Verificación de la multidifusión nativa en el fabric de acceso SD

Contenido

Introducción

Este documento describe cómo verificar la multidifusión nativa en el fabric de acceso SD (SDA).

Prerequisites

Requirements

Cisco recomienda que tenga conocimiento sobre estos temas:

- Reenvío de protocolo de Internet (IP)
- Protocolo de separación/ID de ubicación (LISP)
- Modo disperso de multidifusión independiente de protocolo (PIM)

Componentes Utilizados

- C9000v en Cisco IOS® XE 17.10.1
- Cisco Catalyst Center Versión 2.3.5.3

La información que contiene este documento se creó a partir de los dispositivos en un ambiente de laboratorio específico. Todos los dispositivos que se utilizan en este documento se pusieron en funcionamiento con una configuración verificada (predeterminada). Si tiene una red en vivo, asegúrese de entender el posible impacto de cualquier comando.

Este documento también puede utilizarse con estas versiones de software y hardware:
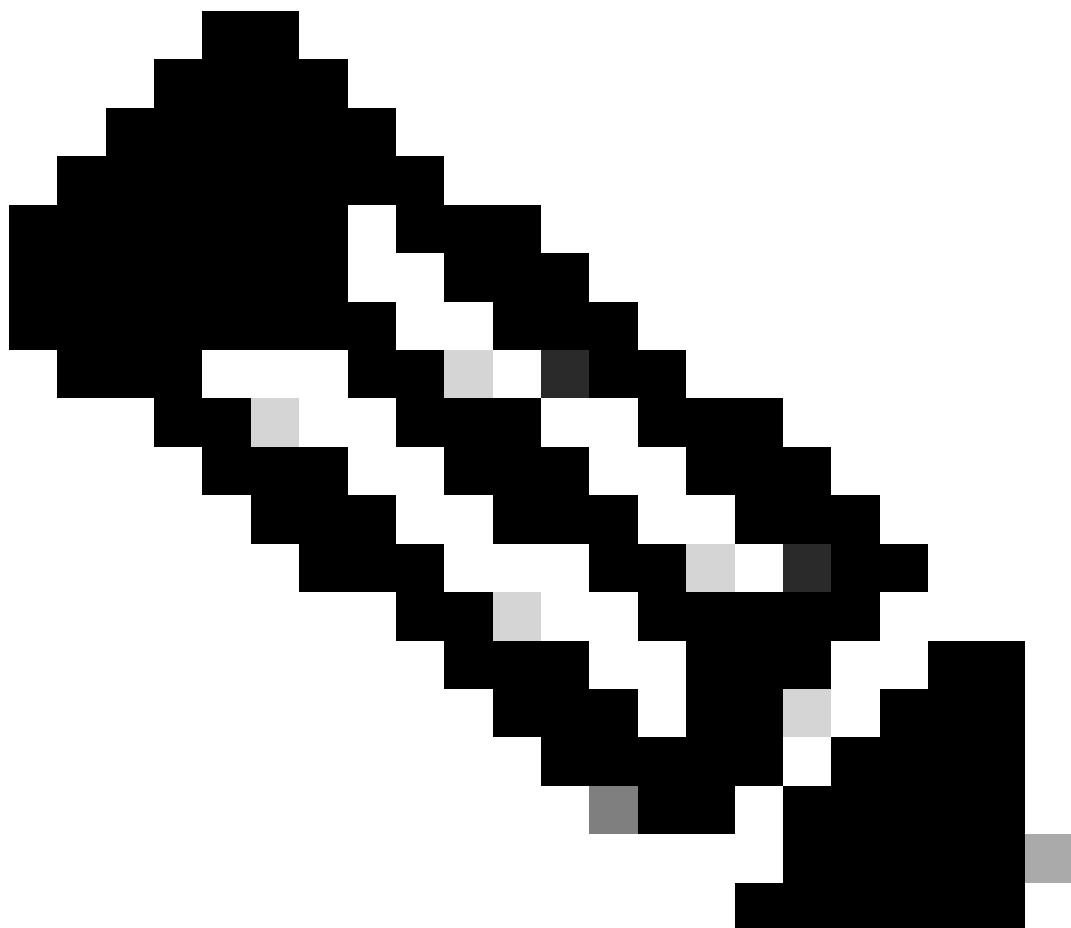
- C9200
- C9300
- C9400
- C9500
- C9600
- Cisco IOS® XE 16.12 y versiones posteriores

Antecedentes

La multidifusión nativa SDA es una forma de multidifusión superpuesta que se utiliza para transportar el tráfico multidifusión entre los dispositivos de fabric y encapsular el tráfico multidifusión en otro grupo multidifusión. La multidifusión nativa puede enrutar el tráfico de multidifusión entre orígenes y receptores que se encuentren en la misma VLAN o en una VLAN diferente (se puede enrutar la multidifusión de la misma VLAN). El tráfico multidifusión entre orígenes y receptores en el mismo Fabric Edge (FE) no se reenvía mediante multidifusión superpuesta (encapsulación VXLAN), sino que el FE lo enruta localmente. La multidifusión nativa no puede enrutar el tráfico de multidifusión para grupos que coincidan con 224.0.0.0/24 o con un período de vida (TTL) =1; estos se gestionan mediante la inundación de capa 2 (L2). La multidifusión nativa se puede configurar para reenviar cualquier multidifusión de origen (ASM), multidifusión específica de origen (SSM) o una combinación de ambas. La multidifusión nativa se

basa en la multidifusión subyacente.
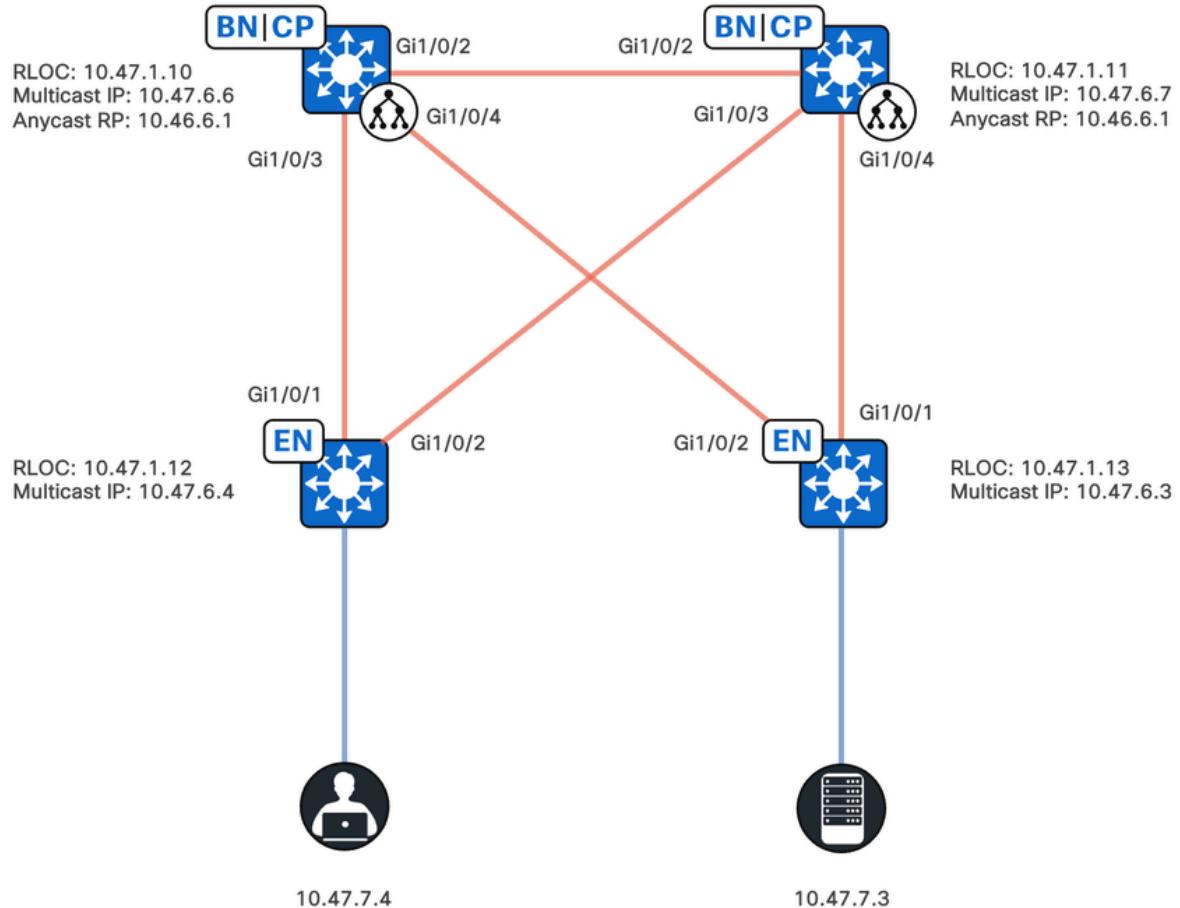
Nota: Los comandos de plataforma (fed) pueden variar. El comando puede ser "show platform fed <active|standby>" versus "show platform fed switch <active|standby>"". Si la sintaxis indicada en los ejemplos no se analiza, pruebe con la variante.

Topología

Topología de red

En esta topología:

- Las ID de ubicación remota (RLOC) 10.47.1.10 y 10.47.1.10 se encuentran en cualquier lugar y también funcionan como punto de encuentro de difusión de multidifusión (RP) con protocolo de transmisión de fuente (MSDP) entre las dos opciones de la red virtual (VN) o del routing y reenvío virtuales (VRF).
- 10.47.1.12 y 10.47.1.3 son nodos FE
- 10.47.7.4 es el receptor de multidifusión
- 10.47.7.3 es el origen de multidifusión
- 239.0.0.5 es la dirección de destino de grupo multidifusión (GDA)

Configuración

Se supone que Cisco Catalyst Center se utiliza para aprovisionar el fabric SDA con estos parámetros:

- La implementación del modo de replicación es multidifusión nativa
- El modo de multidifusión es cualquier multidifusión de origen (ASM)
- Punto de encuentro de difusión ilimitada (RP) con protocolo de transmisión de fuente

multidifusión (MSDP) configurado en los límites entre ubicaciones
- La multidifusión subyacente se configuró manualmente o como parte de la automatización LAN inicial. La multidifusión nativa se basa en la multidifusión subyacente para funcionar correctamente.

Configuración de Fabric Edge (10.47.1.12)

```
ip access-list standard ASM_ACL_IPV4_blue_vn_10.47.6.1
permit 239.0.0.0 0.0.0.255
ip multicast-routing vrf blue_vn
interface LISP0.4100
ip pim lisp transport multicast
ip pim lisp core-group-range 232.0.0.1 1000
interface Vlan1025
ip pim passive
exit
interface Loopback4100
vrf forwarding blue_vn
ip address 10.47.6.4 255.255.255.255
ip pim sparse-mode
ip pim vrf blue_vn rp-address 10.47.6.1 ASM_ACL_IPV4_blue_vn_10.47.6.1
ip pim vrf blue_vn register-source Loopback4100
ip pim vrf blue_vn ssm default
router lisp
service ipv4
etr map-server 10.47.1.11 key ******
etr map-server 10.47.1.10 key ******
etr map-server 10.47.1.10 proxy-reply
etr map-server 10.47.1.11 proxy-reply
service ethernet
etr map-server 10.47.1.11 key ******
etr map-server 10.47.1.10 key ******
etr map-server 10.47.1.10 proxy-reply
etr map-server 10.47.1.11 proxy-reply
instance-id-range 8188 , 8190 , 8192 , 8193 override
remote-rloc-probe on-route-change
service ethernet
eid-table vlan 1025 , 1026 , 1028 , 2727
database-mapping mac locator-set rloc_222e1707-175d-4019-a783-060404f8bc2f
instance-id 4099
service ipv4
sgt
instance-id 4100
service ipv4
sgt
database-mapping 10.47.6.4/32 locator-set rloc_222e1707-175d-4019-a783-060404f8bc2f
instance-id 8188
service ethernet
eid-table vlan 1025
dynamic-eid detection multiple-addr bridged-vm
instance-id 8190
service ethernet
eid-table vlan 1026
dynamic-eid detection multiple-addr bridged-vm
instance-id 8192
service ethernet
eid-table vlan 1028
dynamic-eid detection multiple-addr bridged-vm
```

```
ip domain lookup source-interface Loopback0
ip domain lookup
ip multicast vrf blue_vn multipath
```

Configuración de Fabric Edge (10.47.1.13)

```
ip access-list standard ASM_ACL_IPV4_blue_vn_10.47.6.1
permit 239.0.0.0 0.0.0.255
ip multicast-routing vrf blue_vn
interface LISP0.4100
ip pim lisp transport multicast
ip pim lisp core-group-range 232.0.0.1 1000
interface Vlan1025
ip pim passive
exit
interface Loopback4100
vrf forwarding blue_vn
ip address 10.47.6.3 255.255.255.255
ip pim sparse-mode
ip pim vrf blue_vn rp-address 10.47.6.1 ASM_ACL_IPV4_blue_vn_10.47.6.1
ip pim vrf blue_vn register-source Loopback4100
ip pim vrf blue_vn ssm default
router lisp
service ipv4
etr map-server 10.47.1.11 key ******
etr map-server 10.47.1.10 key ******
etr map-server 10.47.1.10 proxy-reply
etr map-server 10.47.1.11 proxy-reply
service ethernet
etr map-server 10.47.1.11 key ******
etr map-server 10.47.1.10 key ******
etr map-server 10.47.1.10 proxy-reply
etr map-server 10.47.1.11 proxy-reply
instance-id-range 8188 , 8190 , 8192 , 8193 override
remote-rloc-probe on-route-change
service ethernet
eid-table vlan 1025 , 1026 , 1028 , 2727
database-mapping mac locator-set rloc_691b1fe4-5264-44c2-bb1b-0903b3eb2c51
instance-id 4099
service ipv4
sgt
instance-id 4100
service ipv4
sgt
database-mapping 10.47.6.3/32 locator-set rloc_691b1fe4-5264-44c2-bb1b-0903b3eb2c51
instance-id 8188
service ethernet
eid-table vlan 1025
dynamic-eid detection multiple-addr bridged-vm
instance-id 8190
service ethernet
eid-table vlan 1026
dynamic-eid detection multiple-addr bridged-vm
instance-id 8192
service ethernet
eid-table vlan 1028
```

```
dynamic-eid detection multiple-addr bridged-vm
ip domain lookup source-interface Loopback0
ip domain lookup
ip multicast vrf blue_vn multipath
```

Configuración de RP de difusión ilimitada/borde en cualquier lugar (10.47.1.10)

```
ip access-list standard ASM_ACL_IPV4_blue_vn_10.47.6.1
permit 239.0.0.0 0.0.0.255
ip multicast-routing vrf blue_vn
interface LISP0.4100
ip pim lisp transport multicast
ip pim lisp core-group-range 232.0.0.1 1000
interface Vlan3001
ip pim sparse-mode
exit
interface Loopback4100
vrf forwarding blue_vn
ip address 10.47.6.1 255.255.255.255
ip pim sparse-mode
interface Loopback4600
vrf forwarding blue_vn
ip address 10.47.6.6 255.255.255.255
ip pim sparse-mode
ip pim vrf blue_vn rp-address 10.47.6.1 ASM_ACL_IPV4_blue_vn_10.47.6.1
ip pim vrf blue_vn register-source Loopback4100
ip pim vrf blue_vn ssm default
ip msdp vrf blue_vn cache-sa-state
ip msdp vrf blue_vn originator-id Loopback4600
ip msdp vrf blue_vn peer 10.47.6.7 connect-source Loopback4600
ip msdp originator-id Loopback4600
router bgp 69420
address-family ipv4 vrf blue_vn
aggregate-address 10.47.6.0 255.255.255.0 summary-only
network 10.47.6.1 mask 255.255.255.255
router lisp
service ipv4
etr map-server 10.47.1.11 key ******
etr map-server 10.47.1.10 key ******
etr map-server 10.47.1.10 proxy-reply
etr map-server 10.47.1.11 proxy-reply
service ethernet
etr map-server 10.47.1.11 key ******
etr map-server 10.47.1.10 key ******
etr map-server 10.47.1.10 proxy-reply
etr map-server 10.47.1.11 proxy-reply
instance-id 4099
service ipv4
sgt
route-export site-registrations
route-import database bgp 69420 route-map DENY-red_vn locator-set rloc_9080ed56-a6c6-482d-9f46-28eda0e1
distance site-registrations 250
map-cache site-registration
instance-id 4100
service ipv4
map-cache 10.47.6.7/32 10.47.1.11 priority 1 weight 100
```

```
sgt
route-export site-registrations
route-import database bgp 69420 route-map DENY-blue_vn locator-set rloc_9080ed56-a6c6-482d-9f46-28eda0e
distance site-registrations 250
map-cache site-registration
database-mapping 10.47.6.6/32 locator-set rloc_9080ed56-a6c6-482d-9f46-28eda0e18501
database-mapping 10.47.6.1/32 locator-set rloc_9080ed56-a6c6-482d-9f46-28eda0e18501
site site_uci
authentication-key ******
eid-record instance-id 4100 10.47.6.0/24 accept-more-specifics
```

Configuración de RP de difusión ilimitada/borde en cualquier lugar (10.47.1.10)

```
ip access-list standard ASM_ACL_IPV4_blue_vn_10.47.6.1
permit 239.0.0.0 0.0.0.255
ip multicast-routing vrf blue_vn
interface LISP0.4100
ip pim lisp transport multicast
ip pim lisp core-group-range 232.0.0.1 1000
interface Vlan3001
ip pim sparse-mode
exit
interface Loopback4100
vrf forwarding blue_vn
ip address 10.47.6.1 255.255.255.255
ip pim sparse-mode
interface Loopback4600
vrf forwarding blue_vn
ip address 10.47.6.6 255.255.255.255
ip pim sparse-mode
ip pim vrf blue_vn rp-address 10.47.6.1 ASM_ACL_IPV4_blue_vn_10.47.6.1
ip pim vrf blue_vn register-source Loopback4100
ip pim vrf blue_vn ssm default
ip msdp vrf blue_vn cache-sa-state
ip msdp vrf blue_vn originator-id Loopback4600
ip msdp vrf blue_vn peer 10.47.6.7 connect-source Loopback4600
ip msdp originator-id Loopback4600
router bgp 69420
address-family ipv4 vrf blue_vn
aggregate-address 10.47.6.0 255.255.255.0 summary-only
network 10.47.6.1 mask 255.255.255.255
router lisp
service ipv4
etr map-server 10.47.1.11 key ******
etr map-server 10.47.1.10 key ******
etr map-server 10.47.1.10 proxy-reply
etr map-server 10.47.1.11 proxy-reply
service ethernet
etr map-server 10.47.1.11 key ******
etr map-server 10.47.1.10 key ******
etr map-server 10.47.1.10 proxy-reply
etr map-server 10.47.1.11 proxy-reply
instance-id 4099
service ipv4
sgt
route-export site-registrations
```

```
route-import database bgp 69420 route-map DENY-red_vn locator-set rloc_9080ed56-a6c6-482d-9f46-28eda0e1
distance site-registrations 250
map-cache site-registration
instance-id 4100
service ipv4
map-cache 10.47.6.7/32 10.47.1.11 priority 1 weight 100
sgt
route-export site-registrations
route-import database bgp 69420 route-map DENY-blue_vn locator-set rloc_9080ed56-a6c6-482d-9f46-28eda0e
distance site-registrations 250
map-cache site-registration
database-mapping 10.47.6.6/32 locator-set rloc_9080ed56-a6c6-482d-9f46-28eda0e18501
database-mapping 10.47.6.1/32 locator-set rloc_9080ed56-a6c6-482d-9f46-28eda0e18501
site site_uci
authentication-key ******
eid-record instance-id 4100 10.47.6.0/24 accept-more-specifics
```

Verificación del plano de control

La verificación de la multidifusión independiente del protocolo (PIM) se realiza en esta sección, comenzando con la validación de la creación (S,G) en el router de primer salto (FHR)

FHR (S,G) Creación

El origen de multidifusión, 10.47.7.3, envía paquetes de multidifusión UDP a 239.0.0.5. Verifique que IP Device-Tracking (IPDT), Cisco Express Forwarding (CEF) y Reverse Path Forwarding (RPF) apunten correctamente hacia el origen de multidifusión. Además, asegúrese de que Anycast Gateway SVI sea el router designado (DR) PIM para este segmento.

Utilice el comando "show device-tracking database address <ip address>" para asegurarse de que haya una entrada IPDT válida

<#root>

Edge-2#

show device-tracking database address 10.47.7.3


```
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol, DH4 - IPv4 DH
Preflevel flags (prlvl):
0001:MAC and LLA match 0002:Orig trunk 0004:Orig access
0008:Orig trusted trunk 0010:Orig trusted access 0020:DHCP assigned
0040:Cga authenticated 0080:Cert authenticated 0100:Statically assigned
    Network Layer Address Link Layer Address Interface vlan prlvl age  state         Time left
DH4 10.47.7.3            5254.0012.521d      Gi1/0/4   1025 0024 166s
```

REACHABLE

 81 s try 0(2276 s)

Utilice el comando "show ip cef vrf <VN Name> <ip address>" y asegúrese de que el origen de multidifusión esté conectado directamente

<#root>

Edge-2#

show ip cef vrf blue_vn 10.47.7.3

10.47.7.3/32
nexthop 10.47.7.3 Vlan1025

A continuación, utilice el comando "show ip rpf vrf <VN> <ip address>" para asegurarse de que la interfaz RPF es la VLAN en la que está el origen, no el LISP.

<#root>

Edge-1#

show ip rpf vrf blue_vn 10.47.7.3

RPF information for (10.47.7.2)
RPF interface: Vlan1025
RPF neighbor: ? (

10.47.7.3

) - directly connected
RPF route/mask: 10.47.7.3/32
RPF type:

unicast (lisp)

Doing distance-preferred lookups across tables
Multicast Multipath enabled.
RPF topology: ipv4 multicast base, originated from ipv4 unicast base

Utilice el comando "show ip pim vrf <VN name> interface vlan <vlan> detail" | include DR|enabled" para validar que el nodo FE es el DR PIM para el segmento y es el FHR.

<#root>

Edge-2#

show ip pim vrf blue_vn interface vlan 1025 detail | include DR|enabled

PIM: enabled
PIM DR: 10.47.7.1 (this system)
PIM State-Refresh processing: enabled
PIM Non-DR-Join: FALSE

Utilice el comando "show ip mroute vrf <nombre de VPN> <dirección de grupo multicast>" para validar la creación (S,G). (S,G) va a tener una lista de interfaz de salida nula (OIL) porque no ha habido un receptor o router PIM interesado que se haya unido al FHR.

```
<#root>

Edge-2#

show ip mroute vrf blue_vn 239.0.0.5


IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.0.0.5), 00:00:10/stopped, RP 10.47.6.1, flags: SPFl
Incoming interface: LISP0.4100, RPF nbr 10.47.1.10
Outgoing interface list: Null

(

10.47.7.3

,

239.0.0.5

), 00:00:10/00:02:50, flags: PFT
Incoming interface: Vlan1025, RPF nbr 0.0.0.0
Outgoing interface list:

Null
```

Registro en FHR (S,G)

El FHR registra el origen de unidifusión en el RP de difusión ilimitada, utilizando la interfaz configurada como mensajes de registro PIM de "origen registrado".

- Encabezado externo, RLOC a RLOC (10.47.1.13 a 10.47.1.10)

- Encabezado interno, bucle invertido a bucle invertido (10.47.6.3 a 10.47.6.1)
- Multidifusión real

<#root>

Edge-2#

show ip pim vrf blue_vn tunnel

Tunnel1
Type : PIM Encap
RP : 10.47.6.1
Source : 10.47.6.3
State : UP
Last event : Created (00:42:43)

Edge-2#

show ip cef vrf blue_vn 10.47.6.1

10.47.6.1/32
nexthop

10.47.1.10

 LISP0.4100

<-- FHR happened to register to this RP

nexthop 10.47.1.11 LISP0.4100

Informe de afiliación a LHR IGMP

El receptor de multidifusión envía un informe de afiliación/unión IGMP para indicar interés en la recepción del tráfico de multidifusión, lo que crea las entradas de indagación IGMP y de grupo IGMP en el router de último salto (LHR). Utilice el comando "show ip igmp snooping groups vlan <vlan id> <group destination address>" así como "show ip igmp vrf <VN Name> groups <group>"

<#root>

Edge-1#

show ip igmp snooping groups vlan 1025 239.0.0.5

Vlan Group   Type Version Port List

1025 239.0.0.5 igmp v2   Gi1/0/5

Edge-1#

show ip igmp vrf blue_vn groups 239.0.0.5

```
IGMP Connected Group Membership
Group Address Interface Uptime   Expires  Last Reporter Group Accounted
239.0.0.5     Vlan1025  00:02:01 00:02:58 10.47.7.4
```

A continuación, asegúrese de que el LHR sea realmente el PIM DR para este segmento, utilice el comando "show ip pim vrf <nombre VN> interface vlan <vlan> detail" | incluir DR|enabled"

<#root>

Edge-1#

show ip pim vrf blue_vn interface vlan 1025 detail | include DR|enabled

PIM: enabled

PIM DR: 10.47.7.1 (this system)

PIM State-Refresh processing: enabled
PIM Non-DR-Join: FALSE

Creación de superposición LHR (*,G)

A medida que LHR recibe el Informe de afiliación IGMP, también crea el estado PIM, específicamente (*,G) puede utilizar el comando "show ip mroute vrf <VN Name><overlay group> verbose" para ver el estado (*,G)

<#root>

Edge-1#

show ip mroute vrf blue_vn 239.0.0.5 verbose

```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode
```

(*, 239.0.0.5), 1w3d/stopped, RP

10.47.6.1

, flags: SJCl

<-- Anycast RP IP address

Incoming interface: LISP0.4100,

RPF nbr 10.47.1.10

, LISP: [

10.47.1.10

,

232.0.2.245

]

<-- RPF neighbor to reach the Anycast RP, Overlay Group 239.0.0.5 is mapped to Underlay Group 232.0.2.24

Outgoing interface list:

Vlan1025

, Forward/Sparse-Dense, 1w3d/00:02:31, Pkts:0, flags:

<-- IGMP Membership Report/PIM Join received in VLAN 1025, multicast traffic is sent into VLAN 1025

Asignación LHR (*,G) en el grupo SSM subyacente

De (*,G) se deriva el SSM subyacente (S,G). El origen es RP RPF y el grupo es el mapeo de superposición.

<#root>

Edge-1#

show ip mroute 232.0.2.245 10.47.1.10


```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
```

```
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode
```

(

10.47.1.10, 232.0.2.245

), 2d01h/00:02:28, flags: sT

<-- 10.47.1.10 in this example is the RPF IP/neighbor to get to the RP, 232.0.2.245 is the Underlay Grou

Incoming interface:

GigabitEthernet1/0/1

, RPF nbr 10.47.1.0

<-- RPF interface to reach 10.47.1.10

Outgoing interface list:

Null0

, Forward/Dense, 2d01h/stopped, flags:

<-- The Outgoing Interface List (OIL) is Null0, and in Native Multicast, this is treated as a De-Encapsu

Borde/RP crea (*,G) en superposición y (S,G) en superposición

El LHR envía un PIM (*,G) Join en el Overlay, puede utilizar el comando "show ip mroute vrf <nombre VN> <grupo de superposición> verbose" para ver el (*,G) dentro del Overlay

<#root>

Border-1#

show ip mroute vrf blue_vn 239.0.0.5 verbose

```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
```

```
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode
```

(

*, 239.0.0.5

```
), 2d01h/00:03:05, RP 10.47.6.1, flags: Sp
Incoming interface:
```

Null

,

RPF nbr 0.0.0.0

```
Outgoing interface list:
LISP0.4100, (
```

10.47.1.10, 232.0.2.245

```
), Forward/Sparse, 2d01h/stopped, Pkts:0, flags: p
```

10.47.1.12

, 2d01h/00:03:05

<-- This is the RLOC of Edge-1, which is the LHR

En Underlay, puede utilizar el comando "show ip mroute <underlay group address> <RP RLOC>"

<#root>

Border-1#

show ip mroute 232.0.2.245 10.47.1.10

```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode
```

(

10.47.1.10

,

232.0.2.245

), 2d01h/00:03:13, flags: sT
Incoming interface:

Null0

,

RPF nbr 0.0.0.0

Outgoing interface list:

GigabitEthernet1/0/3

, Forward/Sparse, 2d01h/00:03:13, flags:

<-- Interface that connects to Edge-1, which is the LHR, a PIM Join was received off this interface

Border-1 crea (S,G) desde MSDP SA-Cache

El FHR registró el origen de multidifusión en el borde 2. El borde 2 anuncia el origen de multidifusión al borde 1 a través de MSDP. Puede utilizar el comando "show ip msdp vrf <nombre de VPN> summary" para ver el estado de MSDP.

<#root>

Border-1#

show ip msdp vrf blue_vn summary


```
MSDP Peer Status Summary
Peer Address AS      State Uptime/  Reset SA    Peer Name
                           Downtime Count Count
10.47.6.7    23456 Up    2d02h    1     1
```


Utilice el comando "show ip msdp vrf <VN Name> peer <Peer Address> accept-SAs" para ver las SA aceptadas del peer

<#root>

Border-1#

show ip msdp vrf blue_vn peer 10.47.6.7 accepted-SAs

MSDP SA accepted from peer 10.47.6.7 (?)

239.0.0.5

10.47.7.3

 (?) RP:

10.47.6.7 <-- 239.0.0.5 is the Overlay Group, 10.47.7.3 is the multicast source, 10.47.6.7 is the IP add

Utilice el comando "show ip mroute vrf <VN Name> <group destination address> verbose" para
ver el (S,G)

<#root>

Border-1#

show ip mroute vrf blue_vn 239.0.0.5 verbose

```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.0.0.5), 2d02h/00:03:27, RP 10.47.6.1, flags: Sp
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
LISP0.4100, (10.47.1.10, 232.0.2.245), Forward/Sparse, 2d02h/stopped, Pkts:0, flags: p
10.47.1.12, 2d02h/00:03:27

(
```

10.47.7.3

,

239.0.0.5

), 00:18:26/00:02:50, flags: PTA

<-- True multicast source

Incoming interface: LISP0.4100, RPF nbr 10.47.1.13, LISP: [

10.47.1.13

,

232.0.2.245

]

<-- RLOC of Edge-2, which is FHR, and 232.0.2.245 is the Underlay multicast group

Outgoing interface list:

10.47.1.12, 00:00:05/00:03:24

<-- RLOC of Edge-1

La superposición de bordes (S,G) crea la superposición (S,G)

El borde 1 crea la capa subyacente (S,G) como resultado de la superposición (S,G); puede utilizar el comando "show ip mroute <group destination address>" para ver información adicional.

Hay dos (S,G)s, para el FHR, y para sí mismo. El OIL Null0 para 10.47.1.13, 232.0.2.245 indica desencapsulación, el Null0 como un IIF para 10.47.1.10 indica encapsulación.

<#root>

Border-1#

show ip mroute 232.0.2.245

```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode
```

(

10.47.1.13

,

232.0.2.245

), 00:02:34/00:00:25, flags: sPT

<-- RLOC of the FHR, underlay multicast group IP

```
Incoming interface: GigabitEthernet1/0/4, RPF nbr 10.47.1.3 <-- RPF interface towards the FHR


Outgoing interface list: Null <-- Indicates decapsulation


(

10.47.1.10

,

232.0.2.245

), 2d02h/00:02:41, flags: sT

<-- RLOC of Border-1, underlay multicast group IP


Incoming interface: Null0, RPF nbr 0.0.0.0 <-- Indicates encapsulation


Outgoing interface list:


GigabitEthernet1/0/3, Forward/Sparse, 2d02h/00:02:41, flags: <-- where multicast traffic is sent
```

FHR recibe (S,G) unión en superposición y subyacente

El Border/RP envía PIM (S,G) Joins hacia el FHR, puede utilizar el comando "show ip mroute" para obtener información. En la superposición, utilice "show ip mroute vrf <VN Name> <overlay group address"

<#root>

Edge-2#

show ip mroute vrf blue_vn 239.0.0.5

```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
```

```
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.0.0.5), 1w3d/stopped, RP 10.47.6.1, flags: SPFl
Incoming interface: LISP0.4100, RPF nbr 10.47.1.10
Outgoing interface list: Null
```

(

10.47.7.3

,

239.0.0.5

), 1w3d/00:01:23, flags: FT

<-- Multicast source, true multicast group

```
Incoming interface: Vlan1025, RPF nbr 0.0.0.0
Outgoing interface list:
LISP0.4100, (
```

10.47.1.13

,

232.0.2.245

), Forward/Sparse, 19:12:56/stopped, flags:

<-- FHR RLOC, underlay group IP

10.47.1.10, 00:00:09/00:03:19 <-- Border/RP RLOC

En Underlay, utilice "show ip mroute <underlay group address>"

<#root>

Edge-2#

show ip mroute 232.0.2.245

```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
```

```
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode
```

(

10.47.1.13

,

232.0.2.245

), 1w3d/00:03:01, flags: sT

<-- RLOC of the FHR, Underlay multicast group

Incoming interface: Null0, RPF nbr 0.0.0.0 <-- Indicates encapsulation

Outgoing interface list:

GigabitEthernet1/0/1

, Forward/Sparse, 00:01:42/00:03:01, flags:

<-- Where the multicast traffic is forwarded

LHR recibe tráfico multidifusión a lo largo del árbol compartido

Después de que el LHR recibe el tráfico de multidifusión encapsulado a lo largo del árbol compartido desde el RP, desencapsula el tráfico de multidifusión ya que el OIL de la capa subyacente (S,G) es Null0 y, a continuación, crea una entrada (S,G) en la superposición. Puede utilizar el comando "show ip mroute <underlay group address>" y "show ip mroute vrf <VN Name> <overlay group address"

<#root>

Edge-1#

show ip mroute 232.0.2.245

```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
```

```
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode
```

(

10.47.1.10

,

232.0.2.245

), 2d03h/00:00:36, flags: sT

<-- RLOC of the RP, Underlay group

Incoming interface:

GigabitEthernet1/0/1, RPF nbr 10.47.1.0 <-- RPF interface towards the RP

Outgoing interface list:

Null0, Forward/Dense, 2d03h/stopped, flags: <-- Indicates Decapsulation

En la superposición "show ip mroute vrf <VN Name> <overlay group address>"

<#root>

Edge-1#

show ip mroute vrf blue_vn 239.0.0.5


```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.0.0.5), 1w3d/stopped, RP 10.47.6.1, flags: SJCl
Incoming interface: LISP0.4100, RPF nbr 10.47.1.10
Outgoing interface list:
```

Vlan1025, Forward/Sparse-Dense, 1w3d/00:02:03, flags:

(

10.47.7.3, 239.0.0.5

), 00:01:21/00:01:38, flags: JTl

<-- Multicast Source, Overlay Group

Incoming interface: LISP0.4100, RPF nbr 10.47.1.13, LISP:
 [

10.47.1.13, 232.0.2.245

]

<-- RLOC of the FHR, Underlay Group

Outgoing interface list:

Vlan1025

, Forward/Sparse-Dense, 00:01:21/00:02:03, flags:

<-- Multicast traffic is fowarded into VLAN 1025

Ahora, el LHR se une al árbol de trayecto más corto (SPT) y recorta el árbol compartido, a través de las uniones PIM (S,G) en la superposición y la superposición. Después de que el LHR recorta el árbol compartido, el RP OIL para el (S,G) ya no incluye el LHR. Vaya al RP y utilice el comando "show ip mroute vrf <VN Name> <overlay group address>"

<#root>

Border-1#

show ip mroute vrf blue_vn 239.0.0.5


```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode
```

```
(*, 239.0.0.5), 2d04h/00:03:10, RP 10.47.6.1, flags: S
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
LISP0.4100, (10.47.1.10, 232.0.2.245), Forward/Sparse, 2d04h/stopped, flags:

(10.47.7.3, 239.0.0.5), 00:14:17/00:02:42, flags: PT
Incoming interface: LISP0.4100, RPF nbr 10.47.1.13

Outgoing interface list: Null
```

Dado que la estructura (S,G) ya no tiene una asignación subyacente, incluso si el tráfico a 239.0.0.5 se recibe a través de la Subcapa, el RP no la vuelve a encapsular en ningún LHR, que recorta el árbol compartido. Sin embargo, la estructura (S,G) tanto del árbol de origen como del árbol compartido sigue existiendo. Vaya al RP y verifique el grupo Underlay con el comando "show ip mroute <underlay group address>"

```
<#root>

Border-1#

show ip mroute 232.0.2.245


IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(10.47.1.13, 232.0.2.245), 00:01:07/00:01:52, flags: sPT
Incoming interface: GigabitEthernet1/0/4, RPF nbr 10.47.1.3
Outgoing interface list: Null

(10.47.1.10, 232.0.2.245), 2d04h/00:03:23, flags: sT
Incoming interface: Null0, RPF nbr 0.0.0.0
Outgoing interface list:
GigabitEthernet1/0/3, Forward/Sparse, 2d04h/00:03:23, flags:
```

Si el RP ha eliminado todos sus ACEITES, también se elimina del ACEITE FHR, y el ACEITE FHR sólo incluye los ACEITES LHR. Vaya al FHR y utilice el comando "show ip mroute vrf <VN

Name> <overlay group address>"

<#root>

Edge-2#

show ip mroute vrf blue_vn 239.0.0.5

```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.0.0.5), 1w4d/stopped, RP 10.47.6.1, flags: SPFl
Incoming interface: LISP0.4100, RPF nbr 10.47.1.10
Outgoing interface list: Null
```

(

10.47.7.3

,

239.0.0.5

), 1w3d/00:01:25, flags: FT

<-- Multicast Source, Overlay Group

```
Incoming interface: Vlan1025, RPF nbr 0.0.0.0
Outgoing interface list:
LISP0.4100, (
```

10.47.1.13, 232.0.2.245

), Forward/Sparse, 20:16:48/stopped, flags:

<-- RLOC of the LHR, Underlay Group

Verificación del plano de datos (independiente de la plataforma)

Puede haber varios problemas que pueden impedir que el origen o el receptor de multidifusión

envíen o reciban el tráfico. Esta sección se centra en la validación de los problemas que pueden afectar tanto al origen de multidifusión como al receptor de multidifusión, haciendo hincapié en los problemas que no están relacionados con la programación de hardware.

Creación de FHR (S,G)

Para que FHR cree (S,G) y verifique que SISF, LISP, CEF y RPF sean válidos y correctos, utilice el comando "show device-tracking database address <IPv4 address>"

```
<#root>

Edge-2#

show device-tracking database address 10.47.7.3

Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol, DH4 - IPv4 DH(
Preflevel flags (prlvl):
0001:MAC and LLA match 0002:Orig trunk 0004:Orig access
0008:Orig trusted trunk 0010:Orig trusted access 0020:DHCP assigned
0040:Cga authenticated 0080:Cert authenticated 0100:Statically assigned
    Network Layer Address Link Layer Address Interface vlan prlvl age state     Time left
DH4 10.47.7.3            5254.0012.521d    Gi1/0/4   1025 0024  16s REACHABLE 232 s try 0(84662 s)
```

LISP utiliza el sistema SISF; utilice el comando "show lisp instance-id <L3 LISP Instance ID> ipv4 database <IP/32>"

```
<#root>

Edge-2#

show lisp instance-id 4100 ipv4 database 10.47.7.3/32

LISP ETR IPv4 Mapping Database for LISP 0 EID-table vrf blue_vn (IID 4100), LSBs: 0x1
Entries total 1, no-route 0, inactive 0, do-not-register 1

10.47.7.3/32

, dynamic-eid blue-IPV4, inherited from default locator-set rloc_691b1fe4-5264-44c2-bb1b-0903b3eb2c51
Uptime: 5w0d, Last-change: 5w0d
Domain-ID: local
Service-Insertion: N/A
Locator Pri/Wgt Source State
10.47.1.13 10/10 cfg-intf site-self, reachable
Map-server Uptime ACK Domain-ID
10.47.1.10 2d04h Yes 0
10.47.1.11 2d15h Yes 0

Edge-2#

show ip lisp instance-id 4100 forwarding eid local 10.47.7.3

Prefix
10.47.7.3/32
```

Los programas de LISP CEF, utilizan el comando "show ip cef vrf <VN Name> <ip address>" y se aseguran de que sea un salto siguiente en la VLAN, no apuntando hacia LISP.

<#root>

Edge-2#

show ip cef vrf blue_vn 10.47.7.3

10.47.7.3/32
nexthop 10.47.7.3 Vlan1025

Finalmente, asegúrese de que RPF esté apuntando correctamente y que esté directamente conectado.

<#root>

Edge-2#

show ip rpf vrf blue_vn 10.47.7.3

RPF information for (10.47.7.3)
RPF interface: Vlan1025
RPF neighbor: ?

(10.47.7.3) - directly connected

RPF route/mask: 10.47.7.3/32
RPF type: unicast (lisp)
Doing distance-preferred lookups across tables
Multicast Multipath enabled.
RPF topology: ipv4 multicast base, originated from ipv4 unicast base

Si no hay una entrada válida en SISF/IPDT, esto da como resultado que no haya una asignación de base de datos LISP en el FHR, lo que da como resultado que CEF y RPF apunten a los bordes. Si el origen multicast envía tráfico, RPF apunta a la interfaz incorrecta, lo que resulta en una falla de RPF, (S,G) no se forma.

<#root>

Edge-2#

show device-tracking database address 10.47.7.3

Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol, DH4 - IPv4 DH
Preflevel flags (prlvl):
0001:MAC and LLA match 0002:Orig trunk 0004:Orig access
0008:Orig trusted trunk 0010:Orig trusted access 0020:DHCP assigned

```
0040:Cga authenticated 0080:Cert authenticated 0100:Statically assigned
Network Layer Address Link Layer Address Interface vlan prlvl age state Time left
```

Edge-2#

show lisp instance-id 4100 ipv4 database 10.47.7.3/32

% No database-mapping entry for 10.47.7.3/32.

Edge-2#

show ip cef vrf blue_vn 10.47.7.3

```
10.47.7.0/24
nexthop 10.47.1.10
```

LISP0.4100 <-- Result of a LISP Negative Map-Reply, so the LISP interface is now the RPF interface

nexthop 10.47.1.11

LISP0.4100 <-- Result of a LISP Negative Map-Reply, so the LISP interface is now the RPF interface

Edge-2#

show ip rpf vrf blue_vn 10.47.7.3

```
RPF information for (10.47.7.3)
RPF interface:
```

LISP0.4100

RPF neighbor: ? (

10.47.1.11

```
)
RPF route/mask: 10.47.7.3/32
RPF type: unicast ()
Doing distance-preferred lookups across tables
Multicast Multipath enabled.
RPF topology: ipv4 multicast base
```

Para evitar esto, trate el origen de multidifusión como un host silencioso, donde la difusión dirigida IP, la inundación, los enlaces estáticos SISF/IPDT pueden superar este problema.

Registro de origen

El registro PIM es un flujo de paquetes de unidifusión, que utiliza LISP/VXLAN como cualquier otro paquete de unidifusión. Hay varias comprobaciones de solicitud para validar que el FHR puede registrar correctamente el origen de multidifusión en el RP de difusión ilimitada.

Primero, asegúrese de que el RP de difusión ilimitada esté configurado correctamente para el GDA.

```
<#root>

Edge-2#

show ip pim vrf blue_vn rp 239.0.0.5


Group: 239.0.0.5, RP: 10.47.6.1, uptime 1w4d, expires never
```

Asegúrese de que se ha formado el túnel de registro PIM.

```
<#root>

Edge-2#

show ip pim vrf blue_vn tunnel


Tunnel1
Type : PIM Encap

RP : 10.47.6.1 <-- This is from "ip pim vrf blue_vn rp-address 10.47.6.1 ASM_ACL_IPV4_blue_vn_10.47.6.1'


Source : 10.47.6.3 <-- This is from ip pim vrf blue_vn register-source Loopback4100


State : UP
Last event : Created (1w4d)
```

 Asegurarse de que el RP de difusión ilimitada tiene acceso a IP

```
<#root>

Edge-2#

show ip cef vrf blue_vn 10.47.6.1


10.47.6.1/32
nexthop

10.47.1.10

 LISP0.4100

<-- RLOC of Border-1


nexthop

10.47.1.11

 LISP0.4100

<-- RLOC of Border-2
```

```
Edge-2#
```

ping vrf blue_vn 10.47.6.1 source lo4100

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.47.6.1, timeout is 2 seconds:
Packet sent with a source address of 10.47.6.3
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/3 ms
```

Verificación del lado receptor

- Asegúrese de que el receptor multicast esté enviando un IGMP MR.
- Asegúrese de que la función IGMP Snooping esté habilitada. Las VPN solo de L2 son el único tipo de VPN que no tiene activada la función IGMP Snooping
- Asegúrese de que no haya ninguna ACL de puerto, ACL de VLAN, ACL de puerto ruteado configurada que descarte IGMP MR.
- Valide la versión de IGMP MR; de forma predeterminada, es IGMPv2, si el receptor multicast es IGMPv3, que requiere "ip igmp version 3"
- Asegúrese de que "ip option drop" no esté configurado

Verificación de LHR PIM (*,G)

- Asegúrese de que el LHR sea el DR PIM para la subred/segmento del receptor
- Asegúrese de que no haya ningún "ip multicast group-range" configurado
- Asegúrese de que no haya ninguna ACL de puerto, ACL de VLAN, ACL de puerto ruteado configurada que descarte IGMP MR.
- Asegúrese de que no haya una CPU alta ni una política de plano de control (CoPP) que descarte IGMP MR.

Verificación de árbol compartido PIM de LHR

Asegúrese de que haya un RP configurado para el grupo

<#root>

```
Edge-1#
```

show ip mroute vrf blue_vn 239.0.0.5

```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
```

```
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.0.0.5), 1w3d/stopped, RP
```

10.47.6.1

```
, flags: SJCl
```

<-- Anycast RP address

```
Incoming interface: LISP0.4100, RPF nbr 10.47.1.10
Outgoing interface list:
Vlan1025, Forward/Sparse-Dense, 1w3d/00:02:36, flags:
```

Asegúrese de que RPF al RP de difusión ilimitada sea correcto

<#root>

```
Edge-1#
```

show ip cef vrf blue_vn 10.47.6.1

```
10.47.6.1/32
nexthop 10.47.1.10 LISP0.4100
nexthop 10.47.1.11 LISP0.4100

Edge-1#
```

show ip rpf vrf blue_vn 10.47.6.1

```
RPF information for (10.47.6.1)
RPF interface: LISP0.4100
RPF neighbor: ? (10.47.1.10)
RPF route/mask: 10.47.6.1/32
RPF type: unicast ()
Doing distance-preferred lookups across tables
Multicast Multipath enabled.
RPF topology: ipv4 multicast base
```

Reenvío MFIB: verificación del lado de origen de multidifusión nativa (superposición)

Puede utilizar el comando "show ip mfib vrf <VN Name> <overlay group address> <unicast

source> verbose" para obtener información adicional sobre el reenvío de paquetes.

<#root>

Edge-2#

show ip mfib vrf blue_vn 239.0.0.5 10.47.7.3 verbose

```
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
ET - Data Rate Exceeds Threshold, K - Keepalive
DDE - Data Driven Event, HW - Hardware Installed
ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
NS - Negate Signalling, SP - Signal Present,
A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
MA - MFIB Accept, A2 - Accept backup,
RA2 - MRIB Accept backup, MA2 - MFIB Accept backup
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts: Total/RPF failed/Other drops
I/O Item Counts: HW Pkt Count/FS Pkt Count/PS Pkt Count Egress Rate in pps
VRF blue_vn
(10.47.7.3,239.0.0.5) Flags: K HW DDE
0x530 OIF-IC count: 0, OIF-A count: 1
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 352467143981268992/0/19/0, Other: 0/0/0
Vlan1025 Flags: RA A MA
LISP0.4100, (
```

10.47.1.13

,

232.0.2.245

) Flags: RF F NS

<-- RLOC of FHR, Underlay Group IP address

```
CEF: Adjacency with MAC:
```

`45000000000040000001184BC0A2F010DE80002F5000012B50000000008400000000100400BA25CDF4AD38BA25CDF4AD380000`

```
Pkts: 0/0/0 Rate: 0 pps
```

Reenvío de MFIB: verificación del lado de origen de multidifusión nativa (subyacente)

Utilice "show ip mroute <underlay group address> <RLOC of FHR>" para ver el grupo Underlay

<#root>

```
Edge-2#

show ip mroute 232.0.2.245 10.47.1.13


IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(

10.47.1.13

,

232.0.2.245

), 1w4d/00:03:17, flags: sT

<-- RLOC of the FHR, Underlay Group


Incoming interface:

Null0

, RPF nbr 0.0.0.0

<-- Indicates Encapsulation


Outgoing interface list:

GigabitEthernet1/0/1, Forward/Sparse, 00:00:26/00:03:17, flags <-- Where the multicast traffic is forwar


Edge-2#

show ip mfib 232.0.2.245 10.47.1.13 verbo

se
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
ET - Data Rate Exceeds Threshold, K - Keepalive
DDE - Data Driven Event, HW - Hardware Installed
ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
NS - Negate Signalling, SP - Signal Present,
```

```
A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
MA - MFIB Accept, A2 - Accept backup,
RA2 - MRIB Accept backup, MA2 - MFIB Accept backup
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts: Total/RPF failed/Other drops
I/O Item Counts: HW Pkt Count/FS Pkt Count/PS Pkt Count Egress Rate in pps
Default
(
```

10.47.1.13,232.0.2.245

```
) Flags: K HW
0x348 OIF-IC count: 0, OIF-A count: 1
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding:
```

5268151634814304256

```
/0/1/0, Other: 0/0/0
```

Null0

```
 Flags: RA A MA
GigabitEthernet1/0/1 Flags: RF F NS
CEF: Adjacency with MAC: 01005E0002F552540017FE730800
Pkts: 0/0/0 Rate: 0 pps
```

Reenvío de MFIB: multidifusión nativa (después de la desencapsulación)

Cuando el tráfico multicast llega al LHR encapsulado con una IP de origen de 10.47.1.13 y la dirección de destino de 232.0.2.245, se rutea a la interfaz de salida Null0. Esta acción activa la desencapsulación del paquete.

<#root>

Edge-1#

show ip mroute 232.0.2.245 10.47.1.13

```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
```

```
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode
(
```

10.47.1.13

,

232.0.2.245

```
), 00:38:22/00:00:37, flags: sT
Incoming interface: GigabitEthernet1/0/2, RPF nbr 10.47.1.4
Outgoing interface list:
```

Null0

```
, Forward/Dense, 00:01:12/stopped, flags:

Edge-1#
```

show ip mfib 232.0.2.245 10.47.1.13 verbose

```
Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
ET - Data Rate Exceeds Threshold, K - Keepalive
DDE - Data Driven Event, HW - Hardware Installed
ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
NS - Negate Signalling, SP - Signal Present,
A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
MA - MFIB Accept, A2 - Accept backup,
RA2 - MRIB Accept backup, MA2 - MFIB Accept backup
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts: Total/RPF failed/Other drops
I/O Item Counts: HW Pkt Count/FS Pkt Count/PS Pkt Count Egress Rate in pps
Default
(
```

10.47.1.13,232.0.2.245

```
) Flags: K HW
0x77 OIF-IC count: 0, OIF-A count: 1
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
```

GigabitEthernet1/0/2

```
 Flags: RA A MA
```

Null0, LISPv4 Decap Flags: RF F NS

CEF: OCE (lisp decap)

```
Pkts: 0/0/0 Rate: 0 pps
```

Después de la desencapsulación, el LHR identifica que la verdadera dirección IP de destino es 239.0.0.5 dentro de VNI 4100, originada con una IP de origen de 10.47.7.3

```
<#root>

Edge-1#

show ip mroute vrf blue_vn 239.0.0.5


IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.0.0.5), 1w3d/stopped, RP 10.47.6.1, flags: SJCl
Incoming interface: LISP0.4100, RPF nbr 10.47.1.10
Outgoing interface list:
Vlan1025, Forward/Sparse-Dense, 1w3d/00:02:01, flags:

(

10.47.7.3

,

239.0.0.5

), 00:01:29/00:01:30, flags: JTl
Incoming interface: LISP0.4100, RPF nbr 10.47.1.13
Outgoing interface list:

Vlan1025

, Forward/Sparse-Dense, 00:01:29/00:02:01, flags:

Edge-1#

show ip mfib vrf blue_vn 239.0.0.5 10.47.7.3


Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
ET - Data Rate Exceeds Threshold, K - Keepalive
DDE - Data Driven Event, HW - Hardware Installed
ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
NS - Negate Signalling, SP - Signal Present,
A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
MA - MFIB Accept, A2 - Accept backup,
```

```
RA2 - MRIB Accept backup, MA2 - MFIB Accept backup
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts: Total/RPF failed/Other drops
I/O Item Counts: HW Pkt Count/FS Pkt Count/PS Pkt Count Egress Rate in pps
VRF blue_vn
(
```

10.47.7.3,239.0.0.5

```
) Flags: HW
```

<-- Unicast Source and Overlay Group

```
SW Forwarding: 0/0/0/0, Other: 2/1/1
HW Forwarding: 0/0/0/0, Other: 0/0/0
```

LISP0.4100 Flags: A <-- Incoming Interface

Vlan1025 Flags: F NS <-- Outgoing Interface

```
Pkts: 0/0/0 Rate: 0 pps
```

Utilice el comando "show ip igmp snooping groups vlan <VLAN>" para ver qué puertos van a recibir tráfico multicast.

<#root>

```
Edge-1#
```

show ip igmp snooping groups vlan 1025

```
Vlan Group      Type Version Port List
-----------------------------------------------------------------------
1025 239.0.0.5 igmp v2      Gi1/0/5
```

Verificación del plano de datos (según la plataforma)

Mroute Hardware Programming - IOS mroute

La programación de hardware utiliza esta cadena: IOS, FMAN RP, FMAN FP y, a continuación, FED. Verifique primero IOS, con el comando "show ip mroute vrf <VN Name> <overlay group address> verbose" y "show ip mroute <underlay group address> verbose"

<#root>

```
Edge-1#
```

show ip mroute vrf blue_vn 239.0.0.5 verbose

```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(
```

*, 239.0.0.5

```
), 1w3d/stopped, RP 10.47.6.1, flags: SJCl
Incoming interface: LISP0.4100, RPF nbr 10.47.1.10, LISP: [10.47.1.10, 232.0.2.245]
Outgoing interface list:
Vlan1025, Forward/Sparse-Dense, 1w3d/00:02:58, Pkts:0, flags:

(
```

10.47.7.3, 239.0.0.5

```
), 00:02:19/00:00:40, flags: JTl
Incoming interface: LISP0.4100, RPF nbr 10.47.1.13, LISP: [10.47.1.13, 232.0.2.245]
Outgoing interface list:
Vlan1025, Forward/Sparse-Dense, 00:02:19/00:02:58, Pkts:0, flags:
```

En el subyacente

<#root>

```
Edge-1#
```

show ip mroute 232.0.2.245 verbose

```
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
U - URD, I - Received Source Specific Host Report,
Z - Multicast Tunnel, z - MDT-data group sender,
Y - Joined MDT-data group, y - Sending to MDT-data group,
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
V - RD & Vector, v - Vector, p - PIM Joins on route,
```

```
x - VxLAN group, c - PFP-SA cache created entry,
* - determined by Assert, # - iif-starg configured on rpf intf,
e - encap-helper tunnel flag, l - LISP decap ref count contributor
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(

10.47.1.13, 232.0.2.245

), 01:18:55/00:02:04, flags: sT
Incoming interface: GigabitEthernet1/0/2, RPF nbr 10.47.1.4
LISP EID ref count: 1, Underlay ref timer: 00:05:13
Outgoing interface list:
Null0, Forward/Dense, 00:01:46/stopped, Pkts:0, flags:
(

10.47.1.10, 232.0.2.245

), 2d06h/00:02:59, flags: sT
Incoming interface: GigabitEthernet1/0/1, RPF nbr 10.47.1.0
LISP EID ref count: 1, Underlay ref timer: 00:05:12
Outgoing interface list:
Null0, Forward/Dense, 2d06h/stopped, Pkts:0, flags:
```

Programación de hardware Mroute - IOS MFIB

Verifique la MFIB de Overlay y Underlay con el comando "show ip mfib vrf <VN Name> <overlay group address> verbose" y "show ip mroute <underlay group address> verbose"

En el panel Superposición,

<#root>

```
Edge-1#

show ip mfib vrf blue_vn 239.0.0.5 verbose


Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
ET - Data Rate Exceeds Threshold, K - Keepalive
DDE - Data Driven Event, HW - Hardware Installed
ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
NS - Negate Signalling, SP - Signal Present,
A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
MA - MFIB Accept, A2 - Accept backup,
RA2 - MRIB Accept backup, MA2 - MFIB Accept backup
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts: Total/RPF failed/Other drops
I/O Item Counts: HW Pkt Count/FS Pkt Count/PS Pkt Count Egress Rate in pps
VRF blue_vn
(
```

```
*,239.0.0.5

) Flags: C K HW
0x6D OIF-IC count: 0, OIF-A count: 1
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 16218869633044709376/0/0/0, Other: 0/0/0
LISP0.4100 Flags: RA A MA NS
Vlan1025 Flags: RF F NS
CEF: Adjacency with MAC: 01005E00000500000C9FFB870800
Pkts: 0/0/0 Rate: 0 pps
(

10.47.7.3,239.0.0.5

) Flags: K HW DDE
0x7B OIF-IC count: 0, OIF-A count: 1
SW Forwarding: 0/0/0/0, Other: 2/0/2
HW Forwarding: 0/0/0/0, Other: 0/0/0
LISP0.4100 Flags: RA A MA
Vlan1025 Flags: RF F NS
CEF: Adjacency with MAC: 01005E00000500000C9FFB870800
Pkts: 0/0/0 Rate: 0 pps
```

En el subyacente

```
<#root>

Edge-1#

show ip mfib 232.0.2.245 verbose


Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,
ET - Data Rate Exceeds Threshold, K - Keepalive
DDE - Data Driven Event, HW - Hardware Installed
ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB
MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary
MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,
e - Encap helper tunnel flag.
I/O Item Flags: IC - Internal Copy, NP - Not platform switched,
NS - Negate Signalling, SP - Signal Present,
A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,
MA - MFIB Accept, A2 - Accept backup,
RA2 - MRIB Accept backup, MA2 - MFIB Accept backup
Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second
Other counts: Total/RPF failed/Other drops
I/O Item Counts: HW Pkt Count/FS Pkt Count/PS Pkt Count Egress Rate in pps
Default
(

10.47.1.10,232.0.2.245

) Flags: K HW
0x18 OIF-IC count: 0, OIF-A count: 1
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 8384858081233731584/0/0/0, Other: 0/0/0
GigabitEthernet1/0/1 Flags: RA A MA
Null0, LISPv4 Decap Flags: RF F NS
CEF: OCE (lisp decap)
Pkts: 0/0/0 Rate: 0 pps
```

```
(
10.47.1.13,232.0.2.245
) Flags: K HW
0x77 OIF-IC count: 0, OIF-A count: 1
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 0/0/0/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: RA A MA
Null0, LISPv4 Decap Flags: RF F NS
CEF: OCE (lisp decap)
Pkts: 0/0/0 Rate: 0 pps
```

Programación de hardware Mroute - FMAN RP

Para validar el RP de FMAN, capture primero el ID de VRF.

<#root>

Edge-1#

show vrf detail blue_vn | include Id

VRF blue_vn (

VRF Id = 2

); default RD <not set>; default VPNID <not set>

A continuación, utilice el valor de índice VRF para los siguientes comandos. Para validar la superposición (*,G), utilice el comando "show platform software ip switch active r0 mfib vrf index <VRF Index> group <overlay group address>/32"

<#root>

Edge-1#

show platform software ip switch active r0 mfib vrf index 2 group 239.0.0.5/32

```
Route flags:
S - Signal; C - Directly connected;
IA - Inherit A Flag; L - Local;
BR - Bidir route
*, 239.0.0.5/32 --> OBJ_INTF_LIST (0x6d)
Obj id: 0x6d, Flags: C
OM handle: 0x348030b738
```

Para validar la superposición (S,G), utilice el comando "show platform software ip switch active r0 mfib vrf index 2 group address <overlay group address> <unicast source>"

<#root>

Edge-1#

```
show platform software ip switch active r0 mfib vrf index 2 group address 239.0.0.5 10.47.7.3
```

```
Route flags:
S - Signal; C - Directly connected;
IA - Inherit A Flag; L - Local;
BR - Bidir route
239.0.0.5, 10.47.7.3/64 --> OBJ_INTF_LIST (0x7f)
Obj id: 0x7f, Flags: unknown
OM handle: 0x34803a3800
```

Para validar la capa subyacente (S,G) para la capa (*,G), utilice el comando "show platform software ip switch active r0 mfib group address <underlay group address> <RP address>"

<#root>

Edge-1#

```
show platform software ip switch active r0 mfib group address 232.0.2.245 10.47.1.10
```

```
Route flags:
S - Signal; C - Directly connected;
IA - Inherit A Flag; L - Local;
BR - Bidir route
232.0.2.245, 10.47.1.10/64 --> OBJ_INTF_LIST (0x18)
Obj id: 0x18, Flags: unknown
OM handle: 0x34803b9be8
```

Para validar la capa subyacente (S,G) para la capa (S,G), utilice el comando "show platform software ip switch active r0 mfib group address <underlay group address> <RLOC of FHR>"

<#root>

Edge-1#

```
show platform software ip switch active r0 mfib group address 232.0.2.245 10.47.1.13
```

```
Route flags:
S - Signal; C - Directly connected;
IA - Inherit A Flag; L - Local;
BR - Bidir route
232.0.2.245, 10.47.1.13/64 --> OBJ_INTF_LIST (0x77)
Obj id: 0x77, Flags: unknown
OM handle: 0x348026b988
```

Programación de hardware Mroute - FMAN FP

Para validar la superposición (*,G), utilice el comando "show platform software ip switch active f0 mfib vrf index <VRF ID> group <overlay group address>"

<#root>

Edge-1#

```
show platform software software ip switch active f0 mfib vrf index 2 group 239.0.0.5/32
```

```
Route flags:
S - Signal; C - Directly connected;
IA - Inherit A Flag; L - Local;
BR - Bidir route
*, 239.0.0.5/32 --> OBJ_INTF_LIST (0x6d)
Obj id: 0x6d, Flags: C
aom id:
```

100880

```
, HW handle: (nil) (created)
```

Para validar la superposición (S,G), utilice el comando "show platform software ip switch active f0 mfib vrf index <VRF ID> group address <overlay group address> <unicast source>"

<#root>

Edge-1#

```
show platform software ip switch active f0 mfib vrf index 2 group address 239.0.0.5 10.47.7.3
```

```
Route flags:
S - Signal; C - Directly connected;
IA - Inherit A Flag; L - Local;
BR - Bidir route
239.0.0.5, 10.47.7.3/64 --> OBJ_INTF_LIST (0x8f)
Obj id: 0x8f, Flags: unknown
aom id:
```

161855

```
, HW handle: (nil) (created)
```

Para validar la capa subyacente (S,G) para la capa (*,G), utilice el comando ""show platform software ip switch active f0 mfib group address <underlay group address> <RP address>"

<#root>

Edge-1#

```
show platform ip switch active f0 mfib group address 232.0.2.245 10.47.1.10
```

```
Route flags:
S - Signal; C - Directly connected;
IA - Inherit A Flag; L - Local;
BR - Bidir route
232.0.2.245, 10.47.1.10/64 --> OBJ_INTF_LIST (0x18)
Obj id: 0x18, Flags: unknown
aom id:
```

138716

```
, HW handle: (nil) (created)
```

Para validar la capa subyacente (S,G) para la capa (S,G), utilice el comando "show platform software ip switch active f0 mfib group address <underlay group address> <RLOC of FHR>"

<#root>

Edge-1#

show platform software ip switch active f0 mfib group address 232.0.2.245 10.47.1.13

```
Route flags:
S - Signal; C - Directly connected;
IA - Inherit A Flag; L - Local;
BR - Bidir route
232.0.2.245, 10.47.1.13/64 --> OBJ_INTF_LIST (0x5)
Obj id: 0x5, Flags: unknown
aom id:
```

161559

```
, HW handle: (nil) (created)
```

Programación de hardware Mroute - FMAN FP Database

Para validar el objeto FMAN FP, utilice el comando "show platform software object-manager switch active f0 object <object ID> parent"

Por ejemplo, para validar la superposición (*,G)

<#root>

Edge-1#

show platform software object-manager switch active f0 object 100880 parents

```
Object identifier: 100605
Description: ipv4_mcast table 2 (
```

blue_vn

```
), vrf id 2
Status: Done
```

```
Object identifier: 100878
Description:
```

mlist 109

```
Status: Done
```

Para validar la superposición (S,G)

<#root>

```
Edge-1#
```

show platform software object-manager switch active f0 object 161855 parents

```
Object identifier: 100605
Description: ipv4_mcast table 2 (blue_vn), vrf id 2
Status: Done
Object identifier: 161854
Description:
```

mlist 143

```
Status: Done
```

mlist es una combinación de la interfaz de entrada (IIF) y la lista de interfaz de salida (OIL) separadas de la ruta multicast en un objeto diferente. Para validar la mlist, utilice el comando "show platform software mlist switch active f0 index <index>"

<#root>

```
Edge-1#
```

show platform software mlist switch active f0 index 109

```
Multicast List entries
OCE Flags:
NS - Negate Signalling; IC - Internal copy;
A - Accept; F - Forward;
OCE Type OCE Flags Interface
--------------------------------------------------------------------------------
0xf8000171 OBJ_ADJACENCY NS, A LISP0.4100
```

<-- Incoming Interface for (*,G)

```
0xf80001f1 OBJ_ADJACENCY NS, F Vlan1025
```

<-- Outgoing Interface for (S,G)

<#root>

```
Edge-1#

show platform software mlist switch active f0 index 143


Multicast List entries
OCE Flags:
NS - Negate Signalling; IC - Internal copy;
A - Accept; F - Forward;
OCE Type OCE Flags Interface
-------------------------------------------------------------------------------------
0xf8000171 OBJ_ADJACENCY A LISP0.4100

<-- Outgoing Interface for (S,G)


0xf80001f1 OBJ_ADJACENCY NS, F Vlan1025

<-- Incoming Interface for (S,G)
```

Programación de hardware Mroute - FED

Para validar la superposición (S,G), utilice el comando "show platform software fed switch active ip mfib vrf <VN Name> <overlay group address> <Unicast Source>"

<#root>

```
Edge-1#

show platform software fed switch active ip mfib vrf blue_vn 239.0.0.5 10.47.7.3


Multicast (S,G) Information
VRF : 2
Source Address : 10.47.7.3
HTM Handler : 0x7f0efe53a638
SI Handler : 0x7f0efe50ec68
DI Handler :

0x7f0efe530768


REP RI handler : 0x7f0efe5387e8
Flags :
Packet count : 0
State : 4
RPF :
LISP0.4100 A
OIF :
Vlan1025 F NS
LISP0.4100 A
(Adj: 0xf8000171 )
```


Para validar la capa subyacente (S,G), utilice el comando "show platform software fed switch active ip mfib <underlay group address> <RLOC of FHR>"

```
<#root>

Edge-1#

show platform software fed switch active ip mfib 232.0.2.245 10.47.1.13


Multicast (S,G) Information
VRF : 0
Source Address : 10.47.1.13
HTM Handler : 0x7f0efe512408
SI Handler : 0x7f0efe5158f8
DI Handler :

0x7f0efe525538


REP RI handler : 0x7f0efe52ca18
Flags :
Packet count : 0
State : 4
RPF :
GigabitEthernet1/0/2 A
OIF :
LISP0 LISP Decap F NS
GigabitEthernet1/0/2 A
```

A continuación, el índice de destino (DI) se valida tanto para la superposición como para la subyacente (S,G). Puede utilizar el comando "show platform hardware fed switch active fwd-asic abstraction print-resource-handle <DI Handler> 1"

Para la superposición (S,G)


```
<#root>

Edge-1#

show platform hardware fed switch active fwd-asic abs print-resource-handle 0x7f0efe512408 1

Handle:0x7f0efe530768 Res-Type:ASIC_RSC_DI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L3_MULTICA
priv_ri/priv_si Handle: (nil)Hardware Indices/Handles: index0:0x5279 mtu_index/l3u_ri_index0:0x0 index1
Cookie length: 56
00 00 00 00 00 00 00 00 02 00 00 00 03 07 2f 0a 05 00 00 ef 00 00 00 00 00 00 00 00 00 00 00 00 00 00
Detailed Resource Information (ASIC_INSTANCE# 0)
----------------------------------------
Destination index = 0x5279
pmap = 0x00000000 0x00000010

pmap_intf : [GigabitEthernet1/0/5] <-- From IGMP Snooping


cmi = 0x0
rcp_pmap = 0x0
al_rsc_cmi
CPU Map Index (CMI) [0]
ctiLo0 = 0
ctiLo1 = 0
ctiLo2 = 0
cpuQNum0 = 0
cpuQNum1 = 0
```

```
cpuQNum2 = 0
npuIndex = 0
stripSeg = 0
copySeg = 0
Detailed Resource Information (ASIC_INSTANCE# 1)
----------------------------------------
Destination index = 0x5279
pmap = 0x00000000 0x00000000
cmi = 0x0
rcp_pmap = 0x0
al_rsc_cmi
CPU Map Index (CMI) [0]
ctiLo0 = 0
ctiLo1 = 0
ctiLo2 = 0
cpuQNum0 = 0
cpuQNum1 = 0
cpuQNum2 = 0
npuIndex = 0
stripSeg = 0
copySeg = 0
============================================================
```

Para el soporte (S,G)

<#root>

```
Edge-1#
```

show platform hardware fed switch active fwd-asic abs print-resource-handle 0x7f0efe525538 1

```
Handle:0x7f0efe525538 Res-Type:ASIC_RSC_DI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L3_MULTICA
00 00 00 00 00 00 00 00 00 00 00 00 0d 01 2f 0a f5 02 00 e8 00 00 00 00 00 00 00 00 00 00 00 00 00 0
Detailed Resource Information (ASIC_INSTANCE# 0)
----------------------------------------
Destination index = 0x5284
```

pmap = 0x00000000 0x00000000 <-- Expected since this is the Underlay, and recirculation is required to s

```
cmi = 0x0
```

rcp_pmap = 0x1 <-- Indicates recirculation is required

```
al_rsc_cmi
CPU Map Index (CMI) [0]
ctiLo0 = 0
ctiLo1 = 0
ctiLo2 = 0
cpuQNum0 = 0
cpuQNum1 = 0
cpuQNum2 = 0
npuIndex = 0
stripSeg = 0
copySeg = 0
Detailed Resource Information (ASIC_INSTANCE# 1)
----------------------------------------
Destination index = 0x5284
```

```
pmap = 0x00000000 0x00000000
cmi = 0x0
rcp_pmap = 0x0
al_rsc_cmi
CPU Map Index (CMI) [0]
ctiLo0 = 0
ctiLo1 = 0
ctiLo2 = 0
cpuQNum0 = 0
cpuQNum1 = 0
cpuQNum2 = 0
npuIndex = 0
stripSeg = 0
copySeg = 0
===============================================================
```