

Caso Práctico: Multidifusión de capa 3 en el fabric de ACI

Contenido

[Introducción](#)

[Requisitos de diseño](#)

[Solución](#)

[Configuración](#)

[Verificación](#)

Introducción

El routing multidifusión de capa 3 es compatible con el fabric ACI a partir de la versión 2.0 y requiere switches EX (es decir, N9K-C93180YC-EX). Antes de la versión 2.0, ACI sólo admitía multidifusión L2 dentro del dominio de puente. Esta opción sigue siendo válida en 2.0 y se puede utilizar para switches no EX.

En la versión 2.0 de ACI, las funciones de routing multidifusión admitidas incluyen: PIM ASM, PIM SSM, Static RP, PIM Auto-RP y PIM BSR.

En este documento, describimos una solución validada para un escenario real de implementación del cliente para el ruteo multicast L3 en el fabric ACI. La versión de ACI seleccionada es 2.1(1h). Esta versión no soporta RP en el fabric, por lo que se necesita un RP externo para PIM ASM.

Requisitos de diseño

El cliente necesita una solución integral para el ruteo de multidifusión L3 dentro y fuera del fabric. El escenario de implementación tiene los siguientes requisitos:

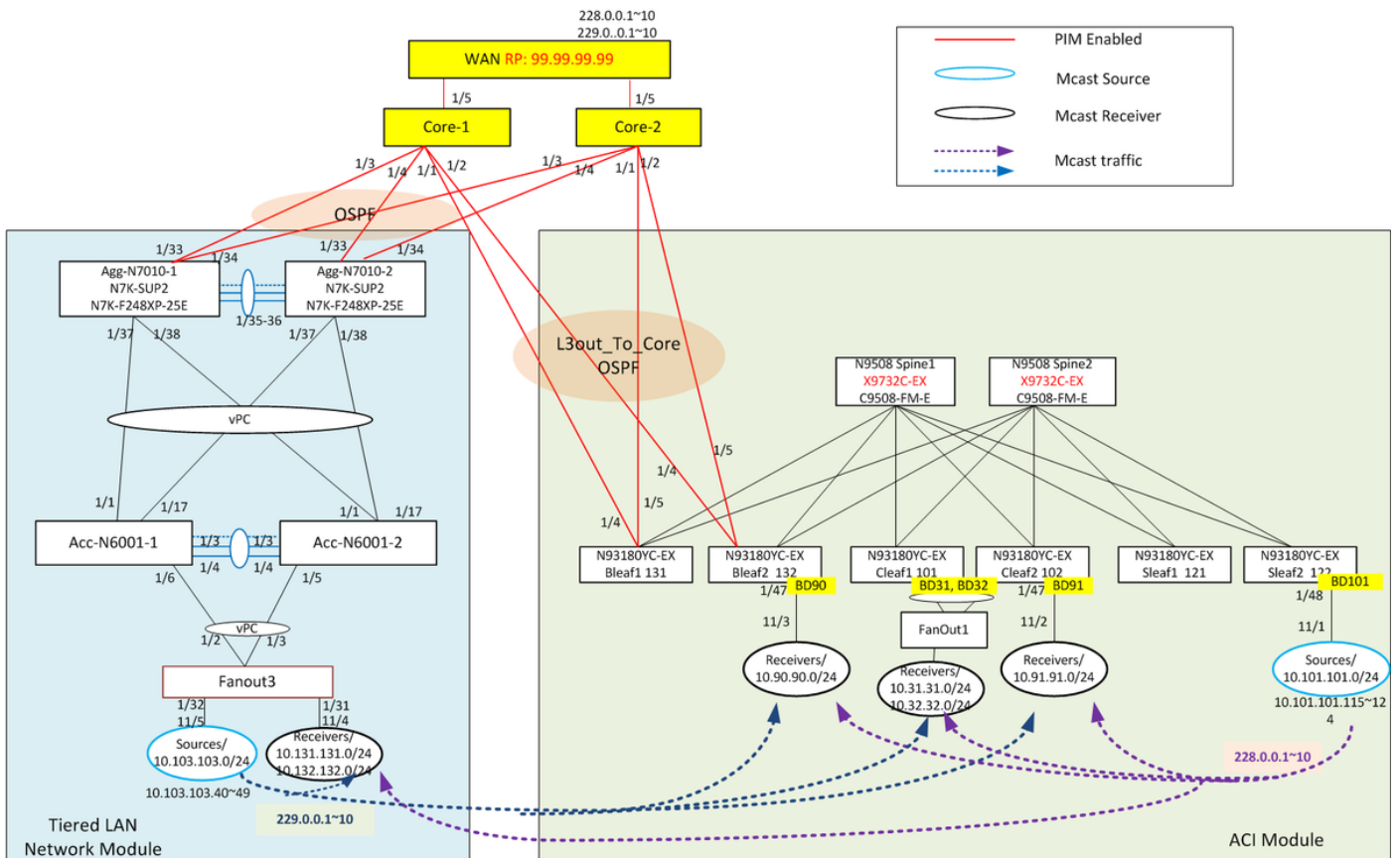
- Un VRF implementado para todos los arrendatarios.

Nota: La multidifusión requiere L3out dedicado para cada VRF. Si hay varios VRF en el fabric, el L3out compartido no se soporta para el ruteo multicast.

- Receptores en fabric con fuentes externas
- Fuentes en fabric con receptores externos
- Orígenes y receptores en el fabric
- RP estático o RP automático

Solución

Revisión de topología



En la topología, hay dos componentes principales: el módulo ACI y el módulo Tiered LAN Network. Ambos módulos están conectados a los dispositivos centrales a través de links L3 punto a punto que ejecutan OSPF y PIM. En el módulo ACI, la red enrutada externa se denomina L3out_to-Core asociada con el VRF common:default. Incluye los cuatro enlaces de las dos hojas de borde a los dispositivos principales. El módulo de red LAN por niveles, denominado externo al fabric, consta de la capa de acceso tradicional y la capa de agregación con vPC.

Los flujos de multidifusión L3 se ejecutan en el fabric ACI y la red LAN heredada a través de la capa de núcleo. Para el escenario de RP estático, RP se implementa en el dispositivo de borde WAN.

Utilizamos generadores de tráfico Spirent (STC) para simular las fuentes y receptores internos y externos. Los puertos Spirent están conectados a diferentes ubicaciones en el módulo ACI y el módulo de red LAN por niveles. Los receptores envían mensajes de afiliación de IGMP v2.

Fuentes internas conectadas a la hoja 2: las IP de origen son 10.101.101.115~124, enviando a las direcciones de grupo: 228.0.0.1~10

Receptores internos conectados a Bleaf1, Cleaf1 y Cleaf2: los BD habilitados para multicast son BD90, BD91, BD31, BD32, grupos interesados: 228.0.0.1~10 y 229.0.0.1~10.

Fuentes externas conectadas a la capa de acceso en la red LAN: las IP de origen son 10.103.103.40~49, enviando a las direcciones de grupo: 229.0.0.1~10.

Receptores externos conectados a la capa de acceso en la red LAN: vlan131, vlan132, grupos interesados: 228.0.0.1~10.

Configuración

Paso 0: Configure RP en el dispositivo WAN simulado conectado al núcleo, habilite el modo disperso de PIM en los dispositivos de red LAN en niveles.

```
!!!! RP configuration

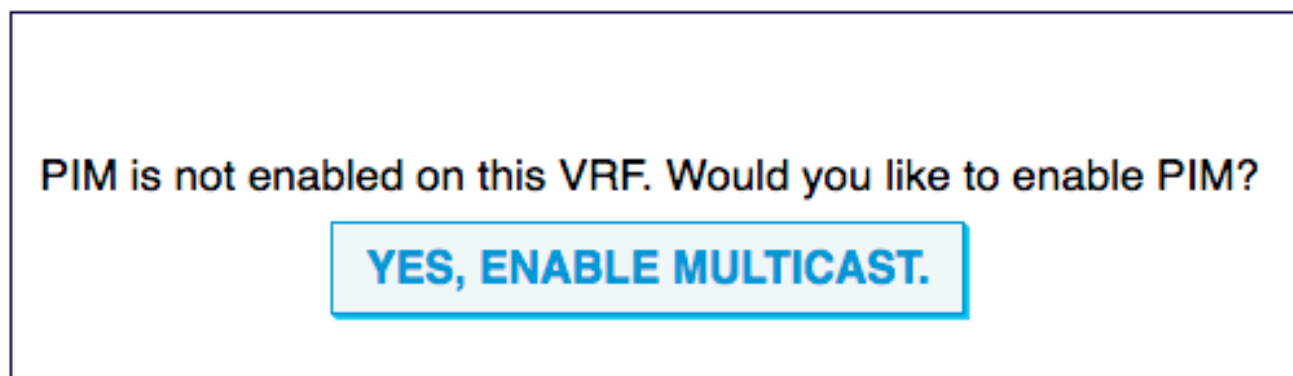
ip pim rp-address 99.99.99.99 group-list 224.0.0.0/4
ip pim ssm range 232.0.0.0/8

interface loopback99
 ip address 99.99.99.99/32
 ip router ospf 65017 area 0.0.0.0
 ip pim sparse-mode

interface Ethernet2/1
 ip pim sparse-mode

interface Ethernet2/2
 ip pim sparse-mode
```

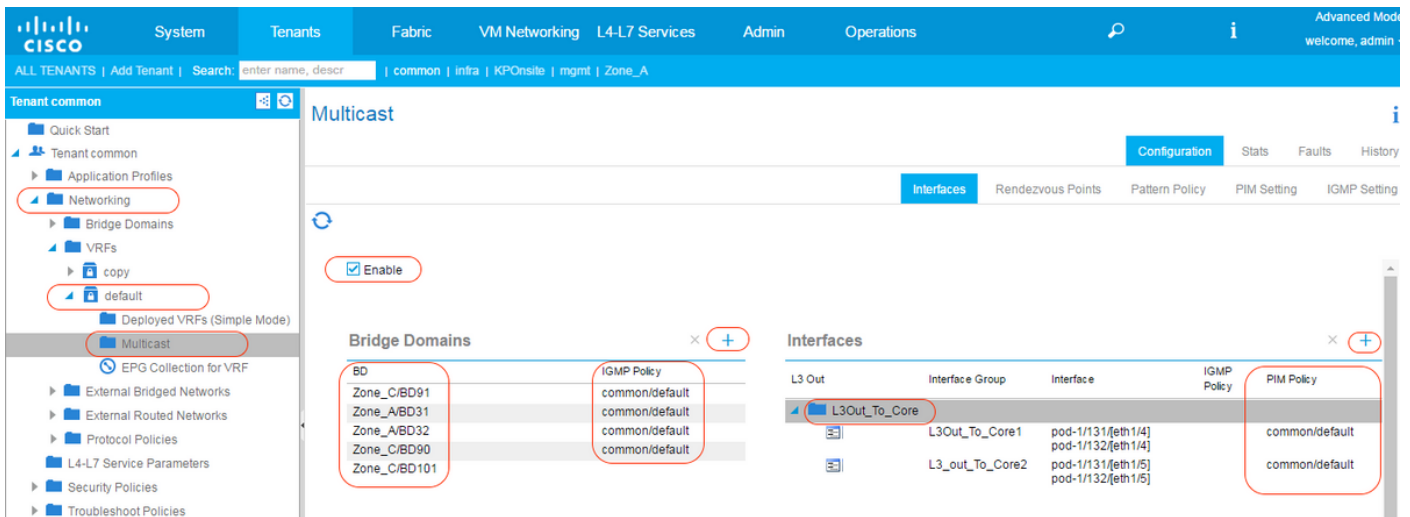
Paso 1: Habilitar multidifusión en el VRF. En el espacio del arrendatario, navegue hasta Redes > VRF > Multicast, en el panel de trabajo, haga clic en la mantequilla para habilitar la multidifusión.



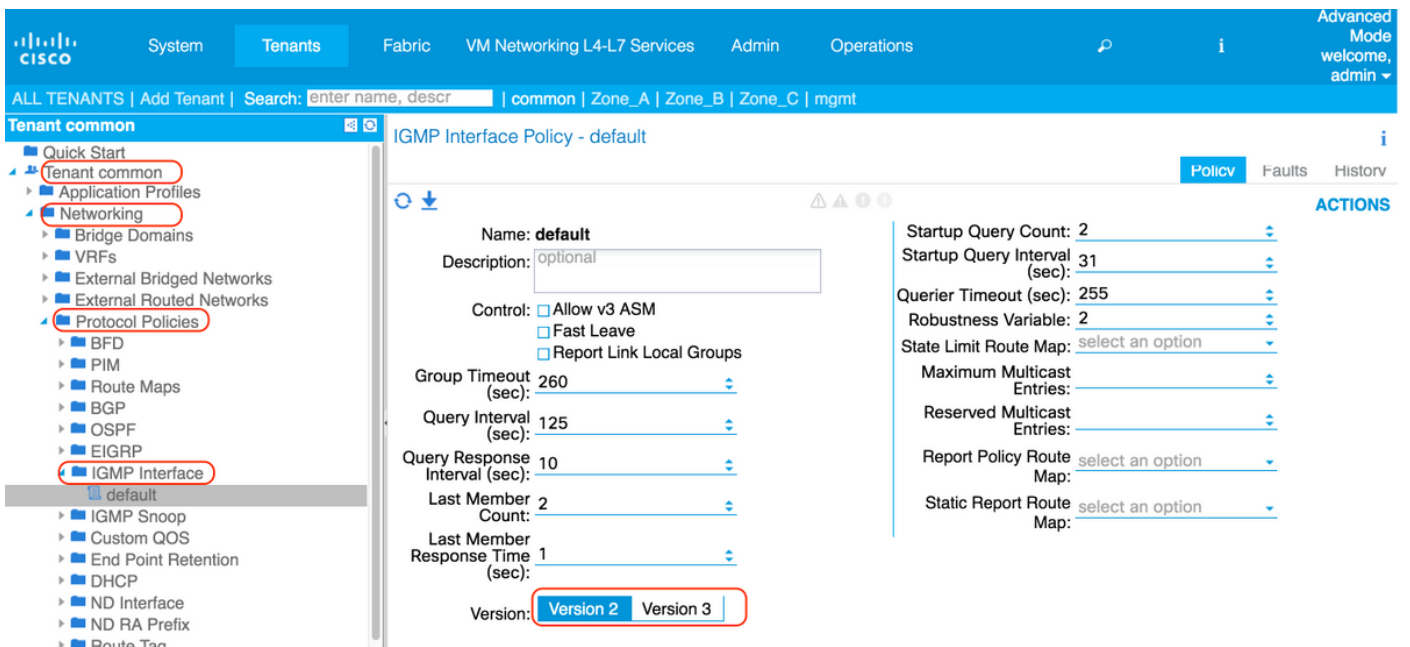
Paso 2: Habilite Multicast en los niveles BD y L3out, habilite IGMP para los BD del receptor. Vaya a Networking > VRFs > VRF name > Multicast, en el panel de trabajo, seleccione Configuration > Interface tab, haga clic en "+" para agregar los Bridge Domains donde se espera tráfico multidifusión. Habilite la política IMGMP para el BD habilitado multicast.

A continuación, haga clic en "+" para agregar L3out para este VRF. Cuando se habilita multicast para un L3out, habilitará PIM en todas las interfaces bajo L3out, y todos los bordes de ese L3out se habilitan con el ruteo multicast. Seleccione la política PIM para los grupos de interfaces L3out.

Asumamos que los BD y L3out ya están aprovisionados.



La asociación de la política IGMP a los BD también lo convierte en un consultor IGMP. La política IGMP se configura en Arrendatario > Redes > Políticas de protocolo > Interfaz IGMP. La política IGMP predeterminada tiene los siguientes parámetros donde puede definir intervalos de consulta. Si no se especifica ninguna política, la interfaz utilizará la política predeterminada.



La política PIM también se configura en Arrendatario > Redes > Políticas de protocolo > PIM.

La política PIM predeterminada tiene los siguientes parámetros donde puede definir intervalos hello.

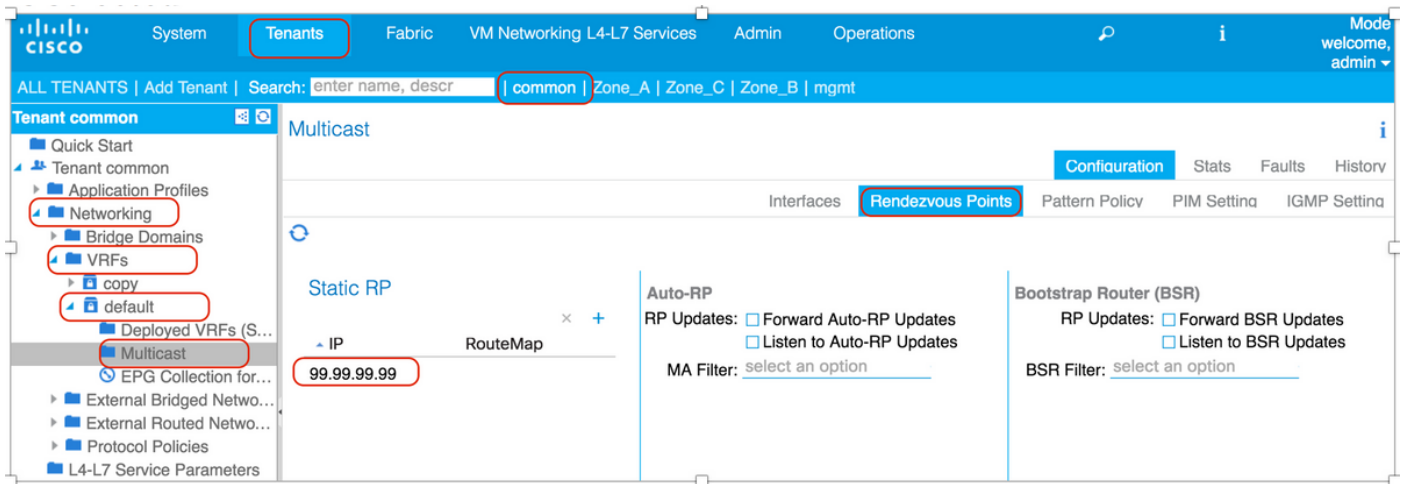
The screenshot shows the 'Edit Interface Policy' configuration page in the Cisco SD-WAN GUI. The left sidebar shows a tree view with 'Networking' and 'PIM Policies' expanded. The main panel shows the configuration for a policy named 'default'. The 'Hello Interval (milliseconds)' is set to 30000. Other settings include 'Auth Type: MD5 HMAC authentication', 'Control State: Multicast Domain Boundary', and 'Designated Router Delay: 3 seconds'.

Los L3Outs en la hoja de borde se deben configurar con las direcciones de loopback habilitadas en el perfil de nodo.

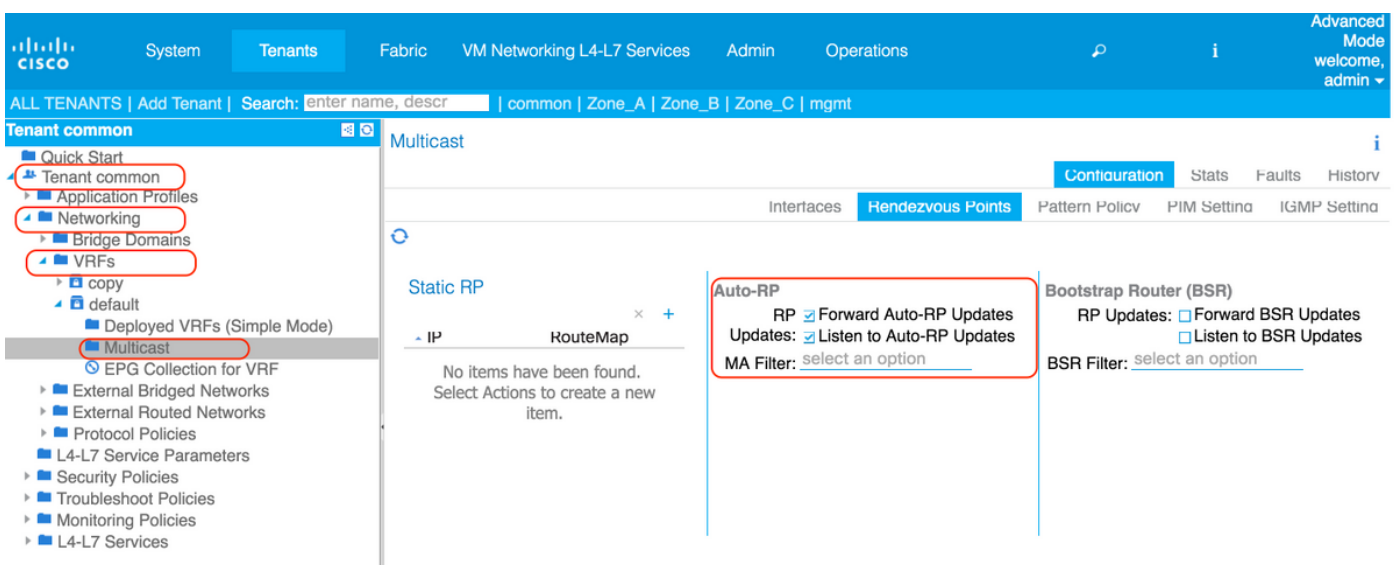
The screenshot shows the 'Logical Node Profile - L3Out_To_Core_NP' configuration page. The left sidebar shows 'External Routed Networks' and 'L3Out_To_Core' expanded. The main panel shows a table of nodes with their Router IDs and Loopback Addresses.

Node ID	Router ID	Static Routes	Loopback Address
topology/pod-1/node-131	131.131.131.1		131.131.131.1
topology/pod-1/node-132	132.132.132.1		132.132.132.1

Paso 3: Configure RP para PIM ASM. Vaya a Arrendatario > VRF > Multicast, en el panel de trabajo seleccione Configuration > Rendezvous Points. En este ejemplo, se selecciona el RP estático. Haga clic en "+" para agregar el RP.



Para la configuración Auto-RP, active las casillas "Reenviar actualizaciones Auto-RP" y "Escuchar actualizaciones Auto-RP" en la página "Puntos de Encuentro".



Fuera del fabric de ACI, las configuraciones AUTO-RP en las plataformas NX-OS siguen siendo las mismas.

!!! On RP candidate

```
ip pim send-rp-announce loopback99 group-list 224.0.0.0/4
ip pim send-rp-discovery loopback99 scope 32
```

!!! On RP listeners:

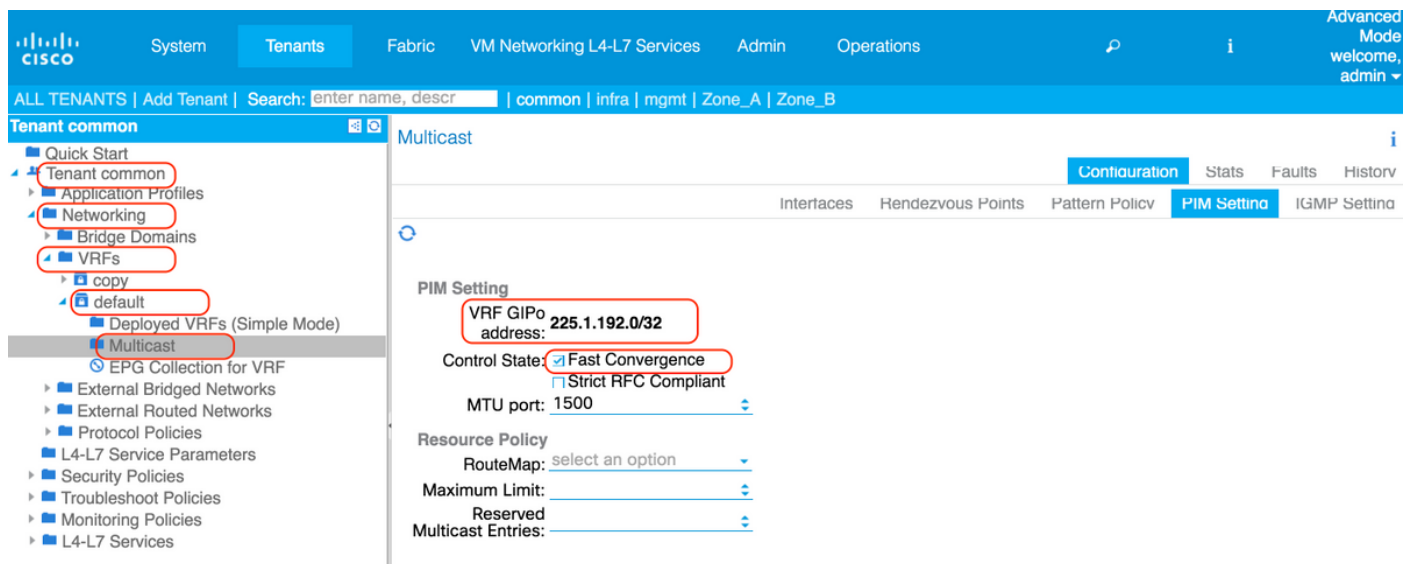
```
ip pim auto-rp listen forward
```

Paso 4: Configure los ajustes PIM necesarios. Navegue hasta Arrendatario >VRF -> Multidifusión, en el panel de trabajo, seleccione Configuración > Configuración de PIM, observe la dirección VRF GIPo 225.1.192.0/32 que es asignada por APIC desde el grupo de direcciones de grupo multicast. El VRF GIPo se utilizará como la dirección IP del grupo externo para el tráfico multicast para los BD habilitados con PIM.

Cuando se habilita el modo **Convergencia rápida** (el valor predeterminado es inhabilitado), todas las hojas de borde habilitadas con PIM enviarán uniones hacia la red externa, pero sólo una hoja de borde reenviará el tráfico al fabric para evitar duplicados. La hoja de borde que reenvía el tráfico para el grupo es el **reenviador designado** para el grupo. La habilitación de la convergencia

rápida ayuda a reducir la duración de la caída de paquetes para los flujos de multidifusión con orígenes externos y receptores internos, cuando hay un cambio de ganador de franjas debido a que la hoja de borde está inactiva. No se produce latencia al unirse al árbol PIM desde el nuevo ganador de la banda. Esto se produce a costa del uso adicional del ancho de banda en los links externos de los ganadores no estriados, ya que todas las hojas de la frontera arrastran el tráfico de la fuente externa.

Acerca de los ganadores de la banda - Actualmente ACI utiliza un hash BSR (Bootstrap Router) para calcular el ganador de la banda BL. El hash se calcula usando la IP de bucle invertido y S,G de la hoja. A partir de ACI 3.0(1) no hay forma de influir en la elección del ganador de la banda para el usuario.



Paso 5: Crear el contrato necesario para permitir el tráfico multidifusión:

- Origen y receptor dentro del fabric (no se necesita contrato)
- Receptor dentro del fabric, fuente externa (no se necesita el contrato)
- Fuente dentro del fabric, receptor externo (se requiere contrato)*

*El contrato no es obligatorio si el BD se implementa en la hoja de frontera

En nuestro caso, tenemos receptores fuera del fabric, aplicamos el contrato entre L3out_to_Core y el origen mcast en EPG101.

The screenshot shows the Cisco ISE configuration interface. The top navigation bar includes 'System', 'Tenants', 'Fabric', 'VM Networking', 'L4-L7 Services', 'Admin', and 'Operations'. The 'Tenants' tab is active, and the 'common' tenant is selected. The left sidebar shows the configuration tree with 'Security Policies' and 'Contracts' expanded, and 'shared_l3out' selected. The main area shows a topology diagram with nodes for 'L3Out_To...', 'EPG101(App...)', and 'Contract shared_l3out'.

Verificación

Verificación PIM

Cuando se habilita el VRF para el ruteo de multidifusión, se crea una interfaz de fabric (túnel) para el ruteo de multidifusión dentro del fabric. Los paquetes del plano de control PIM se envían a través de las interfaces de fabric dentro del fabric. El destino del túnel será la dirección multicast VRF GiPo. En los switches de hoja de borde, el origen del túnel será la interfaz de loopback en la hoja de borde. En los switches de hoja no fronterizos, el origen del túnel será una dirección de loopback (127.0.0.100).

Las hojas de borde envían hellos PIM en la interfaz de fabric. Las interfaces L3Oout ejecutan PIM en el modo normal incluyendo el envío y recepción de hellos, la selección de DR, etc. Las hojas que no son de borde se ejecutan en modo pasivo en la interfaz de entramado; escuchan los hellos PIM desde la frontera sale pero no envían hellos PIM. Las hojas que no sean de borde no aparecerán en la salida para "show ip pim neighbor".

!!!!!! **Border Leaf Node bleaf1** !!!!!

```
bleaf1# show ip pim neighbor
```

```
PIM Neighbor information for Dom:common:default
```

Neighbor	Interface	Uptime	Expires	DRPriority
Bidir	BFDState			
132.132.132.1/32	tunnel16	06:20:40	00:01:21	1
no	n/a			
10.1.20.25/32	eth1/5	06:23:12	00:01:35	1
yes	n/a			
10.1.20.1/32	eth1/4	06:23:12	00:01:24	1
yes	n/a			

```
bleaf1# show interface tunnel 16
```

```
Tunnel16 is up
  MTU 9000 bytes, BW 0 Kbit
```



```
Transport protocol is in VRF "common:default"
Tunnel protocol/transport is ipvlan
Tunnel source 131.131.131.1
Tunnel destination 225.1.192.0/32
Last clearing of "show interface" counters never
Tx
0 packets output, 1 minute output rate 0 packets/sec
Rx
0 packets input, 1 minute input rate 0 packets/sec
```

bleaf1#

!!!! Border Leaf Node bleaf2 !!!!

bleaf2# show ip pim neighbor

```
PIM Neighbor information for Dom:common:default
Neighbor      Interface      Uptime          Expires          DRPriority
Bidir         BFDState
131.131.131.1/32  tunnel16      06:23:26       00:01:30       1
no            n/a
10.1.20.29/32    eth1/5        06:38:26       00:01:43       1
yes           n/a
10.1.20.5/32     eth1/4        06:38:27       00:01:20       1
yes           n/a
```

bleaf2# show interface tunnel 16

```
Tunnel16 is up
  MTU 9000 bytes, BW 0 Kbit
  Transport protocol is in VRF "common:default"
  Tunnel protocol/transport is ipvlan
  Tunnel source 132.132.132.1
  Tunnel destination 225.1.192.0/32
Last clearing of "show interface" counters never
Tx
0 packets output, 1 minute output rate 0 packets/sec
Rx
0 packets input, 1 minute input rate 0 packets/sec
```

bleaf2#

!!!! RP !!!!

bleaf1# show ip pim rp vrf all

```
PIM RP Status Information for VRF:"common:default"
BSR: Not Operational
Auto-RP RPA: 192.168.1.2/32
RP: 99.99.99.99, uptime: 26d21h, expires: 00:02:38,
  priority: 0, RP-source: 192.168.1.2 (A), group-map: None, group ranges:
  224.0.0.0/4
```

bleaf1#

bleaf2# show ip pim rp vrf all

```
PIM RP Status Information for VRF:"common:default"
BSR: Not Operational
Auto-RP RPA: 192.168.1.2/32
RP: 99.99.99.99, uptime: 26d21h, expires: 00:02:38,
  priority: 0, RP-source: 192.168.1.2 (A), group-map: None, group ranges:
  224.0.0.0/4
```

bleaf2#

!!!! Non border leaf Node !!!!

cleaf1# show ip pim neighbor

```
PIM Neighbor information for Dom:common:default
Neighbor          Interface          Uptime              Expires             DRPriority
Bidir             BFDState
132.132.132.1/32  tunnel16          06:32:43           00:01:37           1
no                n/a
131.131.131.1/32  tunnel16          06:32:43           00:01:17           1
no                n/a
```

cleaf1# show interface tunnel 16

```
Tunnel16 is up
  MTU 9000 bytes, BW 0 Kbit
  Transport protocol is in VRF "common:default"
  Tunnel protocol/transport is ipvlan
  Tunnel source 127.0.0.100/32
  Tunnel destination 225.1.192.0/32
  Last clearing of "show interface" counters never
  Tx
  0 packets output, 1 minute output rate 0 packets/sec
  Rx
  0 packets input, 1 minute input rate 0 packets/sec
```

cleaf1#

cleaf2# show ip pim neighbor vrf all

```
PIM Neighbor information for Dom:common:default
Neighbor          Interface          Uptime              Expires             DRPriority
Bidir             BFDState
132.132.132.1/32  tunnel16          06:33:17           00:01:33           1
no                n/a
131.131.131.1/32  tunnel16          06:33:17           00:01:41           1
no                n/a
```

cleaf2# show interface tunnel 16 Tunnel16 is up MTU 9000 bytes, BW 0 Kbit Transport protocol is in VRF "common:default" Tunnel protocol/transport is ipvlan **Tunnel source 127.0.0.100/32**

```
Tunnel destination 225.1.192.0/32
  Last clearing of "show interface" counters never
  Tx
  0 packets output, 1 minute output rate 0 packets/sec
  Rx
  0 packets input, 1 minute input rate 0 packets/sec
```

cleaf2#

!!!!!! Core Router !!!!!

N7K-core-1# show ip pim neighbor

PIM Neighbor Status for VRF "default"

```
Neighbor          Interface          Uptime              Expires             DR      Bidir-  BFD
                  Priority Capable State
10.1.20.2          Ethernet1/1        3d22h              00:01:43           1       no      n/a
10.1.20.6          Ethernet1/2        3d22h              00:01:36           1       no      n/a
10.1.20.10         Ethernet1/3        2w6d               00:01:30           1       yes     n/a
10.1.20.14         Ethernet1/4        2w6d               00:01:18           1       yes     n/a
10.1.20.42         Ethernet1/5        2w6d               00:01:28           1       yes     n/a
```

N7K-core-1#

N7K-core-2# sh ip pim neighbor

PIM Neighbor Status for VRF "default"

```
Neighbor          Interface          Uptime              Expires             DR      Bidir-  BFD
                  Priority Capable State
10.1.20.26         Ethernet1/1        3d22h              00:01:23           1       no      n/a
10.1.20.30         Ethernet1/2        3d22h              00:01:17           1       no      n/a
```

```

10.1.20.18    Ethernet1/3    2w6d    00:01:38    1    yes    n/a
10.1.20.22    Ethernet1/4    2w6d    00:01:41    1    yes    n/a
10.1.20.46    Ethernet1/5    2w6d    00:01:17    1    yes    n/a
N7K-core-2#

```

Verificación de la hoja de borde activa

Si hay más de una hoja de borde habilitada con ruteo multicast, APIC elige una franja ganadora para cada dirección de grupo a través de todas las hojas de borde activas. La hoja de borde que es el ganador de la banda para un grupo es responsable de enviar las uniones PIM en nombre del fabric y reenviar el tráfico multicast al fabric.

El ganador de la banda del grupo decide sobre el Reenvío designado. Si el ganador de la franja tiene disponibilidad para la raíz, entonces el ganador de la franja también es el DF. Si el ganador de la banda no tiene conectividad externa con la raíz, entonces BL elige un DF enviando una unión PIM a través de la interfaz de fabric.

```

!!!! Enter into vsh mode to execute the command !!!!!
bleaf2# vsh
Cisco iNX-OS Debug Shell
This shell should only be used for internal commands and exists
for legacy reasons. User should use ibash infrastructure as this
will be deprecated.
bleaf2# show ip pim internal stripe-winner 228.0.0.1 vrf common:default
PIM Stripe Winner info for VRF "common:default" (BL count: 2)
(*, 228.0.0.1)
BLs: 132.132.132.1 hash: 2081913316 (local)
     131.131.131.1 hash: 1024236260
Winner: 132.132.132.1 best_hash: 2081913316
bleaf2#
bleaf2#
bleaf2# show ip pim internal stripe-winner 229.0.0.1 vrf common:default
PIM Stripe Winner info for VRF "common:default" (BL count: 2)
(*, 229.0.0.1)
BLs: 132.132.132.1 hash: 1595374052 (local)
     131.131.131.1 hash: 2047646436
Winner: 131.131.131.1 best_hash: 2047646436
bleaf2#

```

Verificación de convergencia rápida

```

!!! Verify if fast convergence is enabled
bleaf1# show fabric multicast vrf common:default
Fabric Multicast Enabled VRFs
VRF Name          VRF      Vprime      VN-Seg      VRF      Conv      Tunnel
                  ID        If           ID           Role     Mode      IP
common:default    4        Tunnel16    2162688     BL       Fast      131.131.131.1
bleaf1#

```

!!! None-border leaf

```

cleaf1# show fabric multicast vrf common:default
Fabric Multicast Enabled VRFs
VRF Name          VRF      Vprime      VN-Seg      VRF      Conv      Tunnel
                  ID        If           ID           Role     Mode      IP
common:default    4        Tunnel16    2162688     Leaf    Fast      127.0.0.100
cleaf1#

```

Verificación IGMP

!!!! Bleaf2 receiving IGMP membership join !!!!

bleaf2# show ip igmp groups vrf common:default

Type: S - Static, D - Dynamic, L - Local, T - SSM Translated

Displaying Groups for vrf:common:default

Group Address	Type	Interface	Uptime	Expires	Last Reporter
228.0.0.1	D	vlan25	25d23h	00:02:20	10.90.90.71
229.0.0.1	D	vlan25	25d23h	00:02:24	10.90.90.71
228.0.0.2	D	vlan25	25d23h	00:02:27	10.90.90.72
229.0.0.2	D	vlan25	25d23h	00:02:20	10.90.90.72
228.0.0.3	D	vlan25	25d23h	00:02:25	10.90.90.73
229.0.0.3	D	vlan25	25d23h	00:02:25	10.90.90.73
228.0.0.4	D	vlan25	25d23h	00:02:26	10.90.90.74
229.0.0.4	D	vlan25	25d23h	00:02:25	10.90.90.74
228.0.0.5	D	vlan25	25d23h	00:02:28	10.90.90.75
229.0.0.5	D	vlan25	25d23h	00:02:20	10.90.90.75
228.0.0.6	D	vlan25	25d23h	00:02:22	10.90.90.76
229.0.0.6	D	vlan25	25d23h	00:02:26	10.90.90.76
228.0.0.7	D	vlan25	25d23h	00:02:25	10.90.90.77
229.0.0.7	D	vlan25	25d23h	00:02:19	10.90.90.77
228.0.0.8	D	vlan25	25d23h	00:02:22	10.90.90.78
229.0.0.8	D	vlan25	25d23h	00:02:25	10.90.90.78
228.0.0.9	D	vlan25	25d23h	00:02:27	10.90.90.79
229.0.0.9	D	vlan25	25d23h	00:02:20	10.90.90.79
228.0.0.10	D	vlan25	25d23h	00:02:20	10.90.90.80
229.0.0.10	D	vlan25	25d23h	00:02:21	10.90.90.80

bleaf2#

bleaf2# show ip igmp snooping groups vlan 25

Type: S - Static, D - Dynamic, R - Router port, F - Fabricpath core port

Vlan	Group Address	Ver	Type	Port list
25	*/*	-	R	Vlan25
25	228.0.0.1	v2	D	Eth1/47
25	228.0.0.2	v2	D	Eth1/47
25	228.0.0.3	v2	D	Eth1/47
25	228.0.0.4	v2	D	Eth1/47
25	228.0.0.5	v2	D	Eth1/47
25	228.0.0.6	v2	D	Eth1/47
25	228.0.0.7	v2	D	Eth1/47
25	228.0.0.8	v2	D	Eth1/47
25	228.0.0.9	v2	D	Eth1/47
25	228.0.0.10	v2	D	Eth1/47
25	229.0.0.1	v2	D	Eth1/47
25	229.0.0.2	v2	D	Eth1/47
25	229.0.0.3	v2	D	Eth1/47
25	229.0.0.4	v2	D	Eth1/47
25	229.0.0.5	v2	D	Eth1/47
25	229.0.0.6	v2	D	Eth1/47
25	229.0.0.7	v2	D	Eth1/47
25	229.0.0.8	v2	D	Eth1/47
25	229.0.0.9	v2	D	Eth1/47
25	229.0.0.10	v2	D	Eth1/47

bleaf2#

!!!! cleaf2 receivng IGMP membership join !!!!

cleaf2# show ip igmp groups vrf common:default

Type: S - Static, D - Dynamic, L - Local, T - SSM Translated

Displaying Groups for vrf:common:default

Group Address	Type	Interface	Uptime	Expires	Last Reporter
---------------	------	-----------	--------	---------	---------------

```

228.0.0.1      D      vlan9      25d23h      00:03:37      10.32.32.120
228.0.0.1      D      vlan30     25d23h      00:04:17      10.91.91.71
228.0.0.1      D      vlan3      11d23h      00:03:18      10.31.31.123
229.0.0.1      D      vlan9      25d23h      00:03:41      10.32.32.121
229.0.0.1      D      vlan30     25d23h      00:02:22      10.91.91.71
229.0.0.1      D      vlan3      11d23h      00:03:16      10.31.31.120
228.0.0.2      D      vlan9      25d23h      00:03:38      10.32.32.123
228.0.0.2      D      vlan30     25d23h      00:02:15      10.91.91.72
228.0.0.2      D      vlan3      11d23h      00:03:16      10.31.31.122
229.0.0.2      D      vlan9      25d23h      00:03:37      10.32.32.123
229.0.0.2      D      vlan30     25d23h      00:02:16      10.91.91.72
229.0.0.2      D      vlan3      11d23h      00:03:16      10.31.31.124
228.0.0.3      D      vlan9      25d23h      00:03:41      10.32.32.120
228.0.0.3      D      vlan30     25d23h      00:04:18      10.91.91.73
228.0.0.3      D      vlan3      11d23h      00:03:18      10.31.31.120
229.0.0.3      D      vlan9      25d23h      00:03:38      10.32.32.121
229.0.0.3      D      vlan30     25d23h      00:04:17      10.91.91.73
229.0.0.3      D      vlan3      11d23h      00:03:18      10.31.31.122
<.....>

```

cleaf2#

cleaf2# show ip igmp snooping vlan 3

IGMP Snooping information for vlan 3

IGMP snooping enabled

Lookup mode: IP

Optimised Multicast Flood (OMF) enabled

IGMP querier present, address: 10.31.31.1, version: 2, i/f Vlan3

Switch-querier disabled

IGMPv3 Explicit tracking enabled

IGMPv2 Fast leave disabled

IGMPv1/v2 Report suppression enabled

IGMPv3 Report suppression enabled

Link Local Groups suppression enabled

Router port detection using PIM Hellos, IGMP Queries

Number of router-ports: 1

Number of groups: 20

VLAN vPC function enabled

Active ports:

Eth1/2	Eth1/3	Po3	Po4
--------	--------	-----	-----

cleaf2# show ip igmp snooping groups vlan 3

Type: S - Static, D - Dynamic, R - Router port, F - Fabricpath core port

Vlan	Group Address	Ver	Type	Port list
3	*/*	-	R	Vlan3
3	228.0.0.1	v2	D	Po4
3	228.0.0.2	v2	D	Po4
3	228.0.0.3	v2	D	Po4
3	228.0.0.4	v2	D	Po4
3	228.0.0.5	v2	D	Po4
3	228.0.0.6	v2	D	Po4
3	228.0.0.7	v2	D	Po4
3	228.0.0.8	v2	D	Po4
3	228.0.0.9	v2	D	Po4
3	228.0.0.10	v2	D	Po4
3	229.0.0.1	v2	D	Po4
3	229.0.0.2	v2	D	Po4
3	229.0.0.3	v2	D	Po4
3	229.0.0.4	v2	D	Po4
3	229.0.0.5	v2	D	Po4
3	229.0.0.6	v2	D	Po4
3	229.0.0.7	v2	D	Po4
3	229.0.0.8	v2	D	Po4
3	229.0.0.9	v2	D	Po4
3	229.0.0.10	v2	D	Po4

```
cleaf2#
```

Verificación MRIB

El nodo de hoja sleaf2 que es el FHR tiene directamente conectados orígenes multicast. Su vecino RPF es 10.0.176.64 en la columna 1. La interfaz entrante es la interfaz de fabric (tunnel16) que se peering con la hoja de borde a través de PIM.

Por simplicidad, el resultado que se muestra es para una dirección IP de multidifusión de cada rango de grupo: 228.0.0.1 para fuentes internas y 229.0.0.1 para fuentes externas.

```
!!!! FHR of mcast sources in fabric
sleaf2# show ip mroute vrf common:default
IP Multicast Routing Table for VRF "common:default"

(10.101.101.115/32, 228.0.0.1/32), uptime: 00:17:54, ip pim
  Incoming interface: Tunnel16, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 0)

(10.101.101.116/32, 228.0.0.1/32), uptime: 00:17:54, ip pim
  Incoming interface: Tunnel16, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 0)

(10.101.101.117/32, 228.0.0.1/32), uptime: 00:17:54, ip pim
  Incoming interface: Tunnel16, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 0)

(.....)

(*, 232.0.0.0/8), uptime: 4d00h, pim ip
  Incoming interface: Null, RPF nbr: 0.0.0.0
  Outgoing interface list: (count: 0)

sleaf2# show ip pim neighbor vrf common:default

PIM Neighbor information for Dom:common:default
Neighbor      Interface      Uptime          Expires          DRPriority
Bidir        BFDState
131.131.131.1/32  tunnel16      04:01:06        00:01:23        1
no           n/a
132.132.132.1/32  tunnel16      04:01:06        00:01:32        1
no           n/a
sleaf2#

sleaf2# show interface tunnel 16
Tunnel16 is up
  MTU 9000 bytes, BW 0 Kbit
  Transport protocol is in VRF "common:default"
  Tunnel protocol/transport is ipvlan
  Tunnel source 127.0.0.100/32
  Tunnel destination 225.1.192.0/32
  Last clearing of "show interface" counters never
  Tx
  0 packets output, 1 minute output rate 0 packets/sec
  Rx
  0 packets input, 1 minute input rate 0 packets/sec

sleaf2#
```

Los receptores para 228.0.0.1 están conectados a bleaf2 (nodo 132), cleaf1 (nodo 101) y cleaf2

(nodo 102). Bleaf2 reenvía el mcast al grupo 228.0.0.1 a los receptores internos a través del túnel 16, y a los receptores externos a través de L3out a los dispositivos centrales.

!!!!!! Bleaf2 !!!!!

```
bleaf2# show ip mroute 228.0.0.1 vrf common:default
IP Multicast Routing Table for VRF "common:default"
```

```
(* , 228.0.0.1/32), uptime: 3w5d, ngmvpn ip pim igmp
  Incoming interface: Ethernet1/4, RPF nbr: 10.1.20.5
  Outgoing interface list: (count: 2) (Fabric OIF)
    Vlan25, uptime: 3w5d, igmp
    Tunnel16, uptime: 3w5d, ngmvpn
```

```
(10.101.101.115/32, 228.0.0.1/32), uptime: 3w5d, pim mrrib ip ngmvpn
  Incoming interface: Tunnel16, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 2) (Fabric OIF)
    Vlan25, uptime: 3w5d, mrrib
    Tunnel16, uptime: 3w5d, mrrib, ngmvpn, (RPF)
```

```
(10.101.101.116/32, 228.0.0.1/32), uptime: 3w5d, ip mrrib pim ngmvpn
  Incoming interface: Tunnel16, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 3) (Fabric OIF)
    Ethernet1/5, uptime: 00:04:36, pim
    Vlan25, uptime: 3w5d, mrrib
    Tunnel16, uptime: 3w5d, mrrib, ngmvpn, (RPF)
```

```
(10.101.101.117/32, 228.0.0.1/32), uptime: 3w5d, pim mrrib ip ngmvpn
  Incoming interface: Tunnel16, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 2) (Fabric OIF)
    Vlan25, uptime: 3w5d, mrrib
    Tunnel16, uptime: 3w5d, mrrib, ngmvpn, (RPF)
```

```
(10.101.101.118/32, 228.0.0.1/32), uptime: 3w5d, ip mrrib pim ngmvpn
  Incoming interface: Tunnel16, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 3) (Fabric OIF)
    Ethernet1/5, uptime: 00:04:36, pim
    Vlan25, uptime: 3w5d, mrrib
    Tunnel16, uptime: 3w5d, mrrib, ngmvpn, (RPF)
```

```
(10.101.101.119/32, 228.0.0.1/32), uptime: 3w5d, pim mrrib ip ngmvpn
  Incoming interface: Tunnel16, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 2) (Fabric OIF)
    Vlan25, uptime: 3w5d, mrrib
    Tunnel16, uptime: 3w5d, mrrib, ngmvpn, (RPF)
```

```
(10.101.101.120/32, 228.0.0.1/32), uptime: 3w5d, mrrib ip pim ngmvpn
  Incoming interface: Tunnel16, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 2) (Fabric OIF)
    Vlan25, uptime: 3w5d, mrrib
    Tunnel16, uptime: 3w5d, mrrib, ngmvpn, (RPF)
```

```
(10.101.101.121/32, 228.0.0.1/32), uptime: 3w5d, mrrib ip pim ngmvpn
  Incoming interface: Tunnel16, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 2) (Fabric OIF)
    Vlan25, uptime: 3w5d, mrrib
    Tunnel16, uptime: 3w5d, mrrib, ngmvpn, (RPF)
```

```
(10.101.101.122/32, 228.0.0.1/32), uptime: 3w5d, pim mrrib ip ngmvpn
  Incoming interface: Tunnel16, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 2) (Fabric OIF)
    Vlan25, uptime: 3w5d, mrrib
    Tunnel16, uptime: 3w5d, mrrib, ngmvpn, (RPF)
```



```
(10.101.101.123/32, 228.0.0.1/32), uptime: 3w5d, ip mrib pim ngmvpn
Incoming interface: Tunnel16, RPF nbr: 10.0.176.64 (pervasive)
Outgoing interface list: (count: 3) (Fabric OIF)
Ethernet1/5, uptime: 00:04:36, pim
Vlan25, uptime: 3w5d, mrib
Tunnel16, uptime: 3w5d, mrib, ngmvpn, (RPF)
```

```
(10.101.101.124/32, 228.0.0.1/32), uptime: 3w5d, ip mrib pim ngmvpn
Incoming interface: Tunnel16, RPF nbr: 10.0.176.64 (pervasive)
Outgoing interface list: (count: 3) (Fabric OIF)
Ethernet1/5, uptime: 1d00h, pim
Vlan25, uptime: 3w5d, mrib
Tunnel16, uptime: 3w5d, mrib, ngmvpn, (RPF)
```

bleaf2#

bleaf2# show interface vlan25

```
Vlan25 is up, line protocol is up
Hardware EtherSVI, address is 0000.0c07.ac5a
Internet Address is 10.90.90.1/24
MTU 9000 bytes, BW 10000000 Kbit, DLY 1 usec
reliability 255/255, txload 1/255, rxload 1/255
Carrier delay is 10 sec
Encapsulation ARPA, loopback not set
Keepalive not supported
ARP type: ARPA
Last clearing of "show interface" counters never
30 seconds input rate 0 bits/sec, 0 packets/sec
30 seconds output rate 0 bits/sec, 0 packets/sec
Load-Interval #2: 5 minute (300 seconds)
input rate 0 bps, 0 pps; output rate 0 bps, 0 pps
L3 Switched:
input: 0 pkts, 0 bytes - output: 0 pkts, 0 bytes
L3 in Switched:
ucast: 0 pkts, 0 bytes - mcast: 0 pkts, 0 bytes
L3 out Switched:
ucast: 0 pkts, 0 bytes - mcast: 0 pkts, 0 bytes
```

bleaf2#

Bleaf1 reenvía el grupo de 228.0.0.1 al exterior a través de la interfaz L3out, pero no reenvía al fabric a través de las interfaces de fabric porque no es el ganador de la banda para 228.0.0.1

!!!!! Bleaf1 !!!!!

!!!!!

```
bleaf1# show ip mroute 228.0.0.1 vrf common:default
IP Multicast Routing Table for VRF "common:default"
```

```
(10.101.101.115/32, 228.0.0.1/32), uptime: 3w4d, mrib ip pim
Incoming interface: Tunnel14, RPF nbr: 10.0.176.64 (pervasive)
Outgoing interface list: (count: 1)
Ethernet1/5, uptime: 1d01h, pim
```

```
(10.101.101.116/32, 228.0.0.1/32), uptime: 3w5d, pim mrib ip
Incoming interface: Tunnel14, RPF nbr: 10.0.176.64 (pervasive)
Outgoing interface list: (count: 1)
Ethernet1/4, uptime: 1d01h, pim
```

```
(10.101.101.117/32, 228.0.0.1/32), uptime: 3w5d, pim mrib ip
Incoming interface: Tunnel14, RPF nbr: 10.0.176.64 (pervasive)
Outgoing interface list: (count: 1)
```

```

Ethernet1/5, uptime: 1d01h, pim
(10.101.101.118/32, 228.0.0.1/32), uptime: 3w5d, mrib ip pim
  Incoming interface: Tunnel14, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 1)
    Ethernet1/4, uptime: 1d01h, pim
(10.101.101.119/32, 228.0.0.1/32), uptime: 3w5d, mrib ip pim
  Incoming interface: Tunnel14, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 1)
    Ethernet1/5, uptime: 1d01h, pim
(10.101.101.120/32, 228.0.0.1/32), uptime: 3w5d, pim mrib ip
  Incoming interface: Tunnel14, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 1)
    Ethernet1/4, uptime: 1d01h, pim
(10.101.101.121/32, 228.0.0.1/32), uptime: 3w5d, pim mrib ip
  Incoming interface: Tunnel14, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 1)
    Ethernet1/4, uptime: 1d01h, pim
(10.101.101.122/32, 228.0.0.1/32), uptime: 1d01h, ip mrib pim
  Incoming interface: Tunnel14, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 1)
    Ethernet1/5, uptime: 1d01h, pim
(10.101.101.123/32, 228.0.0.1/32), uptime: 3w5d, pim mrib ip
  Incoming interface: Tunnel14, RPF nbr: 10.0.176.64 (pervasive)
  Outgoing interface list: (count: 1)
    Ethernet1/4, uptime: 1d01h, pim

```

bleaf1#

Bleaf1 es el ganador activo de hoja/tira de borde para el grupo 229.0.0.1. bleaf1 recibe el multicast al grupo 229.0.0.1 a través del dispositivo de núcleo externo y luego se reenvía a los receptores internos en BD90, BD91, BD31, BD32. (observe que el ID de vlan sólo es interno al nodo de hoja como el GW omnipresente).

!!!!! bleaf1 !!!!!

```

bleaf1# show ip mroute 229.0.0.1 vrf common:default IP Multicast Routing Table for VRF
"common:default" (*, 229.0.0.1/32), uptime: 3w5d, ngmvpn ip pim Incoming interface: Ethernet1/5,
RPF nbr: 10.1.20.25 Outgoing interface list: (count: 1) (Fabric OIF) Tunnel14, uptime: 3w5d,
ngmvpn (10.103.103.40/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface:
Ethernet1/5, RPF nbr: 10.1.20.25 Outgoing interface list: (count: 1) Tunnel14, uptime: 1d01h,
mrib (10.103.103.41/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface:
Ethernet1/4, RPF nbr: 10.1.20.1 Outgoing interface list: (count: 1) Tunnel14, uptime: 1d01h,
mrib (10.103.103.42/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface:
Ethernet1/5, RPF nbr: 10.1.20.25 Outgoing interface list: (count: 1) Tunnel14, uptime: 1d01h,
mrib (10.103.103.43/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface:
Ethernet1/5, RPF nbr: 10.1.20.25 Outgoing interface list: (count: 1) Tunnel14, uptime: 1d01h,
mrib (10.103.103.44/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface:
Ethernet1/5, RPF nbr: 10.1.20.25 Outgoing interface list: (count: 1) Tunnel14, uptime: 1d01h,
mrib (10.103.103.45/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface:
Ethernet1/5, RPF nbr: 10.1.20.25 Outgoing interface list: (count: 1) Tunnel14, uptime: 1d01h,
mrib (10.103.103.46/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface:
Ethernet1/5, RPF nbr: 10.1.20.25 Outgoing interface list: (count: 1) Tunnel14, uptime: 1d01h,
mrib (10.103.103.47/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface:
Ethernet1/4, RPF nbr: 10.1.20.1 Outgoing interface list: (count: 1) Tunnel14, uptime: 1d01h,

```

```
mrib (10.103.103.48/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface:
Ethernet1/4, RPF nbr: 10.1.20.1 Outgoing interface list: (count: 1) Tunnel14, uptime: 1d01h,
mrib (10.103.103.49/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface:
Ethernet1/4, RPF nbr: 10.1.20.1 Outgoing interface list: (count: 1) Tunnel14, uptime: 1d01h,
mrib bleaf1#
```

```
!!!! bleaf2 !!!!!
```

```
bleaf2# show ip mroute 229.0.0.1 vrf common:default IP Multicast Routing Table for VRF
"common:default" (*, 229.0.0.1/32), uptime: 3w5d, ip pim igmp Incoming interface: Ethernet1/4,
RPF nbr: 10.1.20.5 Outgoing interface list: (count: 1) Vlan25, uptime: 3w5d, igmp
(10.103.103.40/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface: Ethernet1/4,
RPF nbr: 10.1.20.5 Outgoing interface list: (count: 1) (Fabric Forwarding Loser) Vlan25, uptime:
1d01h, mrib (10.103.103.41/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface:
Ethernet1/4, RPF nbr: 10.1.20.5 Outgoing interface list: (count: 1) (Fabric Forwarding Loser)
Vlan25, uptime: 1d01h, mrib (10.103.103.42/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim
Incoming interface: Ethernet1/5, RPF nbr: 10.1.20.29 Outgoing interface list: (count: 1) (Fabric
Forwarding Loser) Vlan25, uptime: 1d01h, mrib (10.103.103.43/32, 229.0.0.1/32), uptime: 1d01h,
ip mrib pim Incoming interface: Ethernet1/5, RPF nbr: 10.1.20.29 Outgoing interface list:
(count: 1) (Fabric Forwarding Loser) Vlan25, uptime: 1d01h, mrib (10.103.103.44/32,
229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface: Ethernet1/5, RPF nbr: 10.1.20.29
Outgoing interface list: (count: 1) (Fabric Forwarding Loser) Vlan25, uptime: 1d01h, mrib
(10.103.103.45/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface: Ethernet1/4,
RPF nbr: 10.1.20.5 Outgoing interface list: (count: 1) (Fabric Forwarding Loser) Vlan25, uptime:
1d01h, mrib (10.103.103.46/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface:
Ethernet1/5, RPF nbr: 10.1.20.29 Outgoing interface list: (count: 1) (Fabric Forwarding Loser)
Vlan25, uptime: 1d01h, mrib (10.103.103.47/32, 229.0.0.1/32), uptime: 1d01h, ip mrib pim
Incoming interface: Ethernet1/4, RPF nbr: 10.1.20.5 Outgoing interface list: (count: 1) (Fabric
Forwarding Loser) Vlan25, uptime: 1d01h, mrib (10.103.103.48/32, 229.0.0.1/32), uptime: 1d01h,
ip mrib pim Incoming interface: Ethernet1/5, RPF nbr: 10.1.20.29 Outgoing interface list:
(count: 1) (Fabric Forwarding Loser) Vlan25, uptime: 1d01h, mrib (10.103.103.49/32,
229.0.0.1/32), uptime: 1d01h, ip mrib pim Incoming interface: Ethernet1/4, RPF nbr: 10.1.20.5
Outgoing interface list: (count: 1) (Fabric Forwarding Loser) Vlan25, uptime: 1d01h, mrib
bleaf2#
```

La hoja no fronteriza Cleaf1 y Cleaf2 tienen receptores conectados en BD31, BD32, BD91. No se admite la instalación de nodos de hoja no fronterizos (*, G) solamente, (S,G).

```
cleaf1# show ip mroute 228.0.0.1 vrf common:default
IP Multicast Routing Table for VRF "common:default"
```

```
(*, 228.0.0.1/32), uptime: 3w5d, igmp ip pim
Incoming interface: Tunnel14, RPF nbr: 10.0.80.91
Outgoing interface list: (count: 2)
Vlan4, uptime: 1w5d, igmp
Vlan7, uptime: 3w5d, igmp
```

```
cleaf1# show ip mroute 229.0.0.1 vrf common:default
IP Multicast Routing Table for VRF "common:default"
```

```
(*, 229.0.0.1/32), uptime: 3w5d, igmp ip pim
Incoming interface: Tunnel14, RPF nbr: 10.0.80.91
Outgoing interface list: (count: 2)
Vlan4, uptime: 1w5d, igmp
Vlan7, uptime: 3w5d, igmp
```

```
cleaf1#
```

```
cleaf1# show interface vlan 4
Vlan4 is up, line protocol is up
Hardware EtherSVI, address is 0000.0c07.ac1f
Internet Address is 10.31.31.1/24
```

```
MTU 9000 bytes, BW 10000000 Kbit, DLY 1 usec
  reliability 255/255, txload 1/255, rxload 1/255
Carrier delay is 10 sec
Encapsulation ARPA, loopback not set
Keepalive not supported
ARP type: ARPA
Last clearing of "show interface" counters never
30 seconds input rate 0 bits/sec, 0 packets/sec
30 seconds output rate 0 bits/sec, 0 packets/sec
Load-Interval #2: 5 minute (300 seconds)
  input rate 0 bps, 0 pps; output rate 0 bps, 0 pps
L3 Switched:
  input: 0 pkts, 0 bytes - output: 0 pkts, 0 bytes
L3 in Switched:
  ucast: 0 pkts, 0 bytes - mcast: 0 pkts, 0 bytes
L3 out Switched:
  ucast: 0 pkts, 0 bytes - mcast: 0 pkts, 0 bytes
```

```
cleaf1# show interface vlan 7
Vlan7 is up, line protocol is up
Hardware EtherSVI, address is 0000.0c07.ac20
Internet Address is 10.32.32.1/24
MTU 9000 bytes, BW 10000000 Kbit, DLY 1 usec
  reliability 255/255, txload 1/255, rxload 1/255
Carrier delay is 10 sec
Encapsulation ARPA, loopback not set
Keepalive not supported
ARP type: ARPA
Last clearing of "show interface" counters never
30 seconds input rate 0 bits/sec, 0 packets/sec
30 seconds output rate 0 bits/sec, 0 packets/sec
Load-Interval #2: 5 minute (300 seconds)
  input rate 0 bps, 0 pps; output rate 0 bps, 0 pps
L3 Switched:
  input: 0 pkts, 0 bytes - output: 0 pkts, 0 bytes
L3 in Switched:
  ucast: 0 pkts, 0 bytes - mcast: 0 pkts, 0 bytes
L3 out Switched:
  ucast: 0 pkts, 0 bytes - mcast: 0 pkts, 0 bytes
```

```
cleaf1#
```

```
!!!! Non-border leaf node has (*, G) only, (S,G) is not supported.
```

```
cleaf2# show ip mroute 228.0.0.1 vrf common:default
IP Multicast Routing Table for VRF "common:default"
```

```
(*, 228.0.0.1/32), uptime: 3w5d, igmp ip pim
Incoming interface: Tunnel16, RPF nbr: 10.0.80.91
Outgoing interface list: (count: 3)
  Vlan3, uptime: 1w5d, igmp
  Vlan30, uptime: 3w5d, igmp
  Vlan9, uptime: 3w5d, igmp
```

```
cleaf2# show ip mroute 229.0.0.1 vrf common:default
IP Multicast Routing Table for VRF "common:default"
```

```
(*, 229.0.0.1/32), uptime: 3w5d, igmp ip pim
Incoming interface: Tunnel16, RPF nbr: 10.0.80.91
Outgoing interface list: (count: 3)
  Vlan3, uptime: 1w5d, igmp
  Vlan30, uptime: 3w5d, igmp
  Vlan9, uptime: 3w5d, igmp
```

```
cleaf2#
cleaf2# show interface vlan 3
Vlan3 is up, line protocol is up
  Hardware EtherSVI, address is 0000.0c07.ac1f
  Internet Address is 10.31.31.1/24
  MTU 9000 bytes, BW 10000000 Kbit, DLY 1 usec
    reliability 255/255, txload 1/255, rxload 1/255
  Carrier delay is 10 sec
  Encapsulation ARPA, loopback not set
  Keepalive not supported
  ARP type: ARPA
  Last clearing of "show interface" counters never
  30 seconds input rate 0 bits/sec, 0 packets/sec
  30 seconds output rate 0 bits/sec, 0 packets/sec
  Load-Interval #2: 5 minute (300 seconds)
    input rate 0 bps, 0 pps; output rate 0 bps, 0 pps
  L3 Switched:
    input: 0 pkts, 0 bytes - output: 0 pkts, 0 bytes
  L3 in Switched:
    ucast: 0 pkts, 0 bytes - mcast: 0 pkts, 0 bytes
  L3 out Switched:
    ucast: 0 pkts, 0 bytes - mcast: 0 pkts, 0 bytes
```

```
cleaf2# show interface vlan 30
Vlan30 is up, line protocol is up
  Hardware EtherSVI, address is 0000.0c07.ac5b
  Internet Address is 10.91.91.1/24
  MTU 9000 bytes, BW 10000000 Kbit, DLY 1 usec
    reliability 255/255, txload 1/255, rxload 1/255
  Carrier delay is 10 sec
  Encapsulation ARPA, loopback not set
  Keepalive not supported
  ARP type: ARPA
  Last clearing of "show interface" counters never
  30 seconds input rate 0 bits/sec, 0 packets/sec
  30 seconds output rate 0 bits/sec, 0 packets/sec
  Load-Interval #2: 5 minute (300 seconds)
    input rate 0 bps, 0 pps; output rate 0 bps, 0 pps
  L3 Switched:
    input: 0 pkts, 0 bytes - output: 0 pkts, 0 bytes
  L3 in Switched:
    ucast: 0 pkts, 0 bytes - mcast: 0 pkts, 0 bytes
  L3 out Switched:
    ucast: 0 pkts, 0 bytes - mcast: 0 pkts, 0 bytes
```

```
cleaf2# show interface vlan 9
Vlan9 is up, line protocol is up
  Hardware EtherSVI, address is 0000.0c07.ac20
  Internet Address is 10.32.32.1/24
  MTU 9000 bytes, BW 10000000 Kbit, DLY 1 usec
    reliability 255/255, txload 1/255, rxload 1/255
  Carrier delay is 10 sec
  Encapsulation ARPA, loopback not set
  Keepalive not supported
  ARP type: ARPA
  Last clearing of "show interface" counters never
  30 seconds input rate 0 bits/sec, 0 packets/sec
  30 seconds output rate 0 bits/sec, 0 packets/sec
  Load-Interval #2: 5 minute (300 seconds)
    input rate 0 bps, 0 pps; output rate 0 bps, 0 pps
  L3 Switched:
    input: 0 pkts, 0 bytes - output: 0 pkts, 0 bytes
```

```
L3 in Switched:
  ucast: 0 pkts, 0 bytes - mcast: 0 pkts, 0 bytes
L3 out Switched:
  ucast: 0 pkts, 0 bytes - mcast: 0 pkts, 0 bytes
```

```
cleaf2#
```

En los routers de núcleo, N7K-core-1 y N7K-core-2 comparten la carga para los flujos de multidifusión originados en la red LAN; si no se habilita la convergencia rápida, sólo una hoja de borde (bleaf1) envía la unión hacia el origen.

```
!!!! Sources in LAN network !!!!
```

```
!!!! N7K-core-1 !!!!
```

```
N7K-core-1# show ip mroute 229.0.0.1
```

```
IP Multicast Routing Table for VRF "default"
```

```
(10.103.103.41/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/3, RPF nbr: 10.1.20.10
  Outgoing interface list: (count: 1)
    Ethernet1/1, uptime: 1d01h, pim
```

```
(10.103.103.42/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/5, RPF nbr: 10.1.20.42
  Outgoing interface list: (count: 0)
```

```
(10.103.103.43/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/5, RPF nbr: 10.1.20.42
  Outgoing interface list: (count: 0)
```

```
(10.103.103.44/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/5, RPF nbr: 10.1.20.42
  Outgoing interface list: (count: 0)
```

```
(10.103.103.46/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/5, RPF nbr: 10.1.20.42
  Outgoing interface list: (count: 0)
```

```
(10.103.103.47/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/4, RPF nbr: 10.1.20.14
  Outgoing interface list: (count: 1)
    Ethernet1/1, uptime: 1d01h, pim
```

```
(10.103.103.48/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/3, RPF nbr: 10.1.20.10
  Outgoing interface list: (count: 1)
    Ethernet1/1, uptime: 1d01h, pim
```

```
(10.103.103.49/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/3, RPF nbr: 10.1.20.10
  Outgoing interface list: (count: 1)
    Ethernet1/1, uptime: 1d01h, pim
```

```
N7K-core-1#
```

```
!!!! N7K-core-2 !!!!
```

```
N7K-core-2# show ip mroute 229.0.0.1
```

```
IP Multicast Routing Table for VRF "default"
```

```
(* , 229.0.0.1/32), uptime: 3w5d, pim ip
  Incoming interface: Ethernet1/5, RPF nbr: 10.1.20.46
```

```
Outgoing interface list: (count: 1)
  Ethernet1/1, uptime: 3w5d, pim
(10.103.103.40/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/3, RPF nbr: 10.1.20.18
  Outgoing interface list: (count: 1)
    Ethernet1/1, uptime: 1d01h, pim
(10.103.103.41/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/4, RPF nbr: 10.1.20.22
  Outgoing interface list: (count: 0)
(10.103.103.42/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/3, RPF nbr: 10.1.20.18
  Outgoing interface list: (count: 1)
    Ethernet1/1, uptime: 1d01h, pim
(10.103.103.43/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/4, RPF nbr: 10.1.20.22
  Outgoing interface list: (count: 1)
    Ethernet1/1, uptime: 1d01h, pim
(10.103.103.44/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/3, RPF nbr: 10.1.20.18
  Outgoing interface list: (count: 1)
    Ethernet1/1, uptime: 1d01h, pim
(10.103.103.45/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/4, RPF nbr: 10.1.20.22
  Outgoing interface list: (count: 1)
    Ethernet1/1, uptime: 1d01h, pim
(10.103.103.46/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/3, RPF nbr: 10.1.20.18
  Outgoing interface list: (count: 1)
    Ethernet1/1, uptime: 1d01h, pim
(10.103.103.47/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/4, RPF nbr: 10.1.20.22
  Outgoing interface list: (count: 0)
(10.103.103.48/32, 229.0.0.1/32), uptime: 00:53:01, pim mrib ip
  Incoming interface: Ethernet1/5, RPF nbr: 10.1.20.46
  Outgoing interface list: (count: 0)
(10.103.103.49/32, 229.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/4, RPF nbr: 10.1.20.22
  Outgoing interface list: (count: 0)
```

N7K-core-2#

!!!!!! Sources in ACI !!!!!

!!!!!! N7K-core-1 !!!!!

```
N7K-core-1# show ip mroute 228.0.0.1
IP Multicast Routing Table for VRF "default"
```

```
(*, 228.0.0.1/32), uptime: 3w5d, pim ip
  Incoming interface: Ethernet1/5, RPF nbr: 10.1.20.42
  Outgoing interface list: (count: 2)
    Ethernet1/3, uptime: 3w5d, pim
    Ethernet1/2, uptime: 3w5d, pim
```



```
(10.101.101.115/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/2, RPF nbr: 10.1.20.6
  Outgoing interface list: (count: 0)

(10.101.101.116/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/1, RPF nbr: 10.1.20.2
  Outgoing interface list: (count: 1)
    Ethernet1/3, uptime: 1d01h, pim

(10.101.101.117/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/5, RPF nbr: 10.1.20.42
  Outgoing interface list: (count: 0)

(10.101.101.118/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/1, RPF nbr: 10.1.20.2
  Outgoing interface list: (count: 1)
    Ethernet1/3, uptime: 1d01h, pim

(10.101.101.119/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/2, RPF nbr: 10.1.20.6
  Outgoing interface list: (count: 0)

(10.101.101.120/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/1, RPF nbr: 10.1.20.2
  Outgoing interface list: (count: 1)
    Ethernet1/3, uptime: 1d01h, pim

(10.101.101.121/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/1, RPF nbr: 10.1.20.2
  Outgoing interface list: (count: 1)
    Ethernet1/3, uptime: 1d01h, pim

(10.101.101.122/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/2, RPF nbr: 10.1.20.6
  Outgoing interface list: (count: 0)

(10.101.101.123/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/1, RPF nbr: 10.1.20.2
  Outgoing interface list: (count: 1)
    Ethernet1/3, uptime: 1d01h, pim

(10.101.101.124/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/5, RPF nbr: 10.1.20.42
  Outgoing interface list: (count: 0)
```

N7K-core-1#

N7K-core-1#

!!!! N7K-core-2 !!!!

N7K-core-2# show ip mroute 228.0.0.1

IP Multicast Routing Table for VRF "default"

```
(*, 228.0.0.1/32), uptime: 3w5d, pim ip
  Incoming interface: Ethernet1/5, RPF nbr: 10.1.20.46
  Outgoing interface list: (count: 1)
    Ethernet1/4, uptime: 3w5d, pim

(10.101.101.115/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/1, RPF nbr: 10.1.20.26
  Outgoing interface list: (count: 2)
    Ethernet1/4, uptime: 00:02:03, pim
    Ethernet1/3, uptime: 1d01h, pim
```

```
(10.101.101.116/32, 228.0.0.1/32), uptime: 00:01:28, pim mrib ip
  Incoming interface: Ethernet1/2, RPF nbr: 10.1.20.30
  Outgoing interface list: (count: 1)
    Ethernet1/4, uptime: 00:00:57, pim

(10.101.101.117/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/1, RPF nbr: 10.1.20.26
  Outgoing interface list: (count: 2)
    Ethernet1/4, uptime: 00:02:03, pim
    Ethernet1/3, uptime: 1d01h, pim

(10.101.101.118/32, 228.0.0.1/32), uptime: 00:01:28, pim mrib ip
  Incoming interface: Ethernet1/2, RPF nbr: 10.1.20.30
  Outgoing interface list: (count: 1)
    Ethernet1/4, uptime: 00:00:57, pim

(10.101.101.119/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/1, RPF nbr: 10.1.20.26
  Outgoing interface list: (count: 2)
    Ethernet1/4, uptime: 00:02:03, pim
    Ethernet1/3, uptime: 1d01h, pim

(10.101.101.122/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/1, RPF nbr: 10.1.20.26
  Outgoing interface list: (count: 2)
    Ethernet1/4, uptime: 00:02:03, pim
    Ethernet1/3, uptime: 1d01h, pim

(10.101.101.123/32, 228.0.0.1/32), uptime: 00:01:28, pim mrib ip
  Incoming interface: Ethernet1/2, RPF nbr: 10.1.20.30
  Outgoing interface list: (count: 1)
    Ethernet1/4, uptime: 00:00:57, pim

(10.101.101.124/32, 228.0.0.1/32), uptime: 1d01h, pim mrib ip
  Incoming interface: Ethernet1/2, RPF nbr: 10.1.20.30
  Outgoing interface list: (count: 2)
    Ethernet1/3, uptime: 1d01h, pim
    Ethernet1/4, uptime: 1d01h, pim
```

N7K-core-2#

Referencias

[Ruteo de multidifusión ACI 2.0](#)