65000
neighbor 1.1.1.3 update-source loopback 0
neighbor 1.1.1.4 remote-as 65000
neighbor 1.1.1.5 remote-as 65000
neighbor 1.1.1.5 update-source loopback 0
neighbor 1.1.1.6 remote-as 65000
neighbor 1.1.1.6 update-source loopback 0
address-family ipv4 unicast
neighbor 1.1.1.3 activate
neighbor 1.1.1.3 route-reflector-client
neighbor 1.1.1.4 activate
neighbor 1.1.1.4 route-reflector-client
```

neighbor 1.1.1.5 activate neighbor 1.1.1.5 route-reflector-client neighbor 1.1.1.6 activate neighbor 1.1.1.6 route-reflector-client

Figure 17. Adding BGP

Devices (2/2)	Spines		III VIEWS 🖨 RETURN TO P
Spine1-8325- <u>R1-RU21</u> (10.10.210.41) Spine2-8325- 	31 32 inte 33	ip ospf networ erface loopback ip address A.	Spine1-8325-R1-RU21 (10.10.10.41): bgp router-id
<u>K1-RU22</u> • (10.10.10.40)	34 35 rou t	ip ospf 1 area ter bgp 65000	Spine2-8325-R1-RU22 (10.10.10.40): bgp router-id 1.1.1.2
	36	bgp router-id	A.B.C.D
		neighbor 1.1.1	3 remote-as 65000
		neighbor 1.1.1	.3 update-source loopback 0
		neighbor 1.1.1	.4 remote-as 65000
		neighbor 1.1.1	.4 update-source loopback 0
		neighbor 1.1.1	. 5 remote-as 65000
		neighbor 1.1.1	.5 update-source loopback 0
		neighbor 1.1.1	.6 remote-as 65000
		neighbor 1.1.1	.6 update-source loopback 0
		address-family	ipv4 unicast
		neighbor 1	.1.1.3 activate
		neighbor 1	.1.1.3 route-reflector-client
		neighbor 1	.1.1.4 activate
		neighbor 1	.1.1.4 route-reflector-client
		neighbor 1	.1.1.5 activate
		neighbor 1	.1.1.5 route-reflector-client
		neighbor 1	.1.1.6 activate
		neighbor 1	.1.1.6 route-reflector-client
	54 htt <u>r</u>	os-server rest	access-mode read-write

Finally, select "RETURN TO PLAN" -> "DEPLOY" -> "COMMIT" to push down and save the desired configs.

Figure 18. Deploy > Commit

VIEW			9	Device Validation 2 Passed	0	Conformance Passed
DEPLOY	сомміт	ROLLBACK	i	Change Validation Refreshed: 08/16/19 11:24:43		

NetEdit Plan For VSX on Leaf Switches

Create a VSX plan for the leaf switches in NetEdit [Devices -> select leafs -> Action -> Edit Running Config] and name the plan.

Figure 19. Select VSX Leaf switches

De	vices 11 De	vices Enter Search Q								Dalata Davierta
8	Name	Address	Status	MAC	Serial	Current Firmware	Model	Running Config Modifie	×	Delete Device(s)
	8325-R1-RU25	10.10.10.190		548028-fefa00	TW8BKM304D	GL_10.03.0030M	8325	08/12/19 14:20:21	94	Change Credential
	L3Core-RU37	10.10.10.123	۲	d06726-e23670	TW87KCW00X	TL.10.03.0020	8320	08/15/19 13:29:05	٠	Change Firmware
2	R1L1-8325-RU29	10.10.10.165	0	548028-fda400	TW93KM001Y	GL.10.03.0030M	8325	08/16/19 11:48:31		Edit Running Confi
2	R1L2-8325-RU30	10.10.10.163	۲	548028-fd2800	ТW93КМ0026	GL.10.03.0030M	8325	08/16/19 11:48:31	-	Edit Status Carls
2	R2L1-8325-RU31	10.10.10.75		548028-fde700	TW93KM0009	GL.10.03.0030M	8325	08/16/19 11:48:31		East startup Conig
2	R2L2-8325-RU32	10.10.10.162	0	548028-fdf400	тw93км000к	GL.10.03.0030M	8325	08/16/19 11:48:31	1	Edit Attributes
]	R3L1-8325-RU33	10.10.10.153	۲	548028-fd1900	TW93KM002N	GL.10.03.0030M	8325	08/12/19 14:29:59	ê	View Plans
	R4L1-8325-RU34	10,10,10,81	۲	548028-fd5400	TW93KM0034	GL.10.03.0030M	8325	08/14/19 12:25:59	*	Column Sattings
	Server1	10.10.10.124	۲	d06726-e2b6d2	TW87KCW01H	TL.10.02.0020	8320	08/07/19 11:43:37	Ξ.	contractings
	Spine1-8325-R1-RU21	10.10.10.41	0	548028-fe2900	TW8BKM3030	GL.10.03.0030M	8325	08/16/19 11:24:43	۵	Export Data
	Spine2-8325-R1-RU22	10.10.10.40	0	548028-fef900	TW8BKM301F	GL.10.03.0030M	8325	08/16/19 11:24:43		8

Configure VSX in both racks and right click to modify the interface IPs, keepalive settings, and roles for each device.

```
interface lag 1
   no shutdown
   no routing
   vlan trunk native 1 tag
   vlan trunk allowed all
    lacp mode active
interface 1/1/47
   no shutdown
    ip address 111.1.1.1/24
interface 1/1/48
   no shutdown
    lag 1
vsx
    inter-switch-link lag 1
    role primary
    keepalive peer 111.1.1.2 source 111.1.1.1
    vsx-sync vsx-global
```

Leaf-VSX	VIEWS	E RETURN TO PLAN
10 system interfac	ce-group 4 speed 10g	
11 interface lag 1	1	
12 no shutdown	n R1L1-8325-RU29 (10.10.10.165): ip address	
13 no routing	111.1.1/24	
14 vlan trunk	R1L2-8325-RU30 (10.10.10.163): ip address	
15 vlan trunk	111.1.1.2/24	
16 lacp mode a	R2I 1-8325-RU31 (10 10 10 75). in address	
17 interface 1/1/		
18 no shutdown	112.1.1.1/24	
19 ip address	A.B.C.D/M	
20 interface 1/1/	48	
21 no shutdown	ı	
22 lag 1		
23 vsx		
24 inter-swite	ch-link lag 1	
25 role <i>sel</i>		
26 keepalive j	peer A.B.C.D source A.B.C.D	
27 vsx-sync v	sx-global	
28 https-server re	est access-mode read-write	
29 https-server v	rf mgmt	

Figure 20. Adding VSX and modifying Keepalive settings

Select "RETURN TO PLAN" -> "DEPLOY" -> "COMMIT" to push down and save the desired configs.

Verify Change Validation

You can click on "Change Validation" to verify if VSX configuration worked as expected.

Figure 21. Rack 1 VSX status showing up and in-sync

S	Change Validation Results							
						Started: 08/18/19 08:15:46 Refreshed: 08/18/19 08:18:03	SH	
	Name	IP	Command					
>	R1L1-8325-RU29	10.10.10.165	show system					
×	R1L1-8325-RU29	10.10.10.165	show vsx brief					
-	VSX is not configured			+ ISL State + Device State + Keepalive State + Device Role + Number of Multi-cha	assis LAG interfaces	: In-Sync : Peer-Established : reepalive-Established : primary : 0		
~	R1L1-8325-RU29	10.10.10.165	show vsx status					
	vsx is not configured			<pre>vSX Operational St: ISL channel ISL channel ISL myst channel Config Sync State NAE HTTPS Server * * Attribute * *ISL link *ISL version * System NAC * Platform * Device Role * </pre>	ate : In-Sync : operational us : in-sync : peer_reachs Local 	ble ble Feer 1ag1 2 54:80:28:fd:28:fd: 8325 GL.10.03.0030M secondary		

Figure 22. Rack 2 VSX status showing up and in-sync

0	Change Validation Res	sults			
					Started: 08/18/19 08:15:46 Refreshed: 08/18/19 08:18:03
	Name	IP	Command		
>	R2L1-8325-RU31	10.10.10.75	show system		
×	R2L1-8325-RU31	10.10.10.75	show vsx brief		
	VSX is not configured			+ ISL State : In-Sync + Device State : Peer-Esta + Keepalive State : Keepalive + Device Role : primary + Number of Multi-chassis LAG interfaces : 0	blished -Established
~	R2L1-8325-RU31	10.10.10.75	show vsx status		
	VSX is not configured			<pre>* VSX Operational State ISI, channel : In-Sync ISI, mgmt channel : operational Config Sync Status : in-sync NAZ : per_reachable HTTFS Server : per_reachable Attribute Local Peer ISI Ink lag1 lag1 ISI version 2 System MAC St:80:28:fd:e7:00 \$2180:28:fd Platform 8225 8325 Software Version GL.10.03.0030M Device Role primary secondary *</pre>	а:£4:00 030м
	PREVIOUS		Page	2 🔻 of 2	NEXT

NetEdit Plan For Fabric Infrasructure on Leaf Switches

Create a Fabric Configuration plan for the leaf switches in NetEdit [Devices -> select the leafs -> Action -> Edit Running Config] and name the plan.

Figure 23. Selecting Leafs for Fabric Plan

Devices 11 Devices Enter Search Query or Type "HEP"										
8	Name	Address	Status	MAC	Serial	Current Firmware	Model	Running Config Modifie		Delete Device(s)
]	8325-R1-RU25	10.10.10.190		548028-fefa00	TW8BKM304D	GL_10.03.0030M	8325	08/12/19 14:20:21	94	Change Credential
	L3Core-RU37	10.10.10.123	۲	d06726-e23670	TW87KCW00X	TL.10.03.0020	8320	08/15/19 13:29:05		Change Firmware
2	R1L1-8325-RU29	10.10.10.165	0	548028-fda400	TW93KM001Y	GL.10.03.0030M	8325	08/16/19 11:48:31		Edit Running Conf
	R1L2-8325-RU30	10.10.10.163	۲	548028-fd2800	ТW93КМ0026	GL.10.03.0030M	8325	08/16/19 11:48:31	_	Edit Startan Confe
	R2L1-8325-RU31	10.10.10.75		548028-fde700	TW93KM0009	GL.10.03.0030M	8325	08/16/19 11:48:31		Euri Sairup Comi
2	R2L2-8325-RU32	10.10.10.162	٢	548028-fdf400	тw93км000к	GL.10.03.0030M	8325	08/16/19 11:48:31	1	Edit Attributes
ב	R3L1-8325-RU33	10.10.10.153	۲	548028-fd1900	TW93KM002N	GL.10.03.0030M	8325	08/12/19 14:29:59	ê	View Plans
ב	R4L1-8325-RU34	10,10,10,81	۲	548028-fd5400	TW93KM0034	GL.10.03.0030M	8325	08/14/19 12:25:59	•	Column Settinge
ב	Server1	10,10,10,124	۲	d06726-e2b6d2	TW87KCW01H	TL.10.02.0020	8320	08/07/19 11:43:37		committeerings
3	Spine1-8325-R1-RU21	10.10.10.41	۲	548028-fe2900	TW8BKM3030	GL.10.03.0030M	8325	08/16/19 11:24:43	۵	Export Data
ב	Spine2-8325-R1-RU22	10.10.10.40	0	548028-fef900	TW8BKM301F	GL.10.03.0030M	8325	08/16/19 11:24:43	2	8

Start by adding the OSPF configuration and loopbacks. Right click to modify loopbacks and router-IDs assigned to each leaf.

```
router ospf 1
   router-id 1.1.1.3
   area 0.0.0.0
interface loopback 0
   ip address 1.1.1.3/32
   ip ospf 1 area 0.0.0.0
```

Figure 24. Adding OSPF and modifying router-IDs



Figure 25. Adding and modifying loopbacks



Next, configure the uplinks towards spine switches and right click to modify the IPs for each uplink.

```
interface 1/1/49
    no shutdown
    ip address 101.1.1.1/31
    ip ospf 1 area 0.0.0.0
    ip ospf network point-to-point
interface 1/1/50
    no shutdown
    ip address 101.1.1.3/31
    ip ospf 1 area 0.0.0.0
    ip ospf network point-to-point
```

Figure 26. Adding and modifying uplink configurations

```
_eaf-Fabric/Hosts
                                                    👖 VIEWS 🚊 RETURN TO PL
          no shutdown R1L2-8325-RU30 (10.10.10.163): ip address
          ip address 101.1.1.5/31
   23 interface 1/1/4
                       R2L1-8325-RU31 (10.10.10.75): ip address
          no shutdown
                      101.1.1.9/31
          lag 1
   26 interface 1/1/4 R2L2-8325-RU32 (10.10.10.162): ip address
          no shutdown 101.1.1.11/31
          ip address A.B.C.D/M
          ip ospf 1 area 0.0.0.0
          ip ospf network point-to-point
   31 interface 1/1/50
          no shutdown
         ip address A.B.C.D/M
          ip ospf 1 area 0.0.0.0
          ip ospf network point-to-point
```

Now add the IBGP peering configurations towards all spine switches that function. Right click to modify the router-ids.

```
router bgp 65000
bgp router-id 1.1.1.3
neighbor 1.1.1.1 remote-as 65000
neighbor 1.1.1.1 update-source loopback 0
neighbor 1.1.1.2 remote-as 65000
neighbor 1.1.1.2 update-source loopback 0
address-family ipv4 unicast
neighbor 1.1.1.1 activate
neighbor 1.1.1.2 activate
```

Figure 27. Adding BGP and modifying router-IDs

	Existing
23 interface loopback Leaf1 (10.10.10.165): bgp router-id :	10.2.0.1
24 ip address A.B	
25 ip ospf 1 area Leaf2 (10.10.10.163): bgp router-id :	10.2.0.2
26 router bgp 65001 Leaf3 (10.10.10.75): bgp router-id 10	0.2.0.3
27 bgp router-id A.B.C.D	
28 neighbor 10.2.0.101 remote-as 65001	
29 neighbor 10.2.0.101 update-source loopback 0	
30 neighbor 10.2.0.102 remote-as 65001	
31 neighbor 10.2.0.102 update-source loopback 0	
32 address-family 12vpn evpn	
33 neighbor 10.2.0.101 activate	
34 neighbor 10.2.0.101 send-community	
35 neighbor 10.2.0.102 activate	
36 neighbor 10.2.0.102 send-community	

Finally, select "RETURN TO PLAN" -> "DEPLOY" to push down configs.

Verify Change Validation

You can click on "Change Validation" to verify if BGP and OSPF peering is working as expected.

0	Change Validation Results							
				Started: 08/16/19 12:27:36 Refreshed: 08/16/19 12:32:31				
	Name	IP	Command					
×	R2L2-8325-RU32	10.10.10.162	show bgp all-vrf all summary					
				<pre>* VRP : default * BGF Summary * Local AS : 65000 BGP Router Identifier : 1.1.1.6 * Peers : 2 Log Neighbor Changes : No * Cfg. Rold Time : 180 Cfg. Keep Alive : 60 * Address-family : IPV4 Unicast * Neighbor Remote-AS MagRovd MagSent Up/Down Time State AdminStatus * Nichthor Remote-AS MagRovd MagSent Up/Down Time State AdminStatus * Address-family : L2VPN EVPN * Nichthor Remote-AS MagRovd MagSent Up/Down Time State AdminStatus * Nichthor Remo</pre>				

Figure 28. Rack 2 Leaf 2 showing BGP in established state



0	Change Validation Results								
							Started: 0 Refreshed	8/16/19 12:27:36 I: 08/16/19 12:32:31	REFRESH
	Name	IP	Command						
	R2L2-8325-RU32	10.10.10.162	show ip ospf neighbors						
	OSPF Process is not running or	VRF default.		+ OSPF Process ID 1 VRF default +					
				+ + Total Number o	f Neighbors:				
				+ + Neighbor ID					
				1.1.1.1				1/1/49	



0	Change Validation Results							
				Started: 08/18/19 08:29:00 Refreshed: 08/18/19 08:29:56	SH			
	Name	IP	Command					
>	R2L2-8325-RU32	10.10.10.162	show vsx status					
×	R1L2-8325-RU30	10.10.10.163	show bgp all-vrf all summar	ř				
				<pre>* VDF : default * GFG Nummary * Local AS : 65000 BGP Router Identifier : 1.1.1.4 * Feers : 2 Log Neighbor Changes : No * Cfg. Hold Time : 180 Cfg. Keep Alive : 60 * * Address-family : IPv4 Unicast * Neighbor Remote-AS MagRovd MagSent Up/Down Time State AdminStatus * 1.1.1.1 65000 3 3 00h:00m:25s Established Up * 1.1.1.2 65000 3 3 00h:00m:25s Established Up * Address-family : IPv6 Unicast * * Address-family : I2VPN EVDN * * Address-family : L2VPN EVDN * *</pre>				

Figure 31. Rack 1 Leaf 2 showing OSPF in Full state

0	Change Validation Results								
							Started: 08 Refreshed	/18/19 08:29:00 08/18/19 08:29:56	REFRESH
	Name	IP	Command					00,10,15,00.25.50	
	R1L2-8325-RU30	10.10.10.163	show ip msdp summary						
	R1L2-8325-RU30	10.10.10.163	show ip ospf neighbors						
	ISPP Process is not running or	VRF default.		+ OSPF Process II + * Total Number of * Neighbor ID + 1.1.1.1 + + 1.1.1.2 *) 1 VRF defa Neighbora: Priority n/a n/a	ult 2 State FULL FULL	Nb: Address 101.1.1.4 101.1.1.6	Interface 1/1/49 1/1/50	

Figure 32. OSPF and BGP status on Spine 1

Spinel-8325-Rl-F VRF : default BGP Summary	RU21# show	bgp ipv4	unicast	summary		
Local AS Peers Cfg. Hold Time		65000 4 180	BGP Log Cfg.	Router Identif Neighbor Chang Keep Alive	ier : 1.1.1. es : No : 60	1
Neighbor 1.1.1.3 1.1.1.4 1.1.1.5 1.1.1.6 Spinel-8325-R1-F OSPF Process ID ====================================	Remote-AS 65000 65000 65000 65000 RU21# sh ip 1 VRF defa	MsgRcvd 33 32 34 ospf ne: ult ====	MsgSent 32 33 33 33 33 ighbors	Up/Down Time 00h:26m:18s 00h:26m:18s 00h:26m:18s 00h:26m:18s	State Established Established Established Established	AdminStatus Up Up Up Up
lotal Number of	Neighbors:	4				
Neighbor ID	Priority	State		Nbr Address	Interfa	ce
1.1.1.3	n/a	FULL		101.1.1.1	1/1/1	
1.1.1.4	n/a	FULL		101.1.1.5	1/1/2	
1.1.1.5	n/a	FULL		101.1.1.9	1/1/3	
1.1.1.6	n/a	FULL		101.1.1.11	1/1/4	

After validation, you can choose to "COMMIT" to save the desired configs or "ROLLBACK" to revert configs before the configs were deployed and make further desired changes.

4) CONFIGURE HOST INFRASTRUCTURE (VLANS AND LAGS)

NetEdit Plan For Host Configuration on Leaf Switches

Create a Host Configuration plan for the leaf switches in NetEdit [Devices -> select all leafs -> Action -> Edit Running Config] and name the plan.

Give the plan a name and "Create".

Figure 33. Selecting Leafs for Host Plan

≡ 0	rut	00 Devices							Ť		
-										+	Add Device(s)
=	De	Name	Address	Status	MAC	Serial	Current Firmware	Model	Running Config Modifie	×	Delete Device(s)
Ê		8325-R1-RU25	10.10.10.190	0	548028-fefa00	TW8BKM304D	GL10.03.0030M	8325	08/12/19 14:20:21	94	Change Credentials
		L3Core-RU37	10.10.10.123	۲	d06726-e23670	TW87KCW00X	TL.10.03.0020	8320	08/15/19 13:29:05		Change Firmware
22		R1L1-8325-RU29	10.10.10.165	۲	548028-fda400	TW93KM001Y	GL10.03.0030M	8325	08/16/19 11:48:31		Edit Running Confi
	2	R1L2-8325-RU30	10.10.10.163	۲	548028-fd2800	TW93KM0026	GL.10.03.0030M	8325	08/16/19 11:48:31	-	-
۹,	2	R2L1-8325-RU31	10.10.10.75	۲	548028-fde700	TW93KM0009	GL.10.03.0030M	8325	08/16/19 11:48:31		Edit Startup Conng
\$		R2L2-8325-RU32	10.10.10.162	0	548028-fdf400	ТW93КМ000К	GL.10.03.0030M	8325	08/16/19 11:48:31	1	Edit Attributes
		0211 0225 01122	10 10 10 102		C49039 641000	THEORY MOODNI	CL 10.02.0020M	0375	09/12/10 14:20:50	-	(and the second second

Start the configuration by choosing the appropriate Leaf switches from the left panel and then applying the required VLANs and VLAN Interfaces. Right click and modify the VLAN IP addresses as necessary.

Rack 1

```
vlan 10
interface vlan10
    vsx-sync active-gateways
    ip address 10.1.1.253/24
    active-gateway ip 10.1.1.254 mac 00:00:00:00:00:00
    ip ospf 1 area 0.0.0.0
```

Figure 34. Adding VLAN 10 to Rack 1

Devices (2/4)	Leaf-Hosts
<u>R1L1-8325-</u> <u>RU29</u> ◆	6 area 0.0.0.0 7 v lan 1
<u>R1L2-8325-</u>	8 vlan 10
<u>(10.10.10.163)</u>	9 interface mgmt
<u>R2L1-8325-RU31</u> <u>(10.10.10.75)</u>	10 no shutdown
<u>R2L2-8325-RU32</u> (10.10.10.162)	11 ip static A.B.C.D/M
	12 default-gateway 10.10.10.254

Figure 35. Adding VLAN 10 Interface to Rack 1

Devices (2/4)	Leaf-Hosts 🗰 VIEWS 🖹 RETURN TO PLA
<u>R1L1-8325-</u> <u>RU29</u> (10.10.165) <u>R1L2-8325-</u>	37 interface 1/1/51 38 no shutdown
<u>RU30</u> \blacklozenge (10.10.10.163)	39 lag <i>10</i>
<u>R2L1-8325-RU31</u> <u>(10.10.10.75)</u>	40 interface loopb R1L1-8325-RU29 (10.10.10.165): ip address
<u>R2L2-8325-RU32</u> <u>(10.10.10.162)</u>	41 ip address 42 ip ospf 1 a 10.1.1.253/24
	43 interface vlan1 R1L2-8325-RU30 (10.10.10.163) : ip address
	44 vsx-sync ac 10.1.1.252/24
	45 ip address A.B.C.D/M
	46 active-gateway ip 10.1.1.254 mac 00:00:00:00:00:01
	47 ip ospf 1 area 0.0.0.0

Rack 2

```
vlan 11
interface vlan11
   vsx-sync active-gateways
   ip address 11.1.1.253/24
   active-gateway ip 11.1.1.254 mac 00:00:00:00:00:03
   ip ospf 1 area 0.0.0.0
```

Figure 36. Adding VLAN 11 to Rack 2

	Devices (2/4)	Leaf-Hosts
	R1L1-8325-	5 router-1a A.B.C.D
	<u>RU29</u>	6 area 0.0.0.0
_	<u>R1L2-8325-</u>	7 vlan 1
	<u>RU30</u> \diamondsuit (10.10.10.163)	8 vlan 11
	R2L1-8325-	9 interface mgmt
	<u>(10.10.10.75)</u>	10 no shutdown
	<u>R2L2-8325-</u>	
	<u>KU32</u>	11 ip static A.B.C.D/M
		12 default-gateway 10.10.10.254



Figure 37. Adding VLAN 11 Interface to Rack 2

Next, select the appropriate leaf switches facing the servers and crate the needed LAG interfaces and apply to the appropriate interface.

```
interface lag 10 multi-chassis
vsx-sync vlans
no shutdown
```

Rack 1

no shutdown no routing vlan trunk native 1 vlan trunk allowed 10 lacp mode active interface 1/1/51 no shutdown lag 10

```
# Rack 2
```

```
interface lag 11 multi-chassis
    vsx-sync vlans
    no shutdown
    no routing
    vlan trunk native 1
    vlan trunk allowed 11
    lacp mode active
interface 1/1/51
    no shutdown
```

lag 11

Figure 38. View after MLAGs were added to each device

Devices (4/4)	Leaf-Hosts	III VIEWS 📋 RETURN TO PLAN 🛷 VALIDA
R1L1-8325- RU29	21 lacp mode active	
(<u>10.10.10.165)</u> R1L2-8325-	22 interface lag 10 multi-chass	(2/4) is
<u>RU30</u>	23 vsx-sync vlans	(2/4)
R2L1-8325-	24 no shutdown	(2/4)
<u>RU31</u>	25 no routing	(2/4)
R2L2-8325- RU32 -	26 vlan trunk native 1	(2/4)
(10.10.10.162)	27 vlan trunk allowed 10	(2/4)
	28 lacp mode active	(2/4)
	29 interface lag 11 multi-chass	is (24)
	30 vsx-sync vlans	(2/4)
	31 no shutdown	(2/4)
	32 no routing	(2/4)
	33 vlan trunk native 1	(2/4)
	.34 vlan trunk allowed 11	(2/4)
	35 lacp mode active	(2/4)

Figure 39. View of 1/1/51 showing MLAG assignments

	Devices (4/4)	Leaf-Hosts 🗰 views 🖹 return to plan 🛷 validate	
	<u>R1L1-8325-</u> RU29	52 interface 1/1/51	
	(10.10.10.165)	53 no shutdown	
	<u>R1L2-8325-</u> <u>RU30</u>	54 lag RNG	
	<u>(10.10.10.163)</u> <u>R2L1-8325-</u>	55 interfac R1L1-8325-RU29 (10.10.10.165): lag 10	
	<u>RU31</u>	56 ip a	
	R2L2-8325-	57 ip o	
	(10.10.10.162)	58 interfac R2L1-8325-RU31 (10.10.10.75): lag 11 (24)	
		59 vsx- R2L2-8325-RU32 (10.10.10.162): lag 11	
-			

Finally, select "RETURN TO PLAN" -> "DEPLOY" to push down configs.

Verify Change Validation

You can click on "Change Validation" to verify if the VLANs, Interfaces, and LAGs are up.

0	Change Validation Results													
													Started: 08/16/19 13:45:11 Refreshed: 08/16/19 13:45:3	2 REFRESH
N	lame		IP			Command								
1/	1/48 1/49		trunk SFP+DA1 routed QSFP28DA3	yes yes	up up		10000 100000	1/1/48 1/1/49		trunk SFP+DA routed QSFP281	l yes DA3 yes	up up		10000
1/:	1/50		routed QSFP28DA3	yes	up		100000	1/1/50		routed QSFP281	DA3 yes	up		100000
- 1/	1/52		routed OSFP+DA3	no	down	Administratively down		1/1/52		routed OSFP+D	AJ yes Al no	down	Administratively down	
1/	1/53		routed		down	No XCVR installed		1/1/53		routed		down	No XCVR installed	
1/	1/54 ·		routed		down	No XCVR installed		1/1/54		routed		down	No XCVR installed	
1/:	1/55 ·		routed		down	No XCVR installed		1/1/55		routed		down	No XCVR installed	
1/:	1/56 ·		routed		down	No XCVR installed		1/1/56		routed		down	No XCVR installed	
10	opback0 ·		routed	yes				loopback0		routed	yes	up		
- 11							///////////////////////////////////////	+ vlanll			yes	up		
la			trunk	yes	up		10000	Lag1	1	trunk	yes	up		10000
11							////////	+ Lagil		trunk	yes	up		40000

Figure 40. Show interface brief view of Rack 2 Leaf 2 switch showing VLANs, and host interfaces are up

Figure 41. Show LACP interface view of Rack 2 Leaf 2 switch showing LACP is up and active

ø	Cha	Change Validation Results																	
															Starte Refres	d: 08/16 hed: 08/	/19 13 /16/19	3:45:11 13:45:32	REFRESH
	Name				IP		Cor	nman	nd										
~	R2L2-8	325-RU32			10.10.10	.162	sho	w lacj	p interfaces										
	A - Act S - Sho C - Col X - Sta Actor d	ive rt-timeout lecting te m/c expi etails of a	P - Pa L - Lo D - Di .red	ssive ng-tim stribu erface	F - eout N - ting E - s:	Aggregable I - Ind InSync O - Out Default neighbor :	lividua cofSync state			A - Act S - Sho C - Col X - Sta Actor o	tive ort-timeout llecting ate m/c expi details of a	P - Pa L - Lo D - Di tred	assive ong-tim Istribu cerface	F - meout N - uting E -	Aggregable I - In InSync O - Ou Default neighbor	dividua tofSync state			
	Intf	Aggr Name	Port Id	Port Pri	State	System-ID	System Pri	Aggr Ke y	Forwarding State		Aggr Name	Port Id	Port Pri	State	System-ID	System Pri	Aggr Ke y	Forwardin State	
	1/1/48	lag1	49	1	ALFNCD	54:80:28:fd:f4:00	65534	1	шр ////////////////////////////////////	1/1/48 + 1/1/51	lag1 lag11(mc)	49 1051	1 1	ALFNCD ALFNCD	54:80:28:fd:f4:00 54:80:28:fd:e7:00	65534 65534	1 11	up up	- 1
1	Partner	details of		nterfa						Partner	r details of		Interfa						
	Intf	Aggr Name	Port Id	Port Pri	State	System-ID	System Pri	Aggr Key		Intf	Aggr Name	Port Id	Port Pri	State	System-ID	System Pri	Aggr Key		
	1/1/48	lag1	49		ALFNCD	54:80:28:fd:e7:00	65534			1/1/48 + 1/1/51	lag1 lag11(mc)	49 57	1 1	ALFNCD ALFNCD	54:80:28:fd:e7:00 54:80:28:fd:54:00	65534 65534	1 11		

5) CONFIGURE BORDER CONNECTION TO L3CORE ENVIRONMENT

NetEdit Plan For Leaf Switch Border Connection in Rack 2 and L3Core

Create a Host Configuration plan for Rack 2 leaf switches and the L3Core in NetEdit [Devices -> select rack 2 leafs and L3 core-> Action -> Edit Running Config] and name the plan.

Give the plan a name and "Create".

ar									a
	Devices 11	Devices Enter Search Q							+ =
	- Name	Address	Status	MAC	Serial	Current Firmware	Model	Running Config Modified	Curren
Į.	8325-R1-RU25	10.10.10.190	0	548028-fefa00	TW8BKM304D	GL.10.03.0030M	8325	08/12/19 14:20:21	
	L3Core-RU37	10.10.10.123	0	d06726-e23670	TW87KCW00X	TL.10.03.0020	8320	08/15/19 13:29:05	10
Fi	R1L1-8325-RU29	10.10.10.165	0	548028-fda400	TW93KM001Y	GL.10.03.0030M	8325	08/16/19 13:45:19	75
and a	R1L2-8325-RU30	10.10.10.163	۲	548028-fd2800	TW93KM0026	GL.10.03.0030M	8325	08/16/19 13:47:30	96
	R2L1-8325-RU31	10.10.10.75	9	548028-fde700	ТW93КМ0009	GL.10.03.0030M	8325	08/16/19 13:45:19	
14	R2L2-8325-RU32	10.10.10.162	0	548028-fdf400	ТW93КМ000К	GL.10.03.0030M	8325	08/16/19 13:47:31	

Figure 42. Selecting switches for Border to L3Core connection

Choose the Rack 2 Leaf switches and configure the Physical interface and IP addresses. Right click and modify the IP addresses as necessary.

Rack 2

```
interface 1/1/52
    no shutdown
    ip address 111.1.1.3/31
router bgp 65000
    neighbor 111.1.1.2 remote-as 65001
    address-family ipv4 unicast
        neighbor 111.1.1.2 activate
        network 10.1.1.0/24
        redistribute ospf
router ospf 1
    redistribute bgp
```

Figure 43. BGP peering to L3Core added to Rack 2

	Devices (2/3)	R2-L3Core		VIEWS	📋 RETURN TO PL	an 🛷 Validate
	L3Core-RU37		neighbor 1.1.1.2 remote-as 65000			
	(10.10.10.123) ✓ RU1-8325: (10.10.10.75) RU2-3325: ✓ RU32 (10.10.10.162)		neighbor 1.1.1.2 update-source loopback			
			neighbor 111.1.1.0 remote-as 65001			(R2L2-8325-RU32 (10.10.10.1
_			neighbor 111.1.1.2 remote-as 65001			(R2L1-8325-RU31 (10.10.10.7.
			address-family ipv4 unicast			
			neighbor 1.1.1.1 activate			
			neighbor 1.1.1.2 activate			
			neighbor 111.1.1.0 activate			(R2L2-8325-RU32 (10.10.10.1
			neighbor 111.1.1.2 activate			(R2L1-8325-RU31 (10.10.10.7.
			u di studiute e su f			

Figure 44. L3 Interfaces to L3Core added



Figure 45. Redistribute command added between OSPF/BGP

	Devices (2/3)	R2-L3Core
_	12Coro-PI 127	7 aper admin dionb administrators basemond of
	<u>(10.10.10.123)</u>	3 ssh server vrf mgmt
	<u>R2L1-8325-</u> RU31	4 router ospf 1
_	(10.10.10.75) R2I 2-8325-	5 router-id A.B.C.D
		6 redistribute bgp
	<u>(10.10.10.182)</u>	7 area 0.0.0.0

Choose the L3Core and configure interfaces and BGP peering.

```
# L3Core
interface 1/1/49
   no shutdown
    ip address 111.1.1.0/31
interface 1/1/50
   no shutdown
    ip address 111.1.1.2/31
interface loopback 0
   ip address 1.1.1.7/32
router bgp 65001
   bgp router-id 1.1.1.7
    neighbor 111.1.1.1 remote-as 65000
   neighbor 111.1.1.3 remote-as 65000
    address-family ipv4 unicast
        neighbor 111.1.1.1 activate
        neighbor 111.1.1.3 activate
        network 1.1.1.7/32
```

Figure 46. BGP and Fabric interfaces added to L3Core

8	Devices (1/3)	R2-L3Core
	L3Core-RU37 (10.10.10.123) R2L1-8325-	10 interface 1/1/49 11 no shutdown
	RU31 (10.10.10.75) R2L2-8325- RU32	12 ip address 111.1.1.0/31 13 interface 1/1/50
	<u>(10.10.10.162)</u>	14 no shutdown
		15 ip address 111.1.1.2/31
		16 interface loopback 0
		17 ip address 1.1.1.7/32
		18 router bgp 65001
		19 bgp router-id 1.1.1.7
		20 neighbor 111.1.1.1 remote-as 65000
		21 neighbor 111.1.1.3 remote-as 65000
		22 address-family ipv4 unicast
		23 neighbor 111.1.1.1 activate
		24 neighbor 111.1.1.3 activate

Then choose the L3Core and configure the host facing VLANs, addresses, and apply to BGP.

```
# L3Core
vlan 31
interface 1/1/1
    no shutdown
    speed 1000-full
    no routing
    vlan access 31
interface vlan31
    ip address 31.1.1.254/24
router bgp 65001
    address-family ipv4 unicast
    network 31.1.1.0/24
```

Figure 47. Host facing interface and VLAN added to L3Core

8	Devices (1/3)	R2-L3Co	re
	L3Core-RU37	5	vlan <i>31</i>
_	<u>R2L1-8325-</u>		spanning-tree config-name d0:67:26:
	<u>RU31</u>		interface mgmt
П	<u>R2L2-8325-</u> RU32		no shutdown
	(<u>10.10.10.162)</u>		ip static 10.10.10.123/24
			default-gateway 10.10.10.254
			interface 1/1/1
			no shutdown
			speed 1000-full
			no routing
			vlan access 31

Figure 48. Adding VLAN interface and BGP configuration

	Devices (1/3)	R2-L3Core
	L3Core-RU37	23 interface vlan31
_	<u>R2L1-8325-</u>	24 ip address 31.1.1.254/24
	<u>RU31</u> (10.10.10.75)	25 router bgp 65001
	<u>R2L2-8325-</u> <u>RU32</u>	26 bgp router-id 1.1.1.7
	<u>(10.10.10.162)</u>	27 neighbor 111.1.1.1 remote-as 65000
		28 neighbor 111.1.1.3 remote-as 65000
		29 address-family ipv4 unicast
		30 neighbor 111.1.1.1 activate
		31 neighbor 111.1.1.3 activate
		32 network 31.1.1.0/24

Finally, select "RETURN TO PLAN" -> "DEPLOY" to push down configs.

Verify Change Validation

You can click on "Change Validation" to verify if the VLANs, Interfaces, peering is up, and all routes can be seen.

Figure 49. L3Core showing Established BGP state with Rack 2

0	Change Validation Results									
						Started: 08/16/19 14:30:35 Refreshed: 08/16/19 14:31:19	EFRESH			
	Name	IP	Command							
~	L3Core-RU37	10.10.10.123	show bgp all-vrf all summary							
				<pre>VRF : default BGF Summary</pre>	: 65001 BG : 2 Lac : 180 Cf IPv4 Unicast Remote-AS MagRovd MagSent 65000 4 5 65000 5 5 IPv6 Unicast	 Router Identifier : 1.1.1.7 Jeighbor Changes : No Keep Alive : 60 Up/Down Time State AdminStatu 00h:00m:25s Established Up 00h:00m:37s Established Up 	3			

Figure 50. L3Core showing host facing interface is up and set as access for VLAN 31

0	Chang	Change Validation Results																
																2	Started: 08/16/19 14:30:35 Refreshed: 08/16/19 14:31:19	REFRESH
	Name				IP			Command										
>	L3Core-R	RU37			10.10.10.123			show bgp all-	vrf all summa	ry								
>	L3Core-R	RU37			10.10.10.123			show bgp l2v	pn evpn									
~	L3Core-R	RU37			10.10.10.123			show interfa	e brief									
	Port	Native VLAN	Mode	 Туре	Enable	d Status	Reason		Speed (Mb/s)		Port	Native VLAN	Mode	Туре	Enabled	Status	Reason	Speed (Mb/s)
-	1/1/1	==	routed		no	down	Admini	stratively do	wn		+ 1/1/1	31	access		уез	up	Administrativalu dovm	1000

Figure 51. L3Core showing Rack 2 interfaces, Loopback, and VLAN 31 are up

0	Chan	ige Val	idation Results									
											Started: 08/16/19 14:30:35 Refreshed: 08/16/19 14:31:19	REFRESH
	Name		IP			Command						
- 1	/1/48 /1/49		routed	no	down	Administratively down	1/1/48	routed	no	down	Administratively down	
- 1	/1/50		routed QSFP+DA1	no	down	Administratively down	+ 1/1/50	routed QSFP+DA1	yes			40000
1	/1/51		routed		down	No XCVR installed	1/1/51	routed		down	No XCVR installed	
1	/1/52		routed QSFP+DA5		down	Administratively down	1/1/52	routed QSFP+DA5		down	Administratively down	
1	/1/53		routed		down	No XCVR installed	1/1/53	routed		down	No XCVR installed	
1	/1/54		routed		down	No XCVR installed	1/1/54	 routed	no	down	No XCVR installed	
1							+ loopback0					
1							+ v1an31		yes	up		

0	Change Validation Res	sults				
					Started: 08/16/19 14:30:35 Refreshed: 08/16/19 14:31:19	REFRESH
	Name	IP	Command			
>	L3Core-RU37	10.10.10.123	show ip ospf neighbors			
¥	L3Core-RU37	10.10.10.123	show ip route all-vrfs			
	lo ipv4 routes configured			<pre>+ Displaying ipv4 routes selected for forwarding + '[x/y]' denotes [distance/metric] + 1.1.1.1/32, vrf default via 111.1.1.1, [20/0], bgp via 111.1.1.3, [20/0], bgp 1.1.1.6/32, vrf default via 111.1.1.1, [20/0], bgp 1.1.1.4/32, vrf default via 111.1.1.3, [20/0], bgp 1.1.1.4/32, vrf default via 111.1.1.3, [20/0], bgp 1.1.1.4/32, vrf default via 111.1.1.1, [20/0], bgp 1.1.1.4/32, vrf default via 111.1.1.4, [20/0], bgp 1.1.1.4/32, vrf default via 111.1.1.4, [20/0], bgp 1.1.1.4/32, vrf default via 111.1.1.1, [20/0], bgp 1.1.1.4/32, vrf default via 111.1.1.4, [20/0], bgp 1.1.1.4/34, vrf default via 111.1.1.1, [20/0], bgp 1.1.1.0/24, vrf default via 111.1.1.3, [20/0], bgp 1.1.1.0/24, vrf default via 111.1.1.3, [20/0], bgp 1.1.1.0/24, vrf default via 111.1.1.3, [20/0], bgp</pre>		

Figure 52. L3Core showing that it sees routes to VLANs and Loopbacks within the Spine/Leaf fabric

6) CONFIGURE MULTICAST ENVIRONMENT

NetEdit Plan For Multicast Configuration on Leaf Switches

Create a Multicast Leaf Configuration plan for Rack 1 & 2 leaf switches in NetEdit [Devices -> select rack 1 & 2 leafs -> Action -> Edit Running Config] and name the plan.

Give the plan a name and "Create".

Figure 53. Selecting leaf switches for Multicast Plan

= (arut	O Devices							Ī		
	De	vices 11 De	wices Enter Search Ox							+	Add Device(s)
		Name	 Address	Status	мас	Serial	Current Firmware	Model	Running Config Modifie		Delete Device(s)
8		8325-R1-RU25	10.10.10.190	0	548028-fefa00	TW8BKM304D	GL10.03.0030M	8325	08/12/19 14:20:21	07	Change Credentials
		L3Core-RU37	10.10.10.123	0	d06726-e23670	TW87KCW00X	TL.10.03.0020	8320	08/16/19 14:53:04		Change Firmware
22		R1L1-8325-RU29	10.10.10.165	0	548028-fda400	TW93KM001Y	GL.10.03.0030M	8325	08/16/19 13:45:19		Edit Running Config
=		R1L2-8325-RU30	10.10.10.163	0	548028-fd2800	TW93KM0026	GL.10.03.0030M	8325	08/16/19 13:47:30	-	Felle Phone and Comfine
٩.		R2L1-8325-RU31	10.10.10.75	0	548028-fde700	TW93KM0009	GL.10.03.0030M	8325	08/16/19 14:42:59	•	East startup Comig
۵		R2L2-8325-RU32	10.10.10.162	0	548028-fdf400	тw93км000к	GL.10.03.0030M	8325	08/16/19 14:48:01	1	Edit Attributes

Start by choosing the appropriate Leaf switches from the left panel and apply the required VLANs and VLAN Interfaces. Right click and modify the VLAN IP address as necessary.

All Leaf Switches

```
router pim
enable
rp-address 1.1.1.1
active-active
interface 1/1/49
ip pim-sparse enable
interface 1/1/50
ip pim-sparse enable
interface loopback 0
ip pim-sparse enable
```

Rack 1 Leaf Switches

vlan 10
 ip igmp snooping enable
interface vlan10
 ip igmp enable
 ip pim-sparse enable

Rack 2 Leaf Switches

```
interface 1/1/52
    ip pim-sparse enable
vlan 11
    ip igmp snooping enable
interface vlan11
    ip igmp enable
    ip pim-sparse enable
```

Figure 54. IGMP-snooping showing as added to VLANs 10 and 11



	Devices (4/4)	Leafs-MC	VIEWS	😑 RETURN TO PLAN	💎 VALIDA
	<u>R1L1-8325-</u> RU29 스	46 interface 1/1/49			
	<u>(10.10.10.165)</u>	47 no shutdown			
	<u>R1L2-8325-</u> <u>RU30</u>	48 ip address A.B.C.D/M			
	<u>(10.10.10.163)</u> R2L1-8325-	49 ip ospf 1 area 0.0.0.0			
	<u>RU31</u>	50 ip ospf network point-to-point			
_	<u>R2L2-8325-</u>	51 ip pim-sparse enable			
	<u>RU32</u>	52 interface 1/1/50			
		53 no shutdown			
		54 ip address A.B.C.D/M			
		55 ip ospf 1 area 0.0.0.0			
		56 ip ospf network point-to-point			
		57 ip pim-sparse enable			
		58 interface 1/1/51			
		50 no shutdown			
				c	2/4)
		61 interface 1/1/52		4	2/4)
		62 no shutdown			7/4)
		63 ip address A.B.C.D/M		L	2/4)
		64 ip pim-sparse enable		G	2/4)
		65 interface loopback 0			
		66 ip address A.B.C.D/M			
		67 ip ospf 1 area 0.0.0.0			
		68 ip pim-sparse enable			

Figure 55. IP PIM-Sparse added to Fabric Interfaces and Loopback interfaces

Figure 56. IP PIM-Sparse added to VLAN interfaces

	Devices (4/4)	Leafs-MC III VIEWS 🗎 RETURN TO PLA	n 👎 VA
	R1L1-8325- RU29	69 interface vlan10	(2/4)
	(<u>10.10.10.165)</u> R1L2-8325-	70 vsx-sync active-gateways	(2/4)
	RU30	71 ip address A.B.C.D/M	(2/4)
_	R2L1-8325-	72 active-gateway ip 10.1.1.254 mac 00:00:00:00:00:01	(2/4)
	<u>RU31</u> \diamondsuit (10.10.10.75)	73 ip ospf 1 area 0.0.0.0	(2/4)
	RU32	74 ip igmp enable	(2/4)
	(10.10.10.162)	75 ip pim-sparse enable	(2/4)
		76 interface vlan11	(2/4)
		77 vsx-sync active-gateways	(2/4)
		78 ip address A.B.C.D/M	(2/4)
		79 active-gateway ip 11.1.1.254 mac 00:00:00:00:00:03	(2/4)
		80 ip ospf 1 area 0.0.0.0	(2/4)
		81 ip igmp enable	(2/4)
		82 ip pim-sparse enable	(2/4)

Figure 57. Enabling PIM globally and setting Spine 1 as the Static RP



Finally, select "RETURN TO PLAN" -> "DEPLOY" to push down configs.

Verify Change Validation

You can click on "Change Validation" to verify if PIM and IGMP is up.

Figure 58. Rack2 showing IGMP is now configured

0	Change Validation Res	sults				
		Started: 08/18/19 09:22:56 Refreshed: 08/18/19 09:23:46	REFRESH			
	Name	IP	Command			
~	R2L2-8325-RU32	10.10.10.162	show ip igmp			
N CT	(GMP is not enabled on interfe (GMP is not enabled on interfe	ace 1/1/47 ace 1/1/49 ace 1/1/50 ace 1/1/52 ace loopback0 ace vlan11		IGMF is not enabled on interface 1/1/47 IGMF is not enabled on interface 1/1/49 IGMF is not enabled on interface 1/1/50 IGMF is not enabled on interface 1/1/52 IGMF is not enabled on interface loopback0 * WRF Name : default * Interface : vlanl1 * IGMF Configured Version : 3 * IGMF Operating Version : 3 * IGMF Operating Version : 3 * Omerier IF (this switch] : 11.1.1.252 * Operier Expiration Time : Om 22s * IGMF Snoop Enabled on VLAN : True *		

The image below is of 2 Hosts (Rack1 on the left and Rack 2 on the right). The host in Rack 2 is using a Multicast generator to source traffic. The host in Rack 1 is interested in listening to the MC traffic. Because MC is not yet configured end to end rack 1 is unable to receive the streams. This is expected at this stage.

Figure 59. Multicast source in Rack 2 not seen by Rack 1

c • 📗 • 🕂	□			*	<u>V</u> MRC ▼		Ξ.		
	Select Administrat	or: Windows Powe	rShell –				Administrator: Win	dows PowerShell	_ □
y from 10.1.1.25	4: bytes=32 time=4	ns TTL=64			Windows Copyrigh	PowerShell t (C) 2014 Mid	crosoft Corporation. All	rights reserved.	
statistics for Packets: Sent = oximate round tr	10.1.1.254: 1, Received = 1, L ip times in milli-	ost = 0 (0% loss), seconds:			PS C:		Multicast H	lammer	_ D X
4	Multicast I	Hammer	_ 🗆 X		Pingi Reply S	tream <u>H</u> elp			
Stream Help					Reply Reply	Stream Setup			Transmitting
Stream Setup			Listening		Ding	Local Mode:	🔘 Client 💿 Server		Stop
Local Mode:	Client O Server		Elotorining		P	Stream Type:	 Multicast O Unicast 		- Stop
Stream Type:	Multicast Unicast		Stop		Appro M	Network Interface:	Intel(R) 82574L Gigabit Network	Connection #2	Clear
Network Interface:	Intel(R) 82574L Gigabit N	stwork Connection #2 👻	Clear		PS C:	Multicast Groups:	5		🖄 Graph
Multicast Groups	5		Granh			First Group:	239.0.5.1		
First Group:	239.0.5.1					UDP Port Number:	8910		
LIDP Port Number	8910					Time to Live:	33		
TOS-	1					TOS:	1		
103.	· · · · · · · · · · · · · · · · · · ·					Transmit Speed:	·		2
Group	Bytes Bits/s	Lost Pkt SeqErr	Jitter			Pavinad Bytes			2
239.0.5.1	5503552 0	1488 0	8.45			Burst Packets:			1
239.0.5.2	5503552 U 5503552 0	1488 U 1488 0	8.36			Darat Pacificita.	~		<u> </u>
239.0.5.4	5503552 0	1488 0	8.4			Group	Bytes	Bits/s	
239.0.5.5	5503552 0	1488 0	8.45			239.0.5.1	11414144	512	_ _
			-			239.0.5.3	11414144	512	i
9-						239.0.5.4	11414144	512	
4						239.0.5.5	11414144	512	
0-10:32:30	10:33:00	10:33:30	10:34:00						-
Aug 14 20:18:40	ION	220.0.6.1.6	_		8	29		0	
Aug 14 20:16:44	Receiving	239.0.5.1-5		a	5	53			
Aug 15 18:50:14	Idle	239.0.5.1-5			2	~ <u>`</u>			
Aug 15 18:50:16	Receiving	239.0.5.1-5		JC	c	· -	10:33:00		10:34:00
Aug 15 20:19:26	Idle	239.0.5.1-5		>		in 14 20:05:51	IOIN	239.0.5.1.5	
Aug 15 20:31:57	Receiving	239.0.5.1-5	223			ug 14 20:05:52	Receiving	239.0.5.1-5	
Aug 15 20:33:21	Idle	239.0.5.1-5	▼ Listeria	huo	A	ug 14 20:16:30	Idle	239.0.5.1-5	
Aug 10 22.34.16			Listening	1C	٩ A	ug 14 20:16:31 ug 14 20:16:42	LEAVE	239.0.5.1-5	332
					A	ug 14 20.10.42 ug 16 22:34:15	scruing	208.0.0.1-0	Transmitting
				JC	c 📕				
								A	2,24 044
-						÷ 🚍		📥 🔳 🔺 ۹	3 🐻 😼 8/16/201

NetEdit Plan For Multicast Configuration on Spine Switches

Create a Multicast Leaf Configuration plan for Spine 1 & Spine 2 switches in NetEdit [Devices -> select both spines -> Action -> Edit Running Config] and name the plan.

Give the plan a name and "Create".

De	vices 11 De	vices Enter Search Q								
	Name	Address	Status	MAC	Serial	Current Firmware	Model	Running Config Modifie		Delete Device(s)
	8325-R1-RU25	10.10.10.190	0	548028-fefa00	TW88KM304D	GL.10.03.0030M	8325	08/12/19 14:20:21	07	Change Credential
	L3Core-RU37	10.10.10.123	0	d06726-e23670	TW87KCW00X	TL.10.03.0020	8320	08/16/19 14:53:04	₽	Change Firmware
	R1L1-8325-RU29	10.10.10.165	۲	548028-fda400	TW93KM001Y	GL.10.03.0030M	8325	08/16/19 15:29:02		Edit Running Confi
	R1L2-8325-RU30	10.10.10.163		548028-fd2800	TW93KM0026	GL.10.03.0030M	8325	08/16/19 15:33:11	_	
	RZL1-8325-RU31	10.10.10.75	0	548028-fde700	ТW93КМ0009	GL.10.03.0030M	8325	08/16/19 15:29:02		Edit Startup Config
	R2L2-8325-RU32	10.10.10.162	۲	548028-fdf400	TW93KM000K	GL.10.03.0030M	8325	08/16/19 15:33:12	1	Edit Attributes
	R3L1-8325-RU33	10.10.10.153	0	548028-fd1900	TW93KM002N	GL.10.03.0030M	8325	08/12/19 14:29:59	Ê	View Plans
	R4L1-8325-RU34	10.10.10.81	۲	548028-fd5400	TW93KM0034	GL.10.03.0030M	8325	08/14/19 12:25:59	•	Column Settings
	Server1	10.10.10.124	0	d06726-e2b6d2	TW87KCW01H	TL.10.02.0020	8320	08/07/19 11:43:37		countractings
2	Spine1-8325-R1-RU21	10.10.10.41		548028-fe2900	TW88KM3030	GL.10.03.0030M	8325	08/16/19 11:24:43	٥	Export Data
	Spine2-8325-R1-RU22	10.10.10.40	0	548028-fef900	TW88KM301F	GL.10.03.0030M	8325	08/16/19 11:24:43		8

Figure 60. Selecting Spines for MC configuration

Add the following configuration.

```
interface 1/1/1
    ip pim-sparse enable
interface 1/1/2
    ip pim-sparse enable
interface 1/1/3
    ip pim-sparse enable
interface loopback 0
    ip pim-sparse enable
router pim
    enable
    rp-address 1.1.1.1
```

Figure 61. PIM configuration added globally to both spines

Devices (2/2)	Spines-MC	VIEWS
<u>Spine1-8325-</u> <u>R1-RU21</u>	58 neighbor 1.1.1.6 route-reflecto	r-client
<u>(10.10.10.41)</u> Spine2-8325-	59 router pim	
<u>R1-RU22</u>	60 enable	
<u>(10.10.10.40)</u>	61 rp-address 1.1.1.1	

Devices (2/2)	Spines-MC
Spine1-8325-	12 interface 1/1/1
<u>R1-RU21</u> \frown <u>(10.10.10.41)</u>	13 no shutdown
<u>Spine2-8325-</u> <u>R1-RU22</u>	14 ip address A.B.C.D/M
<u>(10.10.10.40)</u>	15 ip ospf 1 area 0.0.0.0
	16 ip ospf network point-to-point
	17 ip pim-sparse enable
	18 interface 1/1/2
	19 no shutdown
	20 ip address A.B.C.D/M
	21 ip ospf 1 area 0.0.0.0
	22 ip ospf network point-to-point
	23 ip pim-sparse enable
	24 interface 1/1/3
	25 no shutdown
	26 ip address A.B.C.D/M
	27 ip ospf 1 area 0.0.0.0
	28 ip ospf network point-to-point
	29 ip pim-sparse enable
	30 interface 1/1/4
	31 no shutdown
	32 ip address A.B.C.D/M
	33 ip ospf 1 area 0.0.0.0
	34 ip ospf network point-to-point
	35 ip pim-sparse enable

Figure 62. PIM Sparse configuration added to fabric facing interfaces

Now select "RETURN TO PLAN" -> "DEPLOY" to push down configs.

Verify Change Validation

You can click on "Change Validation" to PIM status.

Figure 63. Spine 2 showing PIM is now configured

0	Change Validation Res	sults			
	Name	IP	Command		
	Spine2-8325-R1-RU22	10.10.10.40	show ip pim		
	PIM is not enabled for VRF def	ault			
				+ PIM Global Parameters	
			+ VRF : + PIM Status : + Join/Prune Interval (sec) : + SPT Threshold :	default Enabled 60 Enabled	

Figure 64. Spine 2 is now showing PIM neighbors

0	Change Validation Results								
	Name	IP	Command						
>	Spine2-8325-R1-RU22	10.10.10.40	show ip pim interafce						
~	Spine2-8325-R1-RU22	10.10.10.40	show ip pim neighbor						
ree (
				+ PIM Neighbor +					
				<pre>* VRF * IP Address * Interface * Up Time (sec) * Expire Time (sec) * DR Priority * * IP Address * Interface * Up Time (sec) * Expire Time (sec) * IP Address * Interface * Up Time (sec) * Expire Time (sec) * Expire Time (sec) * DR Priority *</pre>	: default : 101.1.1.3 : 1/1/1 : 2 : 104 : 4294967295 : 101.1.1.7 : 1/1/2 : 2 : 105 : 4294967295 : 101.1.1.13 : 1/1/3 : 0 : 105 : 4294967295 : 4294967295				

Eiguro 65	Sping 2 chowing	which interfaces	DIMhac	hoon on shlod	on
Figure 05.	spine z snowing	which interfaces	FINITIAS	been enabled	UII
0					

0	Change Validation Results							
							Started: 08/18/19 09:28:12 Refreshed: 08/18/19 09:28:22	REFRESH
,	Name spinez-8323-K1-KUZZ	IP 10.10.10.40	Command snow ip ospi neignbors					
8	Spine2-8325-R1-RU22	10.10.10.40	show ip pim					
Y	Spine2-8325-R1-RU22	10.10.10.40	show ip pim interface					
				* + PIM Interfaces * * VRF: default * + Interface	IP Address	mode		
				* + 1/1/1 + 1/1/2 + 1/1/3 + loopback0 + 1/1/4	101.1.1.2/31 101.1.1.6/31 101.1.1.12/31 1.1.1.2/32 101.1.1.14/31	sparse sparse sparse sparse sparse		

Figure 66. Spine 1 showing which interfaces PIM has been enabled on

S	Change Validation Results									
							Started: 08/18/19 09:28:12 Refreshed: 08/18/19 09:28:22	REFRESH		
	Name	IP	Command							
	Spine1-8325-R1-RU21	10.10.10.41	show ip ospf neighbors	show ip ospf neighbors						
	Spine1-8325-R1-RU21	10.10.10.41	show ip pim							
	Spine1-8325-R1-RU21	10.10.10.41	show ip pim interface							
				+ + PIM Interfaces + + VRF: default + + Interface	IP Address	mode				
				+ + 1/1/2 + 1/1/1 + 1/1/4 + 1/1/3 + loopback0	101.1.1.4/31 101.1.1.0/31 101.1.1.10/31 101.1.1.8/31 1.1.1.1/32	sparse sparse sparse sparse sparse sparse				

0	Change Validation Results										
					Started: 08/18/19 09:28:12 Refreshed: 08/18/19 09:28:22	REFRESH					
	Name	IP	Command								
	Spine1-8325-R1-RU21	10.10.10.41	show ip ospf neighbors								
	Spine1-8325-R1-RU21	10.10.10.41	show ip pim								
	FIM is not enabled for WRF def	ault	+ + PIM Global F + VRF + VRF + Distatus + Join/Pruse J + SFT Threshol	arameters : default : Enabled nterval (sec) : 60 d : Enabled							
	Spine1-8325-R1-RU21	10.10.10.41	show ip pim interface								
	Spine1-8325-R1-RU21	10.10.10.41	show ip pim neighbor								
			+ FIM Neighbor + VRF + IP Address + The Address + Thetrace + The Trime (see + The Address + The Address	: default : 101.1.1.1 : 1/1/4 : 8 (sec) : 97 : 4224967295 : 101.1.1.5 : 7 (sec) : 100 : 4224967295 : 101.1.1.1 : 1/1/1							

Figure 67. Spine 1 showing PIM is enabled with neighbors

Figure 68. Spine 1 showing Multicast Routes for the 5 groups, and showing which interfaces it is being forwarded on

0	Change Validation Results								
					Started: 08/18/19 09:28:12 Refreshed: 08/18/19 09:28:22	REFRESH			
	Name	IP	Command						
>	Spine1-8325-R1-RU21	10.10.10.41	show ip interface all-vrfs						
~	Spine1-8325-R1-RU21	10.10.10.41	show ip mroute						
				<pre>+ IP Multicast Route Entries + VRF : default + VRF : default + Total number of entries : 10 + + Group Address : 239.0.5.1 + Source Address : 10.1.1.11 + Incoming interface ist : + Interface State + I/I/I forwarding + I/I/I forwarding + Group Address : 239.0.5.1 + Group Address : 11.1.1.2 + Incoming interface ist : + Group Address : 11.1.1.2 + Incoming interface : 100.1.1.111 + Incoming interface : 101.1.1.11 + Incoming interface : 239.0.5.2 + Interface State + U/I/2 forwarding + U/I/1 forwarding + Group Address : 239.0.5.2 + Source Address : 2</pre>					

The image below is now showing that the host in Rack1 is receiving the MC streams.

statistics for	10.1.1.254:			DN	Copyri	ght (C) 2014 Mi	crosoft Corporation. Al	ll rights reserved.	
ackets: Sent = : kimate round tr	1, Received = 1, L ip times in milli-	.ost = 0 (0% loss), -seconds:			PS C:	4	Multicast	Hammer	>
4	Multicast	Hammer	- 0 ×		Reply	<u>S</u> tream <u>H</u> elp			
Stream Help					Reply Reply	Stream Setup			Transmitting
Stream Setup			Listening		Ping	Local Mode:	O Client Server		Stop
Local Mode:	● Client ○ Server		Stop		P Appro	Stream Type:	Multicast Unicast		Clear
Stream Type:	 Multicast O Unicast 		- orop		PS C	Network Interface:	Intel(R) 82574L Gigabit Networ	k Connection #2 👻	Cicar
Network Interface:	Intel(R) 82574L Gigabit N	letwork Connection #2 💌	Clear		. s c.	Multicast Groups:	5		🖄 Graph
Multicast Groups:	5		🖄 Graph			First Group:	239.0.5.1		
First Group:	239.0.5.1					UDP Port Number:	8910		
UDP Port Number:	8910					Time to Live:	33		
TOS:	1					TOS:	1		
1						Transmit Speed:	Ø	2	
Group	Bytes Bits/s	Lost Pkt SeqErr	Jitter			Payload Bytes:	Ø	32	
239.0.5.1	5519648 512	1400 U	10.41			Burst Packets:	Ø	1	
239.0.5.3	5519648 512	1488 0	10.41						
239.0.5.4	5519648 512	1488 0	10.41			Group	Bytes	Bits/s	
238.0.5.5	0019048 012	1400 U	35.12			239.0.5.2	11453536	512	
			•			239.0.5.3	11453536	512	
574			A			239.0.5.4	11453536	512	<mark> </mark>
337			₩			233.0.3.3	11433330	512	
10:43	:00 10:43:30	10:44:00	10:44:30						
-			•			553-			
Nug 14 20:16:44	Receiving	239.0.5.1-5	-			369			
Aug 15 18:50:16	Receiving	239.0.5.1-5		iat		184			
Aug 15 18:50:54	Receiving	239.0.5.1-5		100		0	0:43:00	10:44:00	1
Aug 15 20:19:26	Idle Receiving	239.0.5.1-5							
ug 15 20:31:57 ug 15 20:33:21	Idle	239.0.5.1-5	1000	100		Aug 14 20:05:51	JOIN	239.0.5.1-5	
ug 16 22:40:27	Receiving	239.0.5.1-5	-	ndo		Aug 14 20:05:52 Aug 14 20:16:30	Idle	239.0.5.1-5	
ug 16 22:44:39			Listening			Aug 14 20:16:31	LEAVE	239.0.5.1-5	
						Aug 14 20:16:42	Sending	239.0.5.1-5	
						Aug 16 22:44:39			Transmit

Figure 69. Multicast source and receivers in Spine/Leaf now receiving multicast traffic

NetEdit Plan For Multicast Configuration to Enable Connections to L3Core

Create a Multicast Leaf Configuration plan for Spine 1 & L3Core switches in NetEdit [Devices -> select spine 1 & L3Core -> Action -> Edit Running Config] and name the plan.

Give the plan a name and "Create".

Figure 70. Selecting Spine 1 and L3Core switches for inter PIM configuration

= (arut	O Devices							ſ		020 02	
25										+	Add Device(s)	
- 1	D	Devices 11 Devices Enter Statch Query or Type (HELP)										
	8	Name	Address	Status	MAC	Serial	Current Firmware	Model	Running Config Modifie			
8	D	8325-R1-RU25	10.10.10.190		548028-fefa00	TW8BKM304D	GL.10.03.0030M	8325	08/12/19 14:20:21	••	Change Credentia	
		L3Core-RU37	10.10.10.123	۲	d06726-e23670	TW87KCW00X	TL10.03.0020	8320	08/16/19 14:53:04			
24		R1L1-8325-RU29	10.10.10.165	۲	548028-fda400	TW93KM001Y	GL.10.03.0030M	8325	08/16/19 15:29:02		Edit Running Con	
=		R1L2-8325-RU30	10.10.163	۲	548028-fd2800	ТW93КМ0026	GL.10.03.0030M	8325	08/16/19 15:33:11	_	5-15-15 C C	
٩.		R2L1-8325-RU31	10.10.10.75	۲	548028-fde700	TW93KM0009	GL.10.03.0030M	8325	08/16/19 15:29:02		Edit Startup Confi	
\$		R2L2-8325-RU32	10.10.10.162	۲	548028-fdf400	Т₩93КМ000К	GL.10.03.0030M	8325	08/16/19 15:33:12	1	Edit Attributes	
		R3L1-8325-RU33	10.10.153	٢	548028-fd1900	TW93KM002N	GL.10.03.0030M	8325	08/12/19 14:29:59	Ê	View Plans	
		R4L1-8325-RU34	10.10.10.81	0	548028-fd5400	TW93KM0034	GL.10.03.0030M	8325	08/14/19 12:25:59		Column Settings	
		Server1	10.10.10.124	0	d06726-e2b6d2	TW87KCW01H	TL.10.02.0020	8320	08/07/19 11:43:37	*	Column settings	
		Spine1-8325-R1-RU21	10.10.10.41		548028-fe2900	TW8BKM3030	GL.10.03.0030M	8325	08/16/19 15:40:13	۵	Export Data	

Choose the appropriate switches from the left panel and apply the required configurations.

```
# L3Core
```

```
router pim
    enable
   rp-address 1.1.1.7
router msdp
   enable
    ip msdp peer 1.1.1.1
        connect-source loopback0
        enable
vlan 31
    ip igmp snooping enable
interface 1/1/49
    ip pim-sparse enable
interface 1/1/50
   ip pim-sparse enable
interface loopback 0
   ip pim-sparse enable
interface vlan31
   ip pim-sparse enable
    ip igmp enable
```

Spine1

```
router msdp
enable
ip msdp peer 1.1.1.7
connect-source loopback0
enable
```

Figure 71. L3Core showing new Global PIM and MSDN configurations



Figure 72. Spine 1 MSDN configuration

8	Devices (1/2)	MSDN	🏭 VIEWS 🚊
	<u>L3Core-RU37</u> <u>(10.10.10.123)</u>	63 https-server vrf mgmt	
	<u>Spine1-8325-R1-</u>	64 router msdp	
	<u>RU21 (10.10.10.41)</u>	65 enable	
		66 ip msdp peer 1.1.1.7	
		67 connect-source loopback0	
		68 enable	



Devices (1/2)	MC-Final
L3Core-RU37 (10.10.10.123)	17 interface 1/1/49
<u>Spine1-8325-</u> <u>R1-RU21</u>	18 no shutdown
<u>(10.10.10.41)</u>	19 ip address 111.1.1.0/31
	20 ip pim-sparse enable
	21 interface 1/1/50
	22 no shutdown
	23 ip address 111.1.1.2/31
	24 ip pim-sparse enable
	25 interface loopback 0
	26 ip address 1.1.1.7/32
	27 ip pim-sparse enable
	28 interface vlan31
	29 ip address 31.1.1.254/24
	30 ip igmp enable
	31 ip pim-sparse enable



8	Devices (1/2)	MC-Final	
		· · · · · · · · · · · · · · · · · · ·	
	L3Core-RU37 (10.10.10.123)	5 vlan 31	
	<u>Spine1-8325-</u> <u>R1-RU21</u>	6 ip igmp snooping enable	

Finally, select "RETURN TO PLAN" -> "DEPLOY" to push down configs.

Verify Change Validation

You can click on "Change Validation" to verify that MSDP peering is up, that the L3Core can see Multicast Routes.

Figure 75. L3Core showing MSDN peering and that it is seeing Multicast routes from peer

0	Change Validation Re	sults					
						Started: 08/18/19 09:40:15 Refreshed: 08/18/19 09:57:24	REFRESH
	Name	IP	Command				
	L3Core-RU37	10.10.10.123	show ip msdp sa-cache				
	VRF: default Total entries: 0			VRF: default +(11.1.1.2, 239.0.5.1) RP: 1.1.1 +(11.1.1.2, 239.0.5.2) RP: 1.1.1 +(11.1.1.2, 239.0.5.3) RP: 1.1.1 +(11.1.1.2, 239.0.5.3) RP: 1.1.1 +(11.1.1.2, 239.0.5.5) RP: 1.1.1 +(11.1.1.2, 239.0.5.5) RP: 1.1.1 +Total entries: 5	.1 Peer: 1.1.1.1 1 Peer: 1.1.1.1 1 Peer: 1.1.1.1 1 Peer: 1.1.1.1 1 Peer: 1.1.1.1 1 Peer: 1.1.1.1		
	L3Core-RU37	10.10.10.123	show ip msdp summary				
	VRF: default MSDP Peer Status Summary Peer address State Upti	me(Downtime) Reset Count	SA Count	VRF: default MSDP Peer Status Summary Peer address State Uptime(Downtime) Reset	Count SA Count	
				+1.1.1.1 up 1m 36s +			

~	Change Validation Results										
	Name	IP	Command								
	L3Core-RU37	10.10.10.123	show ip mroute								
				<pre>+ IP Multicast Route Entries + VRF : default + Total number of entries : 5 + Group Address : 239.0.5.1 + Source Address : 111.1.2 + Neighbor : 1111.1.3 + Incoming interface List : + Unterface State +</pre>							

Figure 76. L3Core showing Multicast Routes from neighboring PIM domain

The image below is now showing that the host in L3Core is now receiving the MC streams.

	Select Administra	tor Windows Powe	rShell - 0			Administrate - Min	four DougeChall		67		elect Administrate	ar: Windows Power	Shell
rom 10.1.1.254	bytes=32 times	4na TILE64	ionen i	All Contraction	PowerShell	Administrator. Win	tows Powersnell		Ping	-	Multicast	Hammer	
atistics for 1 kets: Sent = 1	0.1.1.254: L. Received = 1,	Lost = 0 (0% loss)		PS C:					Conti PS-C	Stream Help			
mate round tri	p times in milli	-seconds:		Pingi	-1	Multicast H	ammer i		Ping	Stream Setun			
	mutocasi	nammer		Reply	Stream Help				Reply	Local Mode	Client Clarver		Listening
ream Help				Reply	Streem Setup			Transmitting	Ping	Stream Type:	Chantered O tracant		Stop
tream Setup			Listening	Ping	Local Mode:	Challer @ Server		Stop	Appr	Network Interface:	NINO 12574L Original N	itera), Connection #7 +	Clear
cal Mode:	Climi O Server		Stop	Appro	Stream Typer	Comucan Onliced		Class	Cont	Muticast Groups:	5		Cen Gen
ream Type:	 Matural O Micar 			P5 C1	Network InterTace	PREFLOREST R. Segner Herwitte	Conscient\$1 (*)	Const Const	200	First Group:	230.0.5.t		
twork interface:	edectri 00574L Gould	Antonia Connection #2 -	Clear		Muticast Groups:	S		Craph	Repla	UDP Port Number:	8910		
iticast Groups:	5		🐼 Graph		First Group:	239.0.5.1			Repli	105	t.		
st Group:	239-0.5.1				UDP Port Number:	0169			Pina	CI CONT	Law Law	Luning Lines	Lef.
P Port Number:	aato .				Time to Live.	33				Ciroup 229.0.5.1	Dytes DEs/s	Lost Pid SeqLin 1532 0	- 100F
\$	8				105	1			Sept.	239.0.5.2	5480320 512	1537 0	5.25
Cran	Dates Dirett	Lot Die Casier	Contract Contract		Transmit Speed	<u>S</u>	- 2		P5 C	239.0.5.3	5400320 512	1537 0	5.25
9.0.5.1	5607104 512	1400 0	5.05		Payload Bytes:	2	32		Ping	239.0.5.4	5481952 512 6481952 512	1537 0	5.25
9.0.5.2	5607104 512	1488 0	5.02		Burst Packets:	Q	1		Repl				
9053	5607104 512	1488 0	5.06		Group	Bytes	Bitala						
39.0.5.5	5607104 512	1488 0	5.09		239.0.5.1	11540902	512		Ping	463-			
					239.0.5.2	11540992	\$12		Appro	302			
					239.0.5.3	11540992	512		Conti PS C	151			
۷.					239.0.5.5	11540992	512	i i	Pine	0 11 051	10	11:07:00	1
										11.000		11.01.00	
11:06:00	11:06:30	11:07:00	11:07:30						Repla	Aug 14 20:16:23	JON	239.0.5.1-5	
4 22:10:44	Receiving	239.0.5.1-5	-		553-	V			Ping	Aug 14 20:16:42	Receiving	239.0.5.1-5	
5 18:50:14	ide	239.0.5.1-5		at	369				Appro	Aug 15 20:19:22	kte	239.0.5.1.5	
5 18 50 16	Receiving	219.0 5.1.5			0					Aug 15 20:33:29	litte	239.0 5.1.5	
5 20 18 26	kše	239.0.5.1.5		JCC	11:06:0	00	11:07:00		25 C	Aug 16 23:02:29	Receiving	239.0.5.4-5	
5 20:31:57	Receiving	239.0.5.1-5		2	Aug 14 20 06 26	Stop	239.0.4.1-5		3	Aug 16 23.02-55	Receiving	239.0 5.1-3	doublease
5 20:33:21	kile	239.0.5.1-5			Aug 14 20:05:51	JON	239.0.5.1-5			Aug 16 23:07:41			LI COL
6 22 40 27 8 23 10 48	necerring	239.0.5.1-5	Listerary		Aug 14 20:05:52	Receiving	239.0.5.1-5						Winde
a section and			Cristian and		Aug 14 20 16:30	LEAVE	239.0.5.1.5						

Figure 77. Multicast source and receivers seeing multicast traffic between domains

After validation, if things are looking good as the above screen shots show, you can choose to "COMMIT" to save the desired configs to the startup configuration or you can click "ROLLBACK" to revert configs before the configs were deployed and make further desired changes.

VALIDATED REFERENCE DESIGN GUIDE ERROR! NO TEXT OF SPECIFIED STYLE IN DOCUMENT.



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