Resolución de Problemas de SDA Forwarding East-West Traffic Flow

Contenido

Introducción

Este documento describe cómo validar el flujo de tráfico horizontal como parte del acceso definido por software (SDA).

Prerequisites

Requirements

Cisco recomienda que tenga conocimiento sobre estos temas:

- Reenvío de protocolo de Internet (IP)
- Protocolo de separación Localizador/ID (LISP)

Componentes Utilizados

La información que contiene este documento se basa en las siguientes versiones de software y hardware.

- C9000v en Cisco IOS® XE 17.10.1
- SDA 1.0 (no LISP PubSub)

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.

Productos Relacionados

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

El flujo de tráfico este-oeste de SDA hace referencia al concepto en el que un terminal del fabric de SDA desea comunicarse con otro terminal del mismo fabric. Hay advertencias en cuanto a lo que es y no se considera un flujo Este-Oeste. Un flujo de tráfico horizontal puede ser uno de estos ejemplos:

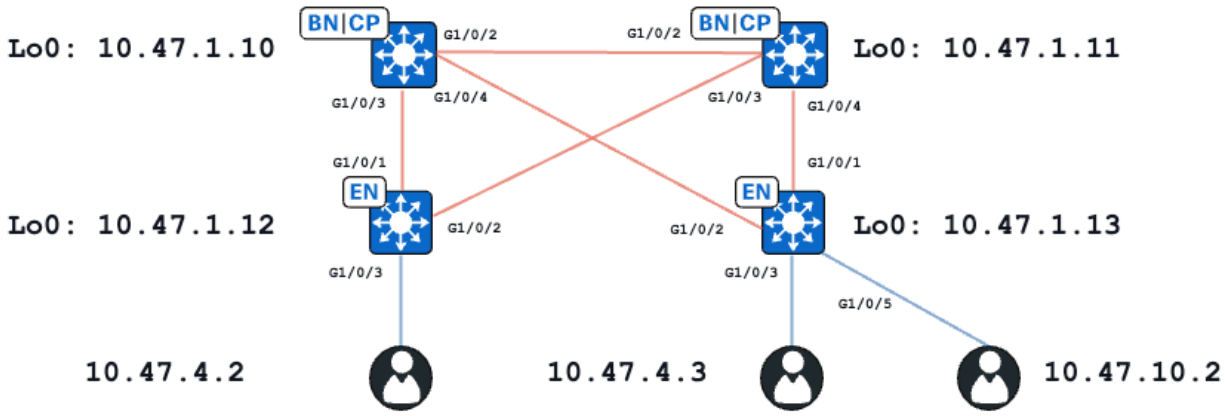
- Los extremos que están en la misma subred (172.17.10.2 que se comunican con 172.19.10.3) se consideran extensión L2LISP
- Los terminales que están en el mismo VRF (VN) (172.19.10.2 que se comunica con 172.19.11.2 y ambos están en el campus VRF) se consideran LISP de L3
- El terminal que está dentro del fabric está hablando con un host que está conectado a un borde de entrega L2, exactamente igual que L2LISP

Los flujos de tráfico horizontal no hacen referencia a estos ejemplos:

- El tráfico se origina desde el fabric SDA hacia fuera del fabric, es decir, de norte a sur
- El ruteo Inter-VRF tampoco se considera Este-Oeste (un punto final en el campus VRF, dirección IP 172.19.10.2 que habla con un punto final en el invitado VRF, dirección IP 172.19.11.2)
- Dominios integrados de SD-WAN
- Tránsito SDA
- Afinidad de borde
- Extranet

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



A efectos de este ejemplo, los switches C9000v funcionan como los bordes del fabric y los bordes colocados. Todos los terminales se encuentran en la misma red virtual (VN), red_vn. Los terminales en 10.47.4.2 y 10.47.4.2 están en la misma subred, el terminal en 10.47.10.2 está en una subred diferente pero la misma VPN.

Configuración

Se supone que Cisco DNA-Center se utiliza para aprovisionar el fabric SDA con la configuración predeterminada:

- La extensión de capa 2 está habilitada (esto fuerza el reenvío del tráfico en función de las búsquedas de direcciones MAC en lugar de las búsquedas de direcciones IP).
- La inundación de Capa 2 está inhabilitada (esto habilita la supresión ARP en los dispositivos de borde y el aprendizaje ARP asistido por LISP).

Después del proceso de incorporación del host adecuado, la configuración de la interfaz contiene varias secciones:

Configuración de interfaz de Fabric Edge (10.47.1.12):

```
interface GigabitEthernet1/0/3
 switchport access vlan 1026
 switchport mode access
 device-tracking attach-policy IPDT_POLICY
 spanning-tree portfast
 spanning-tree bpduguard enable
end

interface Vlan1026
 description Configured from Cisco DNA-Center
 mac-address 0000.0c9f.f341
 vrf forwarding red_vn
 ip address 10.47.4.1 255.255.255.0
 ip helper-address 10.47.9.9
```

```
 no ip redirects
 ip route-cache same-interface
 no lisp mobility liveness test
 lisp mobility red-IPV4
end
```

Configuración de LISP de Fabric Edge (10.47.1.12):

```
router lisp
 locator-table default
 locator-set rloc_222e1707-175d-4019-a783-060404f8bc2f
  IPv4-interface Loopback0 priority 10 weight 10
  exit-locator-set
!
instance-id 4099
  remote-rloc-probe on-route-change
  dynamic-eid red-IPV4
   database-mapping 10.47.4.0/24 locator-set rloc_222e1707-175d-4019-a783-060404f8bc2f
   exit-dynamic-eid
  !
  dynamic-eid red-helpdesk-IPV4
   database-mapping 10.47.10.0/24 locator-set rloc_222e1707-175d-4019-a783-060404f8bc2f
   exit-dynamic-eid
  !
  service ipv4
   eid-table vrf red_vn
   map-cache 0.0.0.0/0 map-request
   sgt distribution
   sgt
   exit-service-ipv4
  !
  exit-instance-id
!
 !
 instance-id 8190
  remote-rloc-probe on-route-change
  service ethernet
   eid-table vlan 1026
   database-mapping mac locator-set rloc_222e1707-175d-4019-a783-060404f8bc2f
   dynamic-eid detection multiple-addr bridged-vm
   exit-service-ethernet
  !
  exit-instance-id
 !
 instance-id 8192
  remote-rloc-probe on-route-change
  service ethernet
   eid-table vlan 1028
   database-mapping mac locator-set rloc_222e1707-175d-4019-a783-060404f8bc2f
   dynamic-eid detection multiple-addr bridged-vm
   exit-service-ethernet
  !
  exit-instance-id
```

Configuración de interfaz de Fabric Edge (10.47.1.13):

```
interface GigabitEthernet1/0/3
 switchport access vlan 1026
 switchport mode access
 device-tracking attach-policy IPDT_POLICY
 spanning-tree portfast
 spanning-tree bpduguard enable
end
!
interface GigabitEthernet1/0/5
 switchport access vlan 1028
 switchport mode access
 device-tracking attach-policy IPDT_POLICY
 spanning-tree portfast
 spanning-tree bpduguard enable
end
!
interface Vlan1026
 description Configured from Cisco DNA-Center
 mac-address 0000.0c9f.f341
 vrf forwarding red_vn
 ip address 10.47.4.1 255.255.255.0
 ip helper-address 10.47.9.9
 no ip redirects
 ip route-cache same-interface
 no lisp mobility liveness test
 lisp mobility red-IPV4
end
!
interface Vlan1028
 description Configured from Cisco DNA-Center
 mac-address 0000.0c9f.f800
 vrf forwarding red_vn
 ip address 10.47.10.1 255.255.255.0
 ip helper-address 10.47.9.9
 no ip redirects
 ip route-cache same-interface
 no lisp mobility liveness test
 lisp mobility red-helpdesk-IPV4
end
```

Configuración de LISP de Fabric Edge (10.47.1.13)

```
router lisp
 locator-table default
 locator-set rloc_691b1fe4-5264-44c2-bb1b-0903b3eb2c51
  IPv4-interface Loopback0 priority 10 weight 10
  exit-locator-set
 !
 instance-id 4099
  remote-rloc-probe on-route-change
  dynamic-eid red-IPV4
   database-mapping 10.47.4.0/24 locator-set rloc_691b1fe4-5264-44c2-bb1b-0903b3eb2c51
   exit-dynamic-eid
  !
  dynamic-eid red-helpdesk-IPV4
   database-mapping 10.47.10.0/24 locator-set rloc_691b1fe4-5264-44c2-bb1b-0903b3eb2c51
```

```
   exit-dynamic-eid
  !
  service ipv4
   eid-table vrf red_vn
   map-cache 0.0.0.0/0 map-request
   sgt distribution
   sgt
   exit-service-ipv4
  !
  exit-instance-id
!
 instance-id 8190
  remote-rloc-probe on-route-change
  service ethernet
   eid-table vlan 1026
   database-mapping mac locator-set rloc_691b1fe4-5264-44c2-bb1b-0903b3eb2c51
   dynamic-eid detection multiple-addr bridged-vm
   exit-service-ethernet
  !
  exit-instance-id
 !
 instance-id 8192
  remote-rloc-probe on-route-change
  service ethernet
   eid-table vlan 1028
   database-mapping mac locator-set rloc_691b1fe4-5264-44c2-bb1b-0903b3eb2c51
   dynamic-eid detection multiple-addr bridged-vm
   exit-service-ethernet
  !
  exit-instance-id
```

Verificación de Onboarding del Host

Como parte del proceso de incorporación del host, se crean varias estructuras:

Entrada de seguimiento de dispositivos IPDT / IP

Después de la incorporación exitosa del host, existe una entrada válida en la tabla de seguimiento de dispositivos IP (IPDT) y el host final se marca como ALCANZABLE:

<#root>

```
Edge-1#
```

show device-tracking database interface g1/0/3

```
portDB has 2 entries for interface Gi1/0/3, 2 dynamic
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      ag
```

```
DH4 10.47.4.2                    5254.0019.93e9    Gi1/0/3    1026       0024       3mr
```

Entrada MAC/ARP

Cuando el host final se incorpora correctamente, puede hacer ping al gateway predeterminado (o se puede hacer ping desde el gateway predeterminado si no hay ningún firewall instalado en el punto final que bloquee esta comunicación):

```
<#root>

Edge-1#

ping vrf red_vn 10.47.4.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.47.4.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 142/150/161 ms
```

En el Nodo de Borde, hay una dirección MAC, así como la entrada ARP correspondiente en la tabla (en VRF):

```
<#root>

Edge-1#

show mac address-table interface g1/0/3

          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----
1026    5254.0019.93e9    DYNAMIC     Gi1/0/3
Total Mac Addresses for this criterion: 1

Edge-1#

show ip arp vrf red_vn

Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  10.47.4.1              -   0000.0c9f.f341  ARPA   Vlan1026

Internet  10.47.4.2              1   5254.0019.93e9  ARPA   Vlan1026

Internet  10.47.10.1             -   0000.0c9f.f800  ARPA   Vlan1028
```

Programación de direcciones MAC con alimentación por software**

Para verificar la dirección MAC en FED, utilice el comando show platform software fed switch active matm macTable vlan <vlan id> mac <mac address>

<#root>

Edge-1#

show platform software fed switch active matm macTable vlan 1026 mac 5254.0019.93e9

VLAN   MAC   Type Seq#   EC_Bi Flags

machandle

siHandle

            riHandle

diHandle

              *a_time *e_time ports   Con

1026   5254.0019.93e9   0x1   9   0   0

0x7f65ec7bda68

0x7f65ec7c21f8

      0x0

0x7f65ec6e1368

            300   7 GigabitEthernet1/0/3   Yes

======platform hardware details ======

Asic: 0
 htm-handle = 0x7f65ec95dc68 MVID = 7 gpn = 1
 SI = 0xc3 RI = 0x25 DI = 0x526e
 DI = 0x526e pmap = 0x00000000 0x00000004 pmap_intf : [GigabitEthernet1/0/3]

Asic: 1
 SI = 0xc3 RI = 0x25 DI = 0x526e
 DI = 0x526e pmap = 0x00000000 0x00000000

MAC Address macHandle Programming

Tome el valor macHandle del comando anterior (0x7f65ec7bda68) y utilícelo en show platform hardware fed switch active fwd-asic abstraction print-resource-handle <macHandle> 1

<#root>

Edge-1#

show platform hardware fed switch active fwd-asic abstraction print-resource-handle 0x7f65ec7bda68 1

Handle:0x7f65ec7bda68 Res-Type:ASIC_RSC_HASH_TCAM Res-Switch-Num:0 Asic-Num:255 Feature-ID:AL_FID_L2 Lk
priv_ri/priv_si Handle: (nil)Hardware Indices/Handles: handle [ASIC: 0]: 0x7f65ec95dc68
Features sharing this resource:Cookie length: 12
19 00 54 52 e9 93 07 80 07 00 00 00

```
Detailed Resource Information (ASIC_INSTANCE# 0)
----------------------------------------
Number of HTM Entries: 1

Entry 0: (handle 0x7f65ec95dc68)

Absolute Index: 6778
Time Stamp: 4
KEY -
```

vlan:7

mac:0x5254001993e9

```
 l3_if:0
```

gpn:3

```
 epoch:0 static:0 flood_en:0 vlan_lead_wless_flood_en: 0 client_home_asic: 0 learning_peerid 0, learnin
MASK - vlan:0 mac:0x0 l3_if:0 gpn:0 epoch:0 static:0 flood_en:0 vlan_lead_wless_flood_en: 0 client_home_
SRC_AD - need_to_learn:0 lrn_v:0 catchall:0 static_mac:0 chain_ptr_v:0 chain_ptr: 0 static_entry_v:0 au
DST_AD - si:0xb7 bridge:0 replicate:0 blk_fwd_o:0 v4_rmac:0 v6_rmac:0 catchall:0 ign_src_lrn:0 port_mas
============================================================
```

Verificación MVID

El número 7 en el resultado anterior es el ID de VLAN asignada (MVID) en el hardware. Para verificar que coinciden con la vlan "real", utilice show platform software fed switch active vlan <vlan number>

<#root>

```
Edge-1#
```

show platform software fed switch active vlan 1026

```
VLAN Fed Information
```

Vlan

Id

```
  IF Id                LE Handle            STP Handle           L3 IF Handle         SVI IF ID
```

MVID

```
-----------------------------------------------------------------------------------------------------
```

1026

```
     0x0000000000420011   0x00007f65ec6a08b8   0x00007f65ec6a1138   0x00007f65ec77e838   0x000000000000
```

7

Verificación del número de puerto global (GPN)

Para correlacionar el GPN con una interfaz "real", utilice el comando show platform software fed switch active ifm mappings gpn

<#root>

```
Edge-1#

show platform software fed switch active ifm mappings gpn

Mappings Table

GPN         Interface                           IF_ID               IF_TYPE
-------------------------------------------------------------------------------------------
1           GigabitEthernet1/0/1                0x0000001a          ETHER
2           GigabitEthernet1/0/2                0x0000001b          ETHER

3


GigabitEthernet1/0/3

             0x0000000b          ETHER

<-- GPN 3 lines up with the expected Egress interface
```

Programación iHandle de direcciones MAC

Tome el valor de siHandle del comando anterior (0x7f65ec7c21f8) y utilícelo en show platform hardware fed switch active fwd-asic abstraction print-resource-handle <si_handle> 1

<#root>

```
 Edge-1#

show platform hardware fed switch active fwd-asic abstraction print-resource-handle 0x7f65ec7c21f8 1

Handle:0x7f65ec7c21f8 Res-Type:ASIC_RSC_SI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L3_UNICAST_
priv_ri/priv_si Handle: 0x7f65ec7c2498Hardware Indices/Handles: index0:0xc3  mtu_index/l3u_ri_index0:0x0
Features sharing this resource:66 (1)]
57 (1)]
Cookie length: 56
00 00 00 00 00 00 00 00 02 04 00 00 00 00 00 00 00 00 00 00 07 00 52 54 00 19 93 e9 00 00 00 00 00 00 0


Detailed Resource Information (ASIC_INSTANCE# 0)
----------------------------------------


Station Index (SI) [0xc3] <-- Station Index is comprised of the Rewrite Index (RI) and Destination Index


stationTableGenericLabel = 0
stationFdConstructionLabel = 0x7
```

```
lookupSkipIdIndex = 0
rcpServiceId = 0
dejaVuPreCheckEn = 0x1
```

Replication Bitmap: LD <-- Local Data (LD) indicates that the destination is on this ASIC

```
Detailed Resource Information (ASIC_INSTANCE# 1)
----------------------------------------
```

Station Index (SI) [0xc3] <-- Station Index is comprised of the Rewrite Index (RI) and Destination Index

```
stationTableGenericLabel = 0
stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0
rcpServiceId = 0
dejaVuPreCheckEn = 0x1
```

Replication Bitmap: CD <-- Core Data (CD) indicates that the destination is on the same ASIC, different

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

MAC Address Rewrite-Index Verification

Tome el valor de RI del comando anterior (0x25) y utilícelo en show platform hardware fed switch active fwd-asic resource asic all rewrite-index range <RI> <RI>

<#root>

```
Edge-1#
```

show platform hardware fed switch active fwd-asic resource asic all rewrite-index range 0x25 0x25

```
ASIC#:0 RI:37 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)
 MAC Addr:
```

MAC Addr: 52:54:00:19:93:e9

```
,
 L3IF LE Index 41

ASIC#:0 RI:38 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)
 MAC Addr: MAC Addr: 01:00:5e:00:00:00,
 L3IF LE Index 40

ASIC#:0 RI:39 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)
 MAC Addr: MAC Addr: 52:54:00:00:50:17,
 L3IF LE Index 40

ASIC#:1 RI:37 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)
 MAC Addr:
```

MAC Addr: 52:54:00:19:93:e9

```
,
 L3IF LE Index 41


ASIC#:1 RI:38 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)
 MAC Addr: MAC Addr: 01:00:5e:00:00:00,
 L3IF LE Index 40


ASIC#:1 RI:39 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)
 MAC Addr: MAC Addr: 52:54:00:00:50:17,
 L3IF LE Index 40
```

Verificación del índice de destino de la dirección MAC

Tome el valor de DI del comando anterior (0x526e) y utilícelo en show platform hardware fed switch active fwd-asic resource asic all destination-index range <DI> <DI>

<#root>

```
Edge-1#

show platform hardware fed switch active fwd-asic resource asic all destination-index range 0x526e 0x526

ASIC#0:


Destination index   = 0x526e

pmap = 0x00000000 0x00000004 <-- Convert decimal 4 to binary, which is 0100. Count this binary right to

pmap_intf : [GigabitEthernet1/0/3]
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
ASIC#1:


Destination index   = 0x526e
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
```

Verificación de puertos

Para correlacionar el puerto que se vio anteriormente, utilice los comandos show platform software fed switch active ifm mappings y observe la columna Puerto.

<#root>

```
Edge-1#
```

show platform software fed switch active ifm mappings

```
------------------ show platform software fed switch active ifm mappings  ------------------
Interface                IF_ID    Inst Asic Core Port SubPort Mac  Cntx LPN  GPN  Type Active
GigabitEthernet1/0/1     0x1a       0   0   0    0      0      1    0    1    1    NIF  Y
GigabitEthernet1/0/2     0x1b       0   0   0    1      0      2    1    2    2    NIF  Y
```

GigabitEthernet1/0/3

```
      0xb        0   0   0
```

2

```
      0      3    2    3    3    NIF  Y
```

<-- Matches port 2 from previous output

Verificación de dirección MAC de alimentación de hardware

Este resultado en un escenario funcional/ideal coincide con lo que la decodificación macHandle proporcionó.

<#root>

```
Edge-1#
```

show platform hardware fed switch active matm macTable vlan 1026 mac 5254.0019.93e9

```
HEAD: MAC address 5254.0019.93e9 in VLAN 1026
KEY:
```

vlan 7

```
,
```

mac 0x5254001993e9

```
, l3_if 0,
```

gpn 3

```
, epoch 0, static 0, flood_en 0, vlan_lead_wless_flood_en 0, client_home_asic 0, learning_peerid 0, lea
MASK: vlan 0, mac 0x0, l3_if 0, gpn 0, epoch 0, static 0, flood_en 0, vlan_lead_wless_flood_en 0, clien
```

```
SRC_AD: need_to_learn 0, lrn_v 0, catchall 0, static_mac 0, chain_ptr_v 0, chain_ptr 0, static_entry_v 0
DST_AD: si 0xb7, bridge 0, replicate 0, blk_fwd_o 0, v4_mac 0, v6_mac 0, catchall 0, ign_src_lrn 0, port

Total Mac number of addresses:: 1
```

- El ID de VLAN en hardware (MVID) es 7
- Dirección MAC: 5254.0019.93e9
- GPN: 3

Entrada LISP

Después de la incorporación exitosa del host, las entradas LISP para el host final se crean localmente en el nodo de borde, así como se registran en los nodos de control (LISP MSMR - Servidor de mapa LISP / Resolver mapa). Todas las verificaciones LISP deben realizarse en relación con el alcance de ID de instancia específico que se puede verificar para L2 y L3:

<#root>

```
Edge-1#
show vlan id 1026

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1026 red                              active

L2LI0:8190

, Gi1/0/3

<-- L2 LISP Instance ID tied to VLAN 1026
```

Verificación de la base de datos LISP L2

Para verificar la base de datos L2 LISP, utilice el comando show lisp instance-id <L2 LISP ID> ethernet database <mac address>

<#root>

```
Edge-1#
show lisp instance-id 8190 ethernet database 5254.0019.93e9

LISP ETR MAC Mapping Database for LISP 0 EID-table Vlan 1026 (IID 8190), LSBs: 0x1
Entries total 1, no-route 0, inactive 0, do-not-register 2
5254.0019.93e9/48, dynamic-eid Auto-L2-group-8190, inherited from default locator-set rloc_222e1707-175
  Uptime: 2d17h, Last-change: 2d17h
  Domain-ID: local
  Service-Insertion: N/A
  Locator     Pri/Wgt  Source     State

10.47.1.12
```

```
   10/10   cfg-intf   site-self, reachable

 -----> Our own RLOC

  Map-server       Uptime         ACK  Domain-ID

 10.47.1.10

       1d11h          Yes  0

-----> RLOC of upstream collocated border


10.47.1.11

       2d17h          Yes  0

-----> RLOC of upstream collocated border
```

Verificación de la base de datos de resolución de direcciones (AR) L2 de LISP

Para verificar la base de datos LISP L2 AR, utilice el comando show lisp instance-id <LISP L2 ID> ethernet database address-resolution <mac address>

<#root>

```
Edge-1#

show lisp instance-id 8190 ethernet database address-resolution 5254.0019.93e9

LISP ETR Address Resolution for LISP 0 EID-table Vlan 1026 (IID 8190)
(*) -> entry being deleted

Hardware Address       L3 InstID Host Address
5254.0019.93e9              4099 10.47.4.2/32  <-- Endpoint MAC Address, LISP L3 Instance ID, Endpoint I
```

Verificación de la base de datos LISP L3

Para verificar la base de datos LISP L3, utilice el comando show lisp instance-id <LISP L3 ID> ipv4 database <IP address/Subnet Mask>

<#root>

```
 Edge-1#

show lisp instance-id 4099 ipv4 database 10.47.4.2/32

LISP ETR IPv4 Mapping Database for LISP 0 EID-table vrf red_vn (IID 4099), LSBs: 0x1
Entries total 1, no-route 0, inactive 0, do-not-register 1

10.47.4.2

/32, dynamic-eid red-IPV4, inherited from default locator-set rloc_222e1707-175d-4019-a783-060404f8bc2f

-----> Endpoint IPv4 Address
```

```
  Uptime: 2d18h, Last-change: 2d18h
  Domain-ID: local
  Service-Insertion: N/A
  Locator     Pri/Wgt  Source     State


10.47.1.12

   10/10   cfg-intf   site-self, reachable

-----> Our own RLOC

  Map-server       Uptime         ACK  Domain-ID


10.47.1.10

       1d11h          Yes  0

 -----> RLOC of upstream collocated border



10.47.1.11

       2d17h          Yes  0

 -----> RLOC of upstream collocated border
```

Verificación CEF

Para verificar CEF, utilice el comando show ip cef vrf <nombre de vrf> <dirección IP> internal

<#root>

```
Edge-1#

show ip cef vrf red_vn 10.47.4.2 internal


10.47.4.2/32, epoch 1, flags [att, sc], RIB[D], refcnt 6, per-destination sharing
  sources: RIB, Adj, IPL
  feature space:
    IPRM: 0x00058000
    Broker: linked, distributed at 3rd priority
  subblocks:
    SC owned,sourced:

LISP local EID

 -
    SC inherited: LISP remote EID - locator status bits 0x00000000
    SC inherited: LISP cfg dyn-EID - LISP configured dynamic-EID
    LISP EID attributes: localEID Yes, c-dynEID Yes, d-dynEID Yes, a-dynEID No
    SC owned,sourced: LISP generalised SMR - [disabled, not inheriting, 0x7F06D0A67E40 locks: 1]
    Adj source:

IP adj out of Vlan1026

,

addr 10.47.4.2
```

```
 7F06D300B738
      Dependent covered prefix type adjfib, cover 10.47.4.0/24
    2 IPL sources [no flags]
  ifnums:
    Vlan1026(29): 10.47.4.2
  path list 7F06CEE8D720, 3 locks, per-destination, flags 0x49 [shble, rif, hwcn]
    path 7F06D0A900C8, share 1/1, type attached nexthop, for IPv4
      nexthop 10.47.4.2 Vlan1026, IP adj out of Vlan1026, addr 10.47.4.2 7F06D300B738
  output chain:


IP adj out of Vlan1026, addr 10.47.4.2

 7F06D300B738
```

Además de las entradas LISP locales en el nodo de extremo SDA, los nodos de control SDA (LISP MS/MR) también contienen información adicional sobre los terminales:

Verificación de servidor LISP de borde L2 entre ubicaciones:

Para verificar el servidor LISP L2, utilice el comando show lisp instance-id <L2 LISP ID> ethernet server <MAC Address>

<#root>

```
Border-1#

show lisp instance-id 8190 ethernet server 5254.0019.93e9

LISP Site Registration Information

Site name: site_uci
Description: map-server configured from Cisco DNA-Center
Allowed configured locators: any
Requested EID-prefix:

  EID-prefix:

5254.0019.93e9

/48 instance-id 8190

<-- Endpoint MAC Address

    First registered:     2w5d
    Last registered:      3d16h
    Routing table tag:    0
    Origin:               Dynamic, more specific of any-mac
    Merge active:         No
    Proxy reply:          Yes
    Skip Publication:     No
    Force Withdraw:       No
    TTL:                  1d00h
    State:                complete
    Extranet IID:         Unspecified
    Registration errors:
      Authentication failures:   0
      Allowed locators mismatch: 0
```

ETR

10.47.1.12

:21038, last registered 3d16h, proxy-reply, map-notify

<-- Egress Tunnel Router (Fabric Edge IP address)

```
                          TTL 1d00h, no merge, hash-function sha1
                          state complete, no security-capability
                          nonce 0xB60C4314-0x97BB332D
                          xTR-ID 0xAB3179F6-0xC774F22C-0x00F2C82E-0x3A66738D
                          site-ID unspecified
                          Domain-ID local
                          Multihoming-ID unspecified
                          sourced by reliable transport
      Locator     Local  State      Pri/Wgt  Scope
```

10.47.1.12

yes up 10/10 IPv4 none

<--(Fabric Edge IP address)

Verificación del servidor con resolución de direcciones LISP (AR) L2 de borde intercalado:

Para verificar el servidor LISP AR L2, utilice el comando show lisp instance-id <LISP L2 ID> ethernet server address-resolution <IP address>

Para verificar el historial de registro, utilice el comando show lisp instance-id <LISP L2 ID> ethernet server address-resolution <IP address> registration-history

<#root>

Border-1#

show lisp instance-id 8190 ethernet server address-resolution 10.47.4.2

Address-resolution data for router lisp 0 instance-id 8190

Site name: site_uci

Host Address:

10.47.4.2

/32
Hardware Address:

5254.0019.93e9

First registered: 2w5d
Last registered: 3d16h
Registration errors:
Authentication failures: 0
ETR

10.47.1.12

```
:21038
  Last registered:       3d16h
  TTL:                   1d00h
  xTR-ID:                0xAB3179F6-0xC774F22C-0x00F2C82E-0x3A66738D
  Site-ID:               unspecified
  Registered addr:       5254.0019.93e9
  L3 Instance ID:        4099

Border-1#
```

show lisp instance-id 8190 ethernet server address-resolution 10.47.4.2 registration-history

```
Map-Server registration history
Roam = Did host move to a new location?
WLC = Did registration come from a Wireless Controller?
Prefix qualifier: + = Register Event, - = Deregister Event, * = AR register event

Timestamp (UTC)      Instance Proto Roam WLC Source
                                            EID prefix / Locator
*Sep 29 16:50:27.762     8190 TCP   No   No  10.47.1.12
                                           +*10.47.4.2/32 / 5254.0019.93e9
*Oct  1 21:05:11.086     8190 TCP   No   No  10.47.1.12
                                           +*10.47.4.2/32 / 5254.0019.93e9
*Oct  2 06:51:11.882     8190 TCP   No   No  10.47.1.12
                                           +*10.47.4.2/32 / 5254.0019.93e9
*Oct  3 00:56:33.642     8190 TCP   No   No  10.47.1.12
                                           +*10.47.4.2/32 / 5254.0019.93e9
*Oct  3 01:53:45.934     8190 TCP   No   No  10.47.1.12
                                           +*10.47.4.2/32 / 5254.0019.93e9
*Oct  6 04:36:08.685     8190 TCP   No   No  10.47.1.12
                                           +*10.47.4.2/32 / 5254.0019.93e9
```

Verificación de servidor LISP L3 de borde compartido

Para verificar el servidor LISP L3, utilice el comando show lisp instance-id <LISP L3 ID> ipv4 server <IP address>

Para verificar el historial de registro del servidor LISP L3, utilice el comando show lisp instance-id <LISP L3 ID> ipv4 server <IP address> registration-history

<#root>

```
Border-1#
```

show lisp instance-id 4099 ipv4 server 10.47.4.2

```
LISP Site Registration Information

Site name: site_uci
Description: map-server configured from Cisco DNA-Center
Allowed configured locators: any
Requested EID-prefix:

  EID-prefix:
```

10.47.4.2

```
/32 instance-id 4099
```

```
    First registered:     2w5d
    Last registered:      02:39:39
    Routing table tag:    0
    Origin:               Dynamic, more specific of 10.47.4.0/24
    Merge active:         No
    Proxy reply:          Yes
    Skip Publication:     No
    Force Withdraw:       No
    TTL:                  1d00h
    State:                complete
    Extranet IID:         Unspecified
    Registration errors:
      Authentication failures:   0
      Allowed locators mismatch: 0
    ETR
```

10.47.1.12

```
:21038, last registered 02:39:39, proxy-reply, map-notify
                          TTL 1d00h, no merge, hash-function sha1
                          state complete, no security-capability
                          nonce 0x128CB668-0xF7B85F77
                          xTR-ID 0xAB3179F6-0xC774F22C-0x00F2C82E-0x3A66738D
                          site-ID unspecified
                          Domain-ID local
                          Multihoming-ID unspecified
                          sourced by reliable transport
      Locator     Local  State      Pri/Wgt  Scope
```

10.47.1.12

```
  yes    up          10/10   IPv4 none

Border-1#
```

show lisp instance-id 4099 ipv4 server 10.47.4.2/32 registration-history

```
Map-Server registration history
Roam = Did host move to a new location?
WLC = Did registration come from a Wireless Controller?
Prefix qualifier: + = Register Event, - = Deregister Event, * = AR register event

Timestamp (UTC)      Instance Proto Roam WLC Source
                                            EID prefix / Locator
*Oct  6 04:36:01.548     4099 UDP   No   No  10.47.1.12
                                          + 10.47.4.2/32
*Oct  6 04:36:08.686     4099 TCP   No   No  10.47.1.12
                                          + 10.47.4.2/32
*Oct  9 18:35:48.058     4099 TCP   No   No  10.47.1.12
                                          + 10.47.4.2/32
```

Resolución ARP en SDA

Se supone que Cisco Catalyst Center se ha utilizado para aprovisionar el fabric SDA con la configuración predeterminada. Esto significa que la extensión de la capa 2 está habilitada y que todo el tráfico dentro del entramado (en la misma VLAN / VPN) se reenvía en función de las

búsquedas de direcciones MAC / instancia de Ethernet LISP, en lugar de las búsquedas de direcciones IP / instancia de IP LISP.

Desde la perspectiva de la solución de problemas, puede ser útil configurar entradas ARP estáticas en ambos hosts para verificar rápidamente si el problema es con la conectividad genérica en el entramado (en tal caso, el ping no funciona entre los hosts) o solamente con la resolución ARP.

El proceso ARP en SDA Fabric aprovecha LISP para resolver la identificación y la ubicación de los hosts y es diferente del comportamiento ARP en los entornos de routing/switching tradicionales.

Paso 1: el terminal de fabric envía una solicitud ARP para determinar el enlace MAC/IP para el otro terminal de fabric

La captura de paquetes se puede configurar en la interfaz de ingreso para confirmar que el paquete ARP se recibe del host:

<#root>

```
Edge-1#

monitor capture 1 interface g1/0/3 in match any

Edge-1#

mon cap 1 start

Started capture point : 1
Edge-1#

mon cap 1 stop

Capture statistics collected at software:
    Capture duration - 22 seconds
    Packets received - 13
    Packets dropped - 0
    Packets oversized - 0

Number of Bytes dropped at asic not collected

Capture buffer will exists till exported or cleared

Stopped capture point : 1
Edge-1#

show monitor capture 1 buffer brief

Starting the packet display ........ Press Ctrl + Shift + 6 to exit

    1   0.000000 52:54:00:19:93:e9 -> ff:ff:ff:ff:ff:ff ARP 60 Who has 10.47.4.3? Tell 10.47.4.2
    2   1.028893 52:54:00:19:93:e9 -> ff:ff:ff:ff:ff:ff ARP 60 Who has 10.47.4.3? Tell 10.47.4.2
    3   2.058244 52:54:00:19:93:e9 -> ff:ff:ff:ff:ff:ff ARP 60 Who has 10.47.4.3? Tell 10.47.4.2

Edge-1#

show monitor capture 1 buffer display-filter arp detailed
```

```
Starting the packet display ........ Press Ctrl + Shift + 6 to exit

Frame 1: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface /tmp/epc_ws/wif_to_ts_p
    Interface id: 0 (/tmp/epc_ws/wif_to_ts_pipe)
        Interface name: /tmp/epc_ws/wif_to_ts_pipe
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 10, 2023 14:52:03.659290000 UTC
    [Time shift for this packet: 0.000000000 seconds]
    Epoch Time: 1696949523.659290000 seconds
    [Time delta from previous captured frame: 0.000000000 seconds]
    [Time delta from previous displayed frame: 0.000000000 seconds]
    [Time since reference or first frame: 0.000000000 seconds]
    Frame Number: 1
    Frame Length: 60 bytes (480 bits)
    Capture Length: 60 bytes (480 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:arp]
Ethernet II, Src: 52:54:00:19:93:e9 (

52:54:00:19:93:e9

), Dst:

ff:ff:ff:ff:ff:ff

 (ff:ff:ff:ff:ff:ff)

<-- SMAC/DMAC respectively

    Destination: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
        Address: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
        .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory d
        .... ...1 .... .... .... .... = IG bit: Group address (multicast/broadcast)
    Source: 52:54:00:19:93:e9 (52:54:00:19:93:e9)
        Address: 52:54:00:19:93:e9 (52:54:00:19:93:e9)
        .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory d
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: ARP (

0x0806

)
    Padding: 000000000000000000000000000000000000
Address Resolution Protocol (request)
    Hardware type: Ethernet (1)
    Protocol type: IPv4 (0x0800)
    Hardware size: 6
    Protocol size: 4
    Opcode: request (1)
    Sender MAC address:

52:54:00:19:93:e9

 (52:54:00:19:93:e9)
    Sender IP address:

10.47.4.2

    Target MAC address:

00:00:00:00:00:00

 (00:00:00:00:00:00)
    Target IP address:
```

10.47.4.3

Paso 2. El nodo de borde consume el paquete ARP y genera la solicitud LISP para determinar la dirección MAC de HOST-02.

Edge-1 envía una petición de mapa LISP para resolver la dirección MAC de 10.47.4.3 a los planos de control LISP (bordes colocados):

<#root>

Edge-1#

debug lisp control-plane all

Edge-1#

debug l2lisp all

```
LISP[REMT ]-0: Map Request: Delay is over for IID 8190 EID 10.47.4.3/32, requester 'AR'.
LISP[REMT ]-0 IID 8190: Schedule processing of Map-Requests from 'remote EID prefix' in IPv4.
LISP[REMT ]-0: Map Request: Sending request for IID 8190 EID 10.47.4.3/32, requester 'AR'.
```

Paso 3. El nodo de control recibe una solicitud LISP para la asignación de IP/MAC y envía una respuesta al nodo de extremo SDA

La solicitud de mapa LISP se recibe desde el borde del entramado y responde con una respuesta de mapa LISP con la dirección MAC que está vinculada a 10.47.4.3

<#root>

Border-1#

debug lisp control-plane all

Border-1#

debug l2lisp all

```
LISP[TRNSP]-0: Processing received Map-Request(1) message on GigabitEthernet1/0/3 from 10.47.4.3:4342 t
LISP[MR   ]-0: Received Map-Request with 1 records, first EID IID 8190 10.47.4.3/32, source EID UNSPEC,
LISP[MR   ]-0 IID 8190 Eth-ARP: MS EID 10.47.4.3/32: Sending proxy reply to 10.47.1.12.
```

El plano de control LISP responde con una respuesta de proxy basada en la entrada de resolución de direcciones almacenada en su base de datos local

<#root>

```
Border-1#
```

show lisp instance-id 8190 ethernet server address-resolution 10.47.4.3

```
Address-resolution data for router lisp 0 instance-id 8190

Site name: site_uci

Host Address:
```

10.47.4.3

```
/32
Hardware Address:
```

5254.001e.ad00

```
First registered:     21:11:17
Last registered:      21:11:17
Registration errors:
  Authentication failures:   0
 ETR 10.47.1.13:16056
  Last registered:       21:11:17
  TTL:                   1d00h
  xTR-ID:                0x8CEE6478-0x9358E248-0xE935FF07-0x8C3C5450
  Site-ID:               unspecified
  Registered addr:
```

5254.001e.ad00

```
  L3 Instance ID:
```

4099

Paso 4. El nodo perimetral recibe respuesta LISP con la dirección MAC 10.47.4.3

El nodo de borde de fabric recibe la respuesta de proxy LISP:

```
LISP[REMT ]-0: Processing Map-Reply mapping record for IID 8190 MAC 5254.001e.ad00/48 LCAF 2, ttl 1440,
LISP[REMT ]-0: Processing mapping information for EID prefix IID 8190 5254.001e.ad00/48.
```

Paso 5. El nodo de borde envía el paquete de solicitud de mapa LISP para determinar la ubicación RLOC para la dirección MAC

Después de completar exitosamente los tres primeros pasos, el Nodo de Borde conoce la dirección MAC de 10.47.4.3 para la cual se generó ARP inicialmente. Cuando la extensión de la Capa 2 está habilitada, el Nodo de Borde no responde con esta información a 10.47.4.2, sino que la utiliza para determinar la ubicación RLOC del Borde del Nodo de Salida, de modo que pueda reenviar ARP hacia 10.47.4.3 como en una red de Capa 2 tradicional.

Por esta razón, el Nodo de Borde genera otro paquete de Solicitud de Mapa LISP en la Instancia Ethernet, esta vez solicitando información RLOC para la dirección MAC de 10.47.4.2:

<#root>

Edge-1#

debug lisp control-plane all

Edge-1#

debug l2lisp all

*Oct 10 17:01:41.430: LISP[REMT]-0 IID 8190: Schedule processing of Map-Requests from 'remote EID pref
*Oct 10 17:01:41.430: LISP[REMT]-0: Map Request: Sending request for IID 8190 EID 5254.001e.ad00/48, r

Paso 6: El nodo de control recibe el paquete de solicitud de mapa LISP para determinar la ubicación RLOC para la dirección MAC

El nodo de control recibe el paquete LISP y le responde en función de su estado de base de datos local

<#root>

Border-1#

debug lisp control-plane all

Border-1#

debug l2lisp all

*Oct 10 16:04:42.055: LISP[MR   ]-0 IID 8190 Eth-ARP: MS EID 10.47.4.3/32: Sending proxy reply to 10.47
*Oct 10 16:04:42.407: LISP[MR   ]-0: Received Map-Request with 1 records, first EID IID 8190 5254.001e.
*Oct 10 16:04:42.408: LISP[MR   ]-0 IID 8190 MAC: MS EID 5254.001e.ad00/48: Sending proxy reply to 10.4

Paso 7: El nodo perimetral recibe la respuesta de mapa LISP

El nodo perimetral recibe la respuesta de mapa LISP generada por el nodo de control:

<#root>

Edge-1#

debug lisp control-plane all

Edge-1#

debug l2lisp all

*Oct 10 17:44:00.181: LISP[TRNSP]-0: Processing received Map-Reply(2) message on GigabitEthernet1/0/2 f
*Oct 10 17:44:00.181: LISP[REMT]-0: Received Map-Reply with nonce 0xF954EC80-0x039D7E4A, 1 records.
*Oct 10 17:44:00.181: LISP[REMT]-0: Map-Reply nonce matches pending request for IID 8190 EID 5254.001e
*Oct 10 17:44:00.181: LISP[REMT]-0: Processing Map-Reply mapping record for IID 8190 MAC 5254.001e.ad0
*Oct 10 17:44:00.181: LISP[REMT]-0: Map Request: Received reply with rtt 560ms.

```
*Oct 10 17:44:00.181: LISP[REMT ]-0: Processing mapping information for EID prefix IID 8190 5254.001e.a
```

Esto finalmente crea una entrada en la memoria caché de mapa de instancia de Ethernet de LISP y permite que el paquete ARP sea reenviado hacia el Edge-2 donde 10.47.4.3 está conectado a

<#root>

```
Edge-1#

show lisp instance-id 8190 ethernet map-cache 5254.001e.ad00

LISP MAC Mapping Cache for LISP 0 EID-table Vlan 1026 (IID 8190), 1 entries

5254.001e.ad00/48, uptime: 00:04:11, expires: 23:55:48, via map-reply, complete
  Sources: map-reply
  State: complete, last modified: 00:04:11, map-source: 10.47.1.13
  Active, Packets out: 8(0 bytes), counters are not accurate (~ 00:00:04 ago)
  Encapsulating dynamic-EID traffic
  Locator     Uptime    State  Pri/Wgt     Encap-IID
  10.47.1.13  00:04:11  up      10/10        -
    Last up-down state change:         00:04:11, state change count: 1
    Last route reachability change:    00:04:11, state change count: 1
    Last priority / weight change:     never/never
    RLOC-probing loc-status algorithm:
      Last RLOC-probe sent:            00:04:11 (rtt 560ms)
```

Paso 8. ARP se encapsula en VXLAN y se envía hacia HOST-02

Se requirieron todos los pasos relacionados con LISP para determinar dónde se encuentra 10.47.4.3, de modo que el nodo perimetral pueda enviar el paquete ARP (difusión) original como unidifusión hacia el nodo perimetral apropiado. La CPU del nodo perimetral almacena en caché (no descarta) la solicitud ARP original hasta que se completan todos los pasos, lo que permite una resolución ARP adecuada incluso cuando se envió un único paquete ARP desde 10.47.4.2.

El paquete ARP está encapsulado en VXLAN, como se muestra en el ejemplo:

<#root>

```
Edge-2#

show monitor capture 1 buffer display-filter arp brief

Starting the packet display ........ Press Ctrl + Shift + 6 to exit
   67  15.149181 52:54:00:19:93:e9 -> 52:54:00:1e:ad:00 ARP 110 Who has 10.47.4.3? Tell 10.47.4.2
   68  15.155511 52:54:00:19:93:e9 -> 52:54:00:1e:ad:00 ARP 110 Who has 10.47.4.3? Tell 10.47.4.2
```

La solicitud ARP se ha encapsulado en VXLAN y también se ha convertido de una solicitud ARP de difusión a una solicitud ARP de unidifusión.

<#root>

```
Frame 68: 110 bytes on wire (880 bits), 110 bytes captured (880 bits) on interface /tmp/epc_ws/wif_to_t
    Interface id: 0 (/tmp/epc_ws/wif_to_ts_pipe)
        Interface name: /tmp/epc_ws/wif_to_ts_pipe
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 10, 2023 17:56:43.256570000 UTC
    [Time shift for this packet: 0.000000000 seconds]
    Epoch Time: 1696960603.256570000 seconds
    [Time delta from previous captured frame: 0.006330000 seconds]
    [Time delta from previous displayed frame: 0.006330000 seconds]
    [Time since reference or first frame: 15.155511000 seconds]
    Frame Number: 68
    Frame Length: 110 bytes (880 bits)
    Capture Length: 110 bytes (880 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:udp:vxlan:eth:ethertype:arp]
Ethernet II, Src: 52:54:00:0a:42:11 (52:54:00:0a:42:11), Dst: 52:54:00:17:fe:65 (52:54:00:17:fe:65)
    Destination: 52:54:00:17:fe:65 (52:54:00:17:fe:65)
        Address: 52:54:00:17:fe:65 (52:54:00:17:fe:65)
        .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory d
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Source: 52:54:00:0a:42:11 (52:54:00:0a:42:11)
        Address: 52:54:00:0a:42:11 (52:54:00:0a:42:11)
        .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory d
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: IPv4 (0x0800)
Internet Protocol Version 4, Src:
```

10.47.1.12

```
, Dst:
```

10.47.1.13 <-- 10.47.1.12 is Edge-1 RLOC, 10.47.1.13 is Edge-2 RLOC

```
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
        0000 00.. = Differentiated Services Codepoint: Default (0)
        .... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
    Total Length: 96
    Identification: 0x1781 (6017)
    Flags: 0x4000, Don't fragment
        0... .... .... .... = Reserved bit: Not set
        .1.. .... .... .... = Don't fragment: Set
        ..0. .... .... .... = More fragments: Not set
    Fragment offset: 0
    Time to live: 253
    Protocol: UDP (17)
    Header checksum: 0x4f95 [validation disabled]
    [Header checksum status: Unverified]
    Source: 10.47.1.12
    Destination: 10.47.1.13
User Datagram Protocol, Src Port: 65354, Dst Port: 4789
    Source Port: 65354
    Destination Port: 4789
    Length: 76
    [Checksum: [missing]]
    [Checksum Status: Not present]
    [Stream index: 0]
    [Timestamps]
        [Time since first frame: 15.155511000 seconds]
        [Time since previous frame: 0.006330000 seconds]
```

```
Virtual eXtensible Local Area Network
    Flags: 0x8800, GBP Extension, VXLAN Network ID (VNI)
        1... .... .... .... = GBP Extension: Defined
        .... .... .0.. .... = Don't Learn: False
        .... 1... .... .... = VXLAN Network ID (VNI): True
        .... .... .... 0... = Policy Applied: False
        .000 .000 0.00 .000 = Reserved(R): 0x0000
    Group Policy ID: 0

    VXLAN Network Identifier (VNI): 8190 <-- L2 LISP IID

    Reserved: 0
Ethernet II, Src:

52:54:00:19:93:e9

 (52:54:00:19:93:e9), Dst:

52:54:00:1e:ad:00

 (52:54:00:1e:ad:00)

<--Unicast ARP Request

    Destination: 52:54:00:1e:ad:00 (52:54:00:1e:ad:00)
        Address: 52:54:00:1e:ad:00 (52:54:00:1e:ad:00)
        .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory d
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Source: 52:54:00:19:93:e9 (52:54:00:19:93:e9)
        Address: 52:54:00:19:93:e9 (52:54:00:19:93:e9)
        .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory d
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: ARP (

0x0806

)
    Trailer: 000000000000000000000000000000000000
Address Resolution Protocol (

request

)
    Hardware type: Ethernet (1)
    Protocol type: IPv4 (0x0800)
    Hardware size: 6
    Protocol size: 4
    Opcode: request (1)
    Sender MAC address: 52:54:00:19:93:e9 (52:54:00:19:93:e9)
    Sender IP address: 10.47.4.2
    Target MAC address: 00:00:00:00:00:00 (00:00:00:00:00:00)
    Target IP address: 10.47.4.3
```

Paso 9. La respuesta ARP es generada por 10.47.4.3 y enviada hacia 10.47.4.2

<#root>

```
Edge-2#

show monitor capture 1 buffer display-filter arp brief

Starting the packet display ........ Press Ctrl + Shift + 6 to exit
```

```
    1   0.000000 52:54:00:1e:ad:00 -> 52:54:00:19:93:e9 ARP 60 10.47.4.3 is at 52:54:00:1e:ad:00
    2   0.069429 52:54:00:1e:ad:00 -> 52:54:00:19:93:e9 ARP 60 10.47.4.3 is at 52:54:00:1e:ad:00
   11   5.960508 52:54:00:1e:ad:00 -> 52:54:00:19:93:e9 ARP 60 Who has 10.47.4.2? Tell 10.47.4.3
```

En este momento, el paquete no está destinado a la dirección de difusión (como solicitud ARP original) sino a la dirección MAC de 10.47.4.2, cuando alcanza el nodo de borde de ingreso (Edge-2), se activa el funcionamiento normal de LISP. Inicialmente falta la dirección MAC de 10.47.4.2 en la instancia Ethernet LISP del nodo de borde, el paquete se dirige a la CPU para generar la solicitud de mapa LISP para determinar el RLOC para el HOST-01. Este comportamiento es exactamente el mismo que se describe en otras secciones de este documento y permite crear una entrada de LISP Map Cache para 10.47.4.2 en Edge-2:

<#root>

```
Edge-2#
```

show lisp instance-id 8190 ethernet map-cache 5254.0019.93e9

```
LISP MAC Mapping Cache for LISP 0 EID-table Vlan 1026 (IID 8190), 1 entries

5254.0019.93e9/48, uptime: 03:18:28, expires: 20:41:32, via map-reply, complete
  Sources: map-reply
  State: complete, last modified: 03:18:28, map-source: 10.47.1.12
  Active, Packets out: 386(0 bytes), counters are not accurate (~ 00:00:12 ago)
  Encapsulating dynamic-EID traffic
  Locator     Uptime    State  Pri/Wgt     Encap-IID
```

10.47.1.12

```
  03:18:28  up      10/10        -
    Last up-down state change:         03:18:28, state change count: 1
    Last route reachability change:    03:18:28, state change count: 1
    Last priority / weight change:     never/never
    RLOC-probing loc-status algorithm:
      Last RLOC-probe sent:            03:18:28 (rtt 710ms)
```

La entrada permite que la respuesta ARP se envíe con éxito hacia Edge-1 en la encapsulación VXLAN y se reenvíe después al proceso de resolución ARP completo 10.47.4.2 que compite.

Alcance básico de host en fabric SDA (misma VLAN/misma VPN)

Se supone que la resolución ARP se completó con éxito y que ambos hosts 10.47.4.2 y 10.47.4.3 tienen entradas ARP apropiadas para cada uno.

Desde la perspectiva de la solución de problemas, es muy útil configurar entradas ARP estáticas en ambos hosts para verificar rápidamente si el problema es con la conectividad genérica en el entramado (en tal caso, el ping no funciona entre los hosts) o solamente con el proceso ARP.

10.47.4.2 genera una solicitud ICMP hacia 10.47.4.3:

<#root>

```
Edge-1#
```

show monitor capture 1 buffer brief

```
Starting the packet display ........ Press Ctrl + Shift + 6 to exit

    1   0.000000    10.47.4.2 -> 10.47.4.3    ICMP 98 Echo (ping) request  id=0x0040, seq=3/768, ttl=64

Edge-1#
```

show monitor capture 1 buffer detail

```
Starting the packet display ........ Press Ctrl + Shift + 6 to exit

Frame 1: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface /tmp/epc_ws/wif_to_ts_p
    Interface id: 0 (/tmp/epc_ws/wif_to_ts_pipe)
        Interface name: /tmp/epc_ws/wif_to_ts_pipe
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 10, 2023 18:21:21.484694000 UTC
    [Time shift for this packet: 0.000000000 seconds]
    Epoch Time: 1696962081.484694000 seconds
    [Time delta from previous captured frame: 0.000000000 seconds]
    [Time delta from previous displayed frame: 0.000000000 seconds]
    [Time since reference or first frame: 0.000000000 seconds]
    Frame Number: 1
    Frame Length: 98 bytes (784 bits)
    Capture Length: 98 bytes (784 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:icmp:data]
Ethernet II, Src:
```

52:54:00:19:93:e9

```
 (52:54:00:19:93:e9), Dst:
```

52:54:00:1e:ad:00

```
 (52:54:00:1e:ad:00)
```

<-- Endpoint MAC, Anycast GW MAC respectively

```
    Destination: 52:54:00:1e:ad:00 (52:54:00:1e:ad:00)
        Address: 52:54:00:1e:ad:00 (52:54:00:1e:ad:00)
        .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory d
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Source: 52:54:00:19:93:e9 (52:54:00:19:93:e9)
        Address: 52:54:00:19:93:e9 (52:54:00:19:93:e9)
        .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory d
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: IPv4 (0x0800)
Internet Protocol Version 4, Src:
```

10.47.4.2

```
, Dst:
```

10.47.4.3

```
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
        0000 00.. = Differentiated Services Codepoint: Default (0)
        .... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
    Total Length: 84
    Identification: 0x7321 (29473)
    Flags: 0x4000, Don't fragment
        0... .... .... .... = Reserved bit: Not set
        .1.. .... .... .... = Don't fragment: Set
        ..0. .... .... .... = More fragments: Not set
    Fragment offset: 0
    Time to live: 64
    Protocol: ICMP (1)
    Header checksum: 0xab25 [validation disabled]
    [Header checksum status: Unverified]
    Source: 10.47.4.2
    Destination: 10.47.4.3
Internet Control Message Protocol
    Type: 8 (Echo (ping) request)
    Code: 0
    Checksum: 0x02ea [correct]
    [Checksum Status: Good]
    Identifier (BE): 64 (0x0040)
    Identifier (LE): 16384 (0x4000)
    Sequence number (BE): 3 (0x0003)
    Sequence number (LE): 768 (0x0300)
    Data (56 bytes)

0000  68 95 8c 3d 00 00 00 00 00 00 00 00 00 00 00 00   h..=............
0010  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
0020  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
0030  00 00 00 00 00 00 00 00                           ........
        Data: 68958c3d0000000000000000000000000000000000000000b^@&
        [Length: 56]
```

El paquete ICMP se envía hacia 10.47.4.3 al nodo perimetral especificado en el campo Locator: 10.47.1.13 (Edge-2) y se puede capturar a través de la captura de paquetes incrustada.

A medida que se recibe el paquete en la VLAN donde se habilita la extensión L2, la búsqueda se realiza en la instancia Ethernet de LISP:

<#root>

```
Edge-1#

show lisp instance-id 8190 ethernet map-cache 5254.001e.ad00

LISP MAC Mapping Cache for LISP 0 EID-table Vlan 1026 (IID 8190), 1 entries

5254.001e.ad00/48, uptime: 00:22:29, expires: 23:37:32, via map-reply, complete
  Sources: map-reply
  State: complete, last modified: 00:22:29, map-source: 10.47.1.13
  Active, Packets out: 42(0 bytes), counters are not accurate (~ 00:00:58 ago)
  Encapsulating dynamic-EID traffic
  Locator     Uptime    State  Pri/Wgt     Encap-IID
```

```
 10.47.1.13

  00:22:29  up      10/10        -
    Last up-down state change:         00:22:29, state change count: 1
    Last route reachability change:    00:22:29, state change count: 1
    Last priority / weight change:     never/never
    RLOC-probing loc-status algorithm:
      Last RLOC-probe sent:            00:22:28 (rtt 1609ms)
```

Verifique la dirección MAC del punto final remoto, señala el L2LI0, que se espera

<#root>

```
Edge-1#

show mac add add 5254.001e.ad00

          Mac Address Table
-------------------------------------------

Vlan    Mac Address       Type        Ports
----    -----------       --------    -----
1026    5254.001e.ad00    CP_LEARN    L2LI0
Total Mac Addresses installed by LISP: REMOTE: 1
```

Verifique la dirección MAC en FED, se puede obtener información adicional

<#root>

```
Edge-1#

show platform software fed sw active matm macTable vlan 1026 mac 5254.001e.ad00

VLAN   MAC                  Type  Seq#    EC_Bi  Flags

machandle


siHandle


riHandle

            diHandle              *a_time  *e_time  ports
-------------------------------------------------------------------------------------------------------------

1026


5254.001e.ad00

  0x1000001       0      0     64

0x7f65ecfdd3a8
```

0x7f65ecfdd1f8

0x7f65ecfdd048

```
      0x0                          0        2  RLOC 10.47.1.13 adj_id 97

======platform hardware details ======

Asic: 0

 htm-handle = 0x7f65ecc4d188 MVID = 7 gpn = 1
 SI = 0xc7 RI = 0x12 DI = 0x5012
Asic: 1
 SI = 0xc7 RI = 0x12 DI = 0x5013
```

MAC Address macHandle Decode

Tome el macHandle (0x7f65ecfdd3a8) del comando anterior y utilícelo en el comando show platform hardware fed switch active fwd-asic abstraction print-resource-handle <macHandle> 1

<#root>

```
Edge-1#
```

show platform hardware fed switch active fwd-asic abstraction print-resource-handle 0x7f65ecfdd3a8 1

```
Handle:0x7f65ecfdd3a8 Res-Type:ASIC_RSC_HASH_TCAM Res-Switch-Num:0 Asic-Num:255 Feature-ID:AL_FID_L2_WI
priv_ri/priv_si Handle: (nil)Hardware Indices/Handles: handle [ASIC: 0]: 0x7f65ecc4d188
Features sharing this resource:Cookie length: 12
1e 00 54 52 00 ad 07 80 07 00 00 00


Detailed Resource Information (ASIC_INSTANCE# 0)
----------------------------------------
Number of HTM Entries: 1

Entry 0: (handle 0x7f65ecc4d188)

Absolute Index: 4706
Time Stamp: 14
KEY -
```

vlan:7

mac:0x5254001ead00

```
 l3_if:0
```

gpn:3401

```
 epoch:0 static:0 flood_en:0 vlan_lead_wless_flood_en: 0 client_home_asic: 0 learning_peerid 0, learnin
MASK - vlan:0 mac:0x0 l3_if:0 gpn:0 epoch:0 static:0 flood_en:0 vlan_lead_wless_flood_en: 0 client_home_
SRC_AD - need_to_learn:0 lrn_v:0 catchall:0 static_mac:0 chain_ptr_v:0 chain_ptr: 0 static_entry_v:0 au
DST_AD - si:0xc7 bridge:0 replicate:0 blk_fwd_o:0 v4_rmac:0 v6_rmac:0 catchall:0 ign_src_lrn:0 port_mas
```

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

Descodificación siHandle de dirección MAC

Tome el siHandle (0x7f65ecfdd1f8) del comando anterior y úselo en el comando show platform hardware fed switch active fwd-asic abstraction print-resource-handle <siHandle> 1

<#root>

```
Edge-1#

show platform hardware fed switch active fwd-asic abstraction print-resource-handle 0x7f65ecfdd1f8 1

Handle:0x7f65ecfdd1f8 Res-Type:ASIC_RSC_SI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L2_WIRELES
priv_ri/priv_si Handle: 0x7f65ecfdd048Hardware Indices/Handles: index0:0xc7  mtu_index/l3u_ri_index0:0x
Features sharing this resource:58 (1)]
Cookie length: 56
00 00 00 00 00 00 00 00 02 04 00 00 00 00 00 00 00 00 00 00 07 00 61 00 00 00 00 00 00 00 00 00 00 00 0

Detailed Resource Information (ASIC_INSTANCE# 0)
----------------------------------------

Station Index (SI) [0xc7] <-- Contains the Rewrite Index (RI) and Outgoing Interface Information (DI)
RI = 0x12 <-- Rewrite Index = Contains information for forwarding
DI = 0x5012 <-- Destination Index = Outgoing Interface

stationTableGenericLabel = 0
stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0
rcpServiceId = 0
dejaVuPreCheckEn = 0
Replication Bitmap: LD

Detailed Resource Information (ASIC_INSTANCE# 1)
----------------------------------------

Station Index (SI) [0xc7] <-- Contains the Rewrite Index (RI) and Outgoing Interface Information (DI)
RI = 0x12 <-- Rewrite Index = Contains information for forwarding
DI = 0x5013 <-- Destination Index = Outgoing Interface

stationTableGenericLabel = 0
stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0
rcpServiceId = 0
dejaVuPreCheckEn = 0
Replication Bitmap: LD

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

Reescritura de decodificación de índice

Tome el RI (0x12) y use en el comando show platform hardware fed switch active fwd-asic

resource asic all rewrite-index range <RI> <RI>

<#root>

```
Edge-1#

show platform hardware fed switch active fwd-asic resource asic all rewrite-index range 0x12 0x12

ASIC#:0 RI:18 Rewrite_type:AL_RRM_REWRITE_L2_PAYLOAD_L2LISP_ENCAP(115) Mapped_rii:LVX_L2_ENCAP_L2_PAYLO
 Src IP:

10.47.1.12 <-- Local RLOC

 Dst IP:

10.47.1.13 <-- Remote RLOC

 iVxlan dstMac:  0x5254:0x01c:0x7de0
 iVxlan srcMac:  0x00:0x00:0x00
 IPv4 TTL:       0
 iid present:    1
 lisp iid:       0
 lisp flags:     0
 dst Port:       4789
 update only l3if:       0
 is Sgt:         1
 is TTL Prop:    0
 L3if LE:        0 (0)
 Port LE:        0 (0)
 Vlan LE:        7 (0)

ASIC#:1 RI:18 Rewrite_type:AL_RRM_REWRITE_L2_PAYLOAD_L2LISP_ENCAP(115) Mapped_rii:LVX_L2_ENCAP_L2_PAYLO
 Src IP:

10.47.1.12 <-- Local RLOC

 Dst IP:

10.47.1.13 <-- Remote RLOC

 iVxlan dstMac:  0x5254:0x01c:0x7de0
 iVxlan srcMac:  0x00:0x00:0x00
 IPv4 TTL:       0
 iid present:    1
 lisp iid:       0
 lisp flags:     0
 dst Port:       4789
 update only l3if:       0
 is Sgt:         1
 is TTL Prop:    0
 L3if LE:        0 (0)
 Port LE:        0 (0)
 Vlan LE:        7 (0)
```

Destination-Index Decode

Tome el DI (0x5012) y utilícelo en el comando show platform hardware fed switch active fwd-asic resource asic all destination-index range <DI> <DI>

<#root>

```
Edge-1#

show platform hardware fed switch active fwd-asic resource asic all destination-index range 0x5012 0x501

ASIC#0:

Destination index   = 0x5012

DI_RCP_PORT1 <-- Recirculation port for VXLAN imposition

pmap                = 0x00000000 0x00000000
cmi                 = 0x0
rcp_pmap            = 0x1
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
ASIC#1:

Destination index   = 0x5012

DI_RCP_PORT1 <-- Recirculation port for VXLAN imposition

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
```

descodificación siHandle

Tome el siHandle (0x7f65ecfdd048) y úselo en el comando show platform hardware fed switch active fwd-asic abstraction print-resource-handle <siHandle> 1

<#root>

```
Edge-1#

show platform hardware fed switch active fwd-asic abstraction print-resource-handle 0x7f65ecfdd048 1

Handle:0x7f65ecfdd048 Res-Type:ASIC_RSC_RI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L2_WIRELES
priv_ri/priv_si Handle: 0x7f65ecfdcd78Hardware Indices/Handles: index0:0x12  mtu_index/l3u_ri_index0:0x
```

```
Features sharing this resource:58 (1)]
Cookie length: 56
00 00 00 00 00 00 00 00 02 04 00 00 00 00 00 00 00 00 00 00 07 00 61 00 00 00 00 00 00 00 00 00 00 00 0

Detailed Resource Information (ASIC_INSTANCE# 0)
----------------------------------------
ASIC#:0 RI:18 Rewrite_type:AL_RRM_REWRITE_L2_PAYLOAD_L2LISP_ENCAP(115) Mapped_rii:LVX_L2_ENCAP_L2_PAYLO
 Src IP:
```

10.47.1.12 <-- Local RLOC

```
 Dst IP:
```

10.47.1.13 <-- Remote RLOC

```
 iVxlan dstMac:     0x610:0x00:0x00
 iVxlan srcMac:     0x00:0x00:0x00
 IPv4 TTL:     0
 iid present:     1
 lisp iid:     0
 lisp flags:     0
 dst Port:     4789
 update only l3if:     0
 is Sgt:     1
 is TTL Prop:     0
 L3if LE:     0 (0)
 Port LE:     279 (0)
 Vlan LE:     7 (0)

Detailed Resource Information (ASIC_INSTANCE# 1)
----------------------------------------
ASIC#:1 RI:18 Rewrite_type:AL_RRM_REWRITE_L2_PAYLOAD_L2LISP_ENCAP(115) Mapped_rii:LVX_L2_ENCAP_L2_PAYLO
Src IP:
```

10.47.1.12 <-- Local RLOC

```
Dst IP:
```

10.47.1.13 <-- Remote RLOC

```
 iVxlan dstMac:     0x610:0x00:0x00
 iVxlan srcMac:     0x00:0x00:0x00
 IPv4 TTL:     0
 iid present:     1
 lisp iid:     0
 lisp flags:     0
 dst Port:     4789
 update only l3if:     0
 is Sgt:     1
 is TTL Prop:     0
 L3if LE:     0 (0)
 Port LE:     279 (0)
 Vlan LE:     7 (0)

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

Verificación de ruta subyacente

El tráfico se encapsula en VXLAN con ID 8190 usando 10.47.1.12 y tiene la capacidad de balancear la carga en Gig1/0/1 y G1/0/2

<#root>

```
Edge-1#
```

show ip route 10.47.1.13

```
Routing entry for 10.47.1.13/32
  Known via "isis", distance 115, metric 30, type level-2
  Redistributing via isis
  Last update from 10.47.1.4 on GigabitEthernet1/0/2, 2d22h ago
  Routing Descriptor Blocks:
    10.47.1.4, from 10.47.1.13, 2d22h ago, via GigabitEthernet1/0/2
      Route metric is 30, traffic share count is 1
  * 10.47.1.0, from 10.47.1.13, 2d22h ago, via GigabitEthernet1/0/1
      Route metric is 30, traffic share count is 1

Edge-1#
```

show ip cef 10.47.1.13

```
10.47.1.13/32
  nexthop 10.47.1.0 GigabitEthernet1/0/1
  nexthop 10.47.1.4 GigabitEthernet1/0/2
```

Para obtener la información si_hdl, ri_hdl, utilice el comando show platform software fed switch active ip adj

<#root>

```
Edge-1#
```

show platform software fed switch active ip adj

```
IPV4 Adj entries
dest                                    if_name                dst_mac          si_hdl          r
----                                    -------                -------          ------          -
225.0.0.0                               GigabitEthernet1/0/1   0100.5e00.0000   0x7f65ec958128 0
10.47.1.10                              LISP0.4100             4500.0000.0000   0x7f65ec895ed8 0
225.0.0.0                               GigabitEthernet1/0/2   0100.5e00.0000   0x7f65ec958f68 0

10.47.1.4                               GigabitEthernet1/0/2   5254.001c.7de0   0x7f65ec8a5458 0x

225.0.0.0                               Null0                  f800.0011.0000   0x7f65ec3740c8 0

10.47.1.0                               GigabitEthernet1/0/1   5254.000a.42f3   0x7f65ec8b8468 0x
```

Decodificación si_hdl de próximo salto subyacente

Para verificar si_hdl (0x7f65ec8a5458) utilice el comando show platform hardware fed switch

active fwd-asic abstraction print-resource-handle <si_hdl> 1

<#root>

```
Edge-1#

show platform hardware fed switch active fwd-asic abstraction print-resource-handle 0x7f65ec8a5458 1

Handle:0x7f65ec8a5458 Res-Type:ASIC_RSC_SI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L3_UNICAST
priv_ri/priv_si Handle: 0x7f65ec8a4eb8Hardware Indices/Handles: index0:0xbc  mtu_index/l3u_ri_index0:0x
Features sharing this resource:66 (1)]
Cookie length: 56
00 00 00 00 00 00 00 00 26 00 00 00 00 00 00 00 00 00 00 00 08 00 52 54 00 1c 7d e0 00 00 00 00 00 00 0
Detailed Resource Information (ASIC_INSTANCE# 0)
----------------------------------------

Station Index (SI) [0xbc]     -----> Contains RI and DI information
RI = 0x1a             -----> Rewrite Index = MAC address rewrite information for L3 forwarding to the ne
DI = 0x526d            -----> Destination Index = Outgoing Interface

stationTableGenericLabel = 0
stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0
rcpServiceId = 0
dejaVuPreCheckEn = 0

Replication Bitmap: LD         -----> Local Data, indicating that this ASIC is directly connected to the


Detailed Resource Information (ASIC_INSTANCE# 1)
----------------------------------------

Station Index (SI) [0xbc]     -----> Contains RI and DI information
RI = 0x1a             -----> Rewrite Index = MAC address rewrite information for L3 forwarding to the ne
DI = 0x526d            -----> Destination Index = Outgoing Interface

stationTableGenericLabel = 0
stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0
rcpServiceId = 0
dejaVuPreCheckEn = 0

Replication Bitmap: CD        -----> Core Data, indicating that this instance of the ASIC is on the same

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

Decodificación de índice de reescritura de salto siguiente subyacente

Para decodificar el RI (0x1a), utilice el comando show platform hardware fed switch active fwd-asic resource asic all rewrite-index range <RI> <RI>

<#root>

```
Edge-1#

show platform hardware fed switch active fwd-asic resource asic all rewrite-index range 0x1a 0x1a

ASIC#:0
```

```
 RI:26

 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)

-----> Decimal 26 is hex 0x1a

MAC Addr: MAC Addr: 52:54:00:1c:7d:e0,

-----> MAC address 5254.001c.7de0 for the next-hop adjacency

L3IF LE Index 38
ASIC#:1 RI:26 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)
MAC Addr: MAC Addr: 52:54:00:1c:7d:e0,

-----> MAC address 5254.001c.7de0 for the next-hop adjacency

L3IF LE Index 38
```

Decodificación del índice de destino de próximo salto subyacente

Para decodificar el ID (0x526d), use en show platform hardware fed switch active fwd-asic resource asic all destination-index range <DI> <DI>

<#root>

```
Edge-1#

show platform hardware fed switch active fwd-asic resource asic all destination-index range 0x526d 0x526

ASIC#0:

Destination index   = 0x526d

pmap                = 0x00000000 0x00000002 <-- Convert decimal 2 to binary, which is 0010. Count this b

pmap_intf : [GigabitEthernet1/0/2]
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
ASIC#1:

Destination index   = 0x526d
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

Edge-1#

show platform software fed switch active ifm mappings

Interface                IF_ID    Inst Asic Core

Port

 SubPort Mac  Cntx LPN  GPN  Type Active
GigabitEthernet1/0/1      0x1a       0   0   0    0      0      1    0    1    1    NIF  Y

GigabitEthernet1/0/2

 0x1b       0   0   0

1

     0      2    1    2    2    NIF  Y

<-- Port 1 lines up to G1/0/2

GigabitEthernet1/0/3      0xb        0   0   0    2      0      3    2    3    3    NIF  Y
GigabitEthernet1/0/4      0xc        0   0   0    3      0      4    3    4    4    NIF  Y
GigabitEthernet1/0/5      0xd        0   0   0    4      0      5    4    5    5    NIF  Y
GigabitEthernet1/0/6      0xe        0   0   0    5      0      6    5    6    6    NIF  Y
GigabitEthernet1/0/7      0xf        0   0   0    6      0      7    6    7    7    NIF  Y
GigabitEthernet1/0/8      0x10       0   0   0    7      0      8    7    8    8    NIF  Y
```

Descodificación ri_hdl de próximo salto subyacente

Para descodificar ri_hdl (0x7f65ec8a4eb8), utilice en show platform hardware fed switch active fwd-asic abstraction print-resource-handle (ri_hdl) 1

<#root>

```
Edge-1#

show platform hardware fed switch active fwd-asic abstraction print-resource-handle 0x7f65ec8a4eb8 1

Handle:0x7f65ec8a4eb8 Res-Type:ASIC_RSC_RI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L3_UNICAST_
priv_ri/priv_si Handle: 0x7f65ec903b28Hardware Indices/Handles: index0:0x1a  mtu_index/l3u_ri_index0:0x0
Features sharing this resource:66 (1)]
Cookie length: 56
00 00 00 00 00 00 00 00 26 00 00 00 00 00 00 00 00 00 00 00 08 00 52 54 00 1c 7d e0 00 00 00 00 00 00 0

Detailed Resource Information (ASIC_INSTANCE# 0)
----------------------------------------
ASIC#:0

RI:26

 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)
```

```
<-- Decimal 26 is 0x1a in hex

    MAC Addr: MAC Addr:

52:54:00:1c:7d:e0

,

<-- MAC address 5254.001c.7de0 for the next-hop adjacency

    L3IF LE Index 38


Detailed Resource Information (ASIC_INSTANCE# 1)
----------------------------------------
ASIC#:1

RI:26

 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)

<-- Decimal 26 is 0x1a in hex

 MAC Addr: MAC Addr:

52:54:00:1c:7d:e0

,
    MAC Addr: MAC Addr:

52:54:00:1c:7d:e0

,

<-- MAC address 5254.001c.7de0 for the next-hop adjacency


    L3IF LE Index 38


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

Alcance básico de host en fabric SDA (diferentes VLAN/misma VPN)

En esta sección, se examina la comunicación entre 10.47.4.2 y 10.47.10.2. Como estos hosts pertenecen a diferentes VLAN, ambos necesitan tener default-gateway configurado que apunte a default gateway. Para 10.47.4.2 es 10.47.4.1 y 10.47.10.2 es 10.47.10.1.

Paso 1. Confirme que la conectividad entre el terminal y el gateway predeterminado funcione:

<#root>

```
Edge-1#

ping vrf red_vn 10.47.4.2

Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 10.47.4.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 155/164/181 ms
```

<#root>

```
Edge-2#
```

ping vrf red_vn 10.47.10.1

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.47.10.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 41/46/62 ms
```

Paso 2. Confirme que el paquete de 10.47.4.2 sea recibido con éxito por Edge-1:

El paquete se puede capturar en la interfaz de ingreso orientada a 10.47.4.2:

<#root>

```
Edge-1#
```

monitor capture 1 interface g1/0/3 in match any

```
Edge-1#
```

mon cap 1 start

```
Started capture point : 1
Edge-1#
```

mon cap 1 stop

```
Capture statistics collected at software:
    Capture duration - 12 seconds
    Packets received - 9
    Packets dropped - 0
    Packets oversized - 0

Number of Bytes dropped at asic not collected

Capture buffer will exists till exported or cleared

Stopped capture point : 1

Edge-1#
```

show monitor capture 1 buffer brief

```
Starting the packet display ........ Press Ctrl + Shift + 6 to exit

    1   0.000000    10.47.4.2 -> 10.47.10.2   ICMP 98 Echo (ping) request  id=0x0041, seq=0/0, ttl=64
    2   0.023447    10.47.4.2 -> 10.47.10.2   ICMP 98 Echo (ping) request  id=0x0041, seq=0/0, ttl=64

Edge-1#
```

show monitor capture 1 buffer detailed

```
Starting the packet display ........ Press Ctrl + Shift + 6 to exit

Frame 1: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface /tmp/epc_ws/wif_to_ts_p
    Interface id: 0 (/tmp/epc_ws/wif_to_ts_pipe)
        Interface name: /tmp/epc_ws/wif_to_ts_pipe
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 11, 2023 15:27:46.033825000 UTC
    [Time shift for this packet: 0.000000000 seconds]
    Epoch Time: 1697038066.033825000 seconds
    [Time delta from previous captured frame: 0.000000000 seconds]
    [Time delta from previous displayed frame: 0.000000000 seconds]
    [Time since reference or first frame: 0.000000000 seconds]
    Frame Number: 1
    Frame Length: 98 bytes (784 bits)
    Capture Length: 98 bytes (784 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:icmp:data]
Ethernet II, Src: 52:54:00:19:93:e9 (
```

52:54:00:19:93:e9

```
), Dst: 00:00:0c:9f:f3:41 (
```

00:00:0c:9f:f3:41

```
)
```

<-- SMAC and DMAC respectively

```
    Destination: 00:00:0c:9f:f3:41 (00:00:0c:9f:f3:41)
        Address: 00:00:0c:9f:f3:41 (00:00:0c:9f:f3:41)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Source: 52:54:00:19:93:e9 (52:54:00:19:93:e9)
        Address: 52:54:00:19:93:e9 (52:54:00:19:93:e9)
        .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory d
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: IPv4 (0x0800)
Internet Protocol Version 4, Src:
```

10.47.4.2

```
, Dst:
```

10.47.10.2

```
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
        0000 00.. = Differentiated Services Codepoint: Default (0)
        .... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
    Total Length: 84
    Identification: 0x395e (14686)
    Flags: 0x4000, Don't fragment
        0... .... .... .... = Reserved bit: Not set
        .1.. .... .... .... = Don't fragment: Set
        ..0. .... .... .... = More fragments: Not set
    Fragment offset: 0
    Time to live: 64
    Protocol: ICMP (1)
    Header checksum: 0xdee9 [validation disabled]
    [Header checksum status: Unverified]
    Source: 10.47.4.2
```

```
    Destination: 10.47.10.2
Internet Control Message Protocol
    Type: 8 (Echo (ping) request)
    Code: 0
    Checksum: 0x248a [correct]
    [Checksum Status: Good]
    Identifier (BE): 65 (0x0041)
    Identifier (LE): 16640 (0x4100)
    Sequence number (BE): 0 (0x0000)
    Sequence number (LE): 0 (0x0000)
    Data (56 bytes)

0000  2a 46 a8 ee 00 00 00 00 00 00 00 00 00 00 00 00   *F..............
0010  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
0020  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
0030  00 00 00 00 00 00 00 00                           ........
        Data: 2a46a8ee0000000000000000000000000000000000000000b^@&
        [Length: 56]
```

Paso 3: Búsqueda de LISP

El nodo de borde de ingreso debe determinar la ubicación (RLOC) del HOST-03 al que envía paquetes. Como en este caso el host final HOST-03 está en VLAN diferente (pero la misma VLAN / VRF: USUARIOS), se utiliza la instancia IPv4 de LISP ya que la búsqueda se basa en la dirección IP (la dirección MAC pertenece al propio nodo de borde).

<#root>

```
Edge-1#
```

debug lisp control-plane all

```
LISP[REMT ]-0: Map Request: Sending request for IID 4099 EID 10.47.10.2/32, requester 'remote EID prefi
LISP[REMT ]-0: Map-Reply nonce matches pending request for IID 4099 EID 10.47.10.2/32, requester 'remot
```

La solicitud de mapa LISP alcanza el límite 1 del nodo de control (servidor de mapa LISP):

<#root>

```
Border-1#
```

debug lisp control-plane all

```
LISP[TRNSP]-0: Processing received Map-Request(1) message on GigabitEthernet1/0/3 from 10.47.10.2:4342
LISP[MR   ]-0: Received Map-Request with 1 records, first EID IID 4099 10.47.10.2/32, source EID 10.47.
LISP[MR   ]-0 IID 4099 IPv4: MS EID 10.47.10.2/32: Sending proxy reply to 10.47.1.12.
```

LISP Map-Reply alcanza el nodo perimetral:

```
LISP[REMT ]-0: Processing Map-Reply mapping record for IID 4099 IPv4 10.47.10.2/32 LCAF 2, ttl 1440, ac
```

```
LISP[REMT ]-0: Processing mapping information for EID prefix IID 4099 10.47.10.2/32.
```

El Fabric Edge consulta el RLOC para 10.47.10.2 y procesa el mapa-respuesta

```
LISP[REMT ]-0: Map Request: Sending request for IID 4099 EID 10.47.10.2/32, requester 'remote EID RLOC'
LISP[REMT ]-0: Processing Map-Reply mapping record for IID 4099 IPv4 10.47.10.2/32 LCAF 2, ttl 1440, ac
LISP[REMT ]-0: Processing mapping information for EID prefix IID 4099 10.47.10.2/32.
```

En caso de que la entrada no exista, las depuraciones deben recopilarse desde la perspectiva del proceso LISP. También hay una herramienta, llamada LIG (LISP Grouper) que se puede utilizar para activar manualmente el proceso LISP (esta es una manera muy efectiva de probar la configuración redundante del nodo de control y la coherencia de la base de datos entre ambos nodos de control):

<#root>

```
Edge-1#
```

lig instance-id 4099 10.47.10.2 to 10.47.1.10

```
Mapping information for EID 10.47.10.2 from 10.47.1.10 with RTT 334 msecs
10.47.10.2/32, uptime: 00:00:00, expires: 23:59:59, via map-reply, complete
  Locator     Uptime    State  Pri/Wgt     Encap-IID
  10.47.1.13  00:00:00  up      10/10        -

Edge-1#
```

lig instance-id 4099 10.47.10.2 to 10.47.1.11

```
Mapping information for EID 10.47.10.2 from 10.47.1.11 with RTT 327 msecs
10.47.10.2/32, uptime: 00:00:06, expires: 23:59:59, via map-reply, complete
  Locator     Uptime    State  Pri/Wgt     Encap-IID
  10.47.1.13  00:00:06  up      10/10        -
```

Verificación de ruta

CEF utiliza LISP y LISP utiliza la entrada de la memoria caché de mapas que ha recibido

<#root>

```
Edge-1#
```

show ip cef vrf red_vn 10.47.10.2

```
10.47.10.2/32
  nexthop 10.47.1.13 LISP0.4099

Edge-1#
```

show ip route 10.47.1.13

```
Routing entry for 10.47.1.13/32
  Known via "isis", distance 115, metric 30, type level-2
  Redistributing via isis
  Last update from 10.47.1.4 on GigabitEthernet1/0/2, 3d19h ago
  Routing Descriptor Blocks:
    10.47.1.4, from 10.47.1.13, 3d19h ago, via GigabitEthernet1/0/2
      Route metric is 30, traffic share count is 1
  * 10.47.1.0, from 10.47.1.13, 3d19h ago, via GigabitEthernet1/0/1
      Route metric is 30, traffic share count is 1

Edge-1#
```

show lisp instance-id 4099 ipv4 map-cache 10.47.10.2

```
LISP IPv4 Mapping Cache for LISP 0 EID-table vrf red_vn (IID 4099), 1 entries


10.47.10.2

/32, uptime: 00:08:48, expires: 23:51:17, via map-reply, complete
  Sources: map-reply
  State: complete, last modified: 00:08:48, map-source: 10.47.1.11
  Active, Packets out: 51(29376 bytes), counters are not accurate (~ 00:00:15 ago)
  Encapsulating dynamic-EID traffic
  Locator     Uptime    State  Pri/Wgt     Encap-IID


10.47.1.13

  00:08:48  up      10/10        -
    Last up-down state change:         00:08:48, state change count: 1
    Last route reachability change:    22:07:12, state change count: 1
    Last priority / weight change:     never/never
    RLOC-probing loc-status algorithm:
      Last RLOC-probe sent:            00:08:48 (rtt 931ms)
```

Verificación de Siguiente Salto de LISP

Dado que este paquete está encapsulado en VXLAN, debe verificarse el siguiente salto LISP. Utilice el comando show platform software fed switch active ip adj para obtener información adicional sobre 10.47.1.13, el salto siguiente LISP

<#root>

```
Edge-1#
```

show platform software fed switch active ip adj

```
IPV4 Adj entries
dest                                    if_name                dst_mac          si_hdl         r
----                                    -------                -------          ------         -
10.47.1.10                              LISP0.4100             4500.0000.0000   0x7f65ec895ed8 0
10.47.1.4                               GigabitEthernet1/0/2   5254.001c.7de0   0x7f65ec8a5458 0
10.47.1.0                               GigabitEthernet1/0/1   5254.000a.42f3   0x7f65ec8b8468 0
10.47.4.2                               Vlan1026               5254.0019.93e9   0x7f65ec7c21f8 0

10.47.1.13                              LISP0.4099             4500.0000.0000   0x7f65ed00f668 0x
```

LISP Next-Hop si_hdl Decode

Tome el si_hdl (0x7f65ed00f668) y utilícelo en show platform hardware fed switch active fwd-asic abstraction print-resource-handle <si_hdl> 1

<#root>

```
Edge-1#

show platform hardware fed switch active fwd-asic abstraction print-resource-handle 0x7f65ed00f668 1

Handle:0x7f65ed00f668 Res-Type:ASIC_RSC_SI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_LISP Lkp-f
priv_ri/priv_si Handle: 0x7f65ed00fd58Hardware Indices/Handles: index0:0xc8  mtu_index/l3u_ri_index0:0x
Features sharing this resource:109 (1)]
Cookie length: 56
00 00 00 00 00 00 00 00 38 5f 84 ec 0a 2f 01 0d ff ff ff ff 00 00 00 00 00 00 00 00 00 00 00 00 00 00


Detailed Resource Information (ASIC_INSTANCE# 0)
----------------------------------------


Station Index (SI) [0xc8] <-- Contains the RI and DI
RI = 0x2c <-- Rewrite Index contains information for L3 Forwarding
DI = 0x5012 <-- Destination Index contains information for the destination port

stationTableGenericLabel = 0
stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0xc
rcpServiceId = 0
dejaVuPreCheckEn = 0
Replication Bitmap: LD


Detailed Resource Information (ASIC_INSTANCE# 1)
----------------------------------------

Station Index (SI) [0xc8] <-- Contains the RI and DI
RI = 0x2c <-- Rewrite Index contains information for L3 Forwarding
DI = 0x5013 <-- Destination Index contains information for the destination port

stationTableGenericLabel = 0
stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0xc
rcpServiceId = 0
dejaVuPreCheckEn = 0
Replication Bitmap: LD

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

Descodificación LISP de RI de próximo salto

Tome el RI (0x2c) y use en show platform hardware fed switch active fwd-asic resource asic all rewrite-index range <RI> <RI>

<#root>

```
Edge-1#

show platform hardware fed switch active fwd-asic resource asic all rewrite-index range 0x2c 0x2c

ASIC#:0 RI:44 Rewrite_type:AL_RRM_REWRITE_IPV4_VXLAN_INNER_IPV4_ENCAP(110) Mapped_rii:LVX_L3_ENCAP_L2_PA
 Dst Mac:     MAC Addr: ba:25:cd:f4:ad:38,
 Src IP:

10.47.1.12 <-- Local RLOC

 Dst IP:

10.47.1.13 <-- RLOC of Edge-2

 IPv4 TTL:     0
 LISP INSTANCEID:     0
 L3IF LE Index:     46

ASIC#:1 RI:44 Rewrite_type:AL_RRM_REWRITE_IPV4_VXLAN_INNER_IPV4_ENCAP(110) Mapped_rii:LVX_L3_ENCAP_L2_PA
 Dst Mac:     MAC Addr: ba:25:cd:f4:ad:38,
 Src IP:

10.47.1.12 <-- Local RLOC


 Dst IP:

10.47.1.13 <-- RLOC of Edge-2


 IPv4 TTL:     0
 LISP INSTANCEID:     0
 L3IF LE Index:     46
```

Decodificación de ID de próximo salto LISP

Tome el DI (0x5012) y utilícelo en show platform hardware fed switch active fwd-asic resource asic all destination-index range <DI> <DI>

<#root>

```
Edge-1#

show platform hardware fed switch active fwd-asic resource asic all destination-index range 0x5012 0x501

ASIC#0:

Destination index   = 0x5012

DI_RCP_PORT1 <-- Expected, this means the packet is recirculated for VXLAN imposition

pmap                = 0x00000000 0x00000000
cmi                 = 0x0
rcp_pmap            = 0x1
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
ASIC#1:

Destination index   = 0x5012
```

DI_RCP_PORT1 <-- Expected, this means the packet is recirculated for VXLAN imposition

```
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
```

LISP Next-Hop ri_hdl Decode

Tome el ri_hdl (0x7f65ed00fd58) y utilícelo en el comando show platform hardware fed switch active fwd-asic abstraction print-resource-handle <ri_hdl> 1

<#root>

```
Edge-1#
```

show platform hardware fed switch active fwd-asic abstraction print-resource-handle 0x7f65ed00fd58 1

```
Handle:0x7f65ed00fd58 Res-Type:ASIC_RSC_RI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_LISP Lkp-f
priv_ri/priv_si Handle: 0x7f65ed00b618Hardware Indices/Handles: index0:0x2c  mtu_index/l3u_ri_index0:0x
Features sharing this resource:109 (1)]
Cookie length: 56
00 00 00 00 00 00 00 00 2e 00 00 00 0a 2f 01 0d ff ff ff ff 00 00 00 00 00 00 00 00 00 00 00 00 00 0


Detailed Resource Information (ASIC_INSTANCE# 0)
----------------------------------------
ASIC#:0 RI:44 Rewrite_type:AL_RRM_REWRITE_IPV4_VXLAN_INNER_IPV4_ENCAP(110) Mapped_rii:LVX_L3_ENCAP_L2_P
 Dst Mac:     MAC Addr: ba:25:cd:f4:ad:38,
 Src IP:
```

10.47.1.12 <-- Local RLOC

```
 Dst IP:
```

10.47.1.13 <-- Edge-2 RLOC

```
 IPv4 TTL:     0
 LISP INSTANCEID:     0
 L3IF LE Index:     46
```

```
Detailed Resource Information (ASIC_INSTANCE# 1)
----------------------------------------
ASIC#:1 RI:44 Rewrite_type:AL_RRM_REWRITE_IPV4_VXLAN_INNER_IPV4_ENCAP(110) Mapped_rii:LVX_L3_ENCAP_L2_PA
 Dst Mac:     MAC Addr: ba:25:cd:f4:ad:38,
 Src IP:
```

10.47.1.12 <-- Local RLOC

```
 Dst IP:
```

10.47.1.13 <-- Edge-2 RLOC

```
 IPv4 TTL:     0
 LISP INSTANCEID:     0
 L3IF LE Index:     46

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

Verificación de próximo salto subyacente

Para llegar al Siguiente Salto de LISP, hay dos trayectorias posibles en la capa subyacente, la verificación ocurre para una, la misma lógica se aplica en la verificación del otro salto siguiente de la capa subyacente.

<#root>

```
Edge-1#
```

show ip route 10.47.1.13

```
Routing entry for 10.47.1.13/32
  Known via "isis", distance 115, metric 30, type level-2
  Redistributing via isis
  Last update from 10.47.1.4 on GigabitEthernet1/0/2, 3d19h ago
  Routing Descriptor Blocks:
```

10.47.1.4

```
, from 10.47.1.13, 3d19h ago, via GigabitEthernet1/0/2
      Route metric is 30, traffic share count is 1
  *
```

10.47.1.0

```
, from 10.47.1.13, 3d19h ago, via GigabitEthernet1/0/1
      Route metric is 30, traffic share count is 1
```

Para obtener más información sobre los saltos siguientes, utilice show platform software fed switch active ip adj

<#root>

```
Edge-1#
```

```
show platform software fed switch active ip adj

IPV4 Adj entries
dest                                    if_name                 dst_mac          si_hdl          r
----                                    -------                 -------          ------          -

10.47.1.4                               GigabitEthernet1/0/2    5254.001c.7de0   0x7f65ec8a5458 0x

10.47.1.0                               GigabitEthernet1/0/1    5254.000a.42f3   0x7f65ec8b8468 0x

<snip>
```

Decodificación si_hdl de próximo salto subyacente

Tome el si_hdl (0x7f65ec8a5458) y utilícelo en el comando show platform hardware fed switch active fwd-asic abstraction print-resource-handle <si_hdl> 1

<#root>

```
Edge-1#

show platform hardware fed switch active fwd-asic abstraction print-resource-handle 0x7f65ec8a5458 1

Handle:0x7f65ec8a5458 Res-Type:ASIC_RSC_SI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L3_UNICAST_
priv_ri/priv_si Handle: 0x7f65ec8a4eb8Hardware Indices/Handles: index0:0xbc  mtu_index/l3u_ri_index0:0x0
Features sharing this resource:66 (1)]
Cookie length: 56
00 00 00 00 00 00 00 00 26 00 00 00 00 00 00 00 00 00 00 00 08 00 52 54 00 1c 7d e0 00 00 00 00 00 00 0

Detailed Resource Information (ASIC_INSTANCE# 0)
----------------------------------------

Station Index (SI) [0xbc] <-- Contains the RI and DI
RI = 0x1a <-- Rewrite index contains information for L3 Forwarding
DI = 0x526d <-- Destination index contains information for the destination port

stationTableGenericLabel = 0
stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0
rcpServiceId = 0
dejaVuPreCheckEn = 0
Replication Bitmap: LD

Detailed Resource Information (ASIC_INSTANCE# 1)
----------------------------------------

Station Index (SI) [0xbc] <-- Contains the RI and DI
RI = 0x1a <-- Rewrite index contains information for L3 Forwarding
DI = 0x526d <-- Destination index contains information for the destination port

stationTableGenericLabel = 0
stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0
rcpServiceId = 0
dejaVuPreCheckEn = 0
Replication Bitmap: CD
```

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

Descodificación RI de próximo salto subyacente

Tome el RI (0x1a) y use en el comando show platform hardware fed switch active fwd-asic resource asic all rewrite-index range <RI> <RI>

<#root>

```
Edge-1#
show platform hardware fed switch active fwd-asic resource asic all rewrite-index range 0x1a 0x1a
ASIC#:0
RI:26
 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)
<-- Decimal 26 is hex 0x1a
    MAC Addr: MAC Addr:
52:54:00:1c:7d:e0
,
<-- MAC Address 5254.001c.7de0 corresponds to the next-hop
    L3IF LE Index 38

ASIC#:1
RI:26
 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)
<-- Decimal 26 is hex 0x1a
    MAC Addr: MAC Addr:
 52:54:00:1c:7d:e0
,
<-- MAC Address 5254.001c.7de0 corresponds to the next-hop
    L3IF LE Index 38
```

Decodificación de Next Hop DI subyacente

Tome el DI (0x526d) y utilícelo en el comando show platform hardware fed switch active fwd-asic resource asic all destination-index range <DI> <DI>

<#root>

```
Edge-1#
```

show platform hardware fed switch active fwd-asic resource asic all destination-index range 0x526d 0x526

ASIC#0:

Destination index   = 0x526d

pmap   = 0x00000000 0x00000002 <-- Take decimal 2 and convert to binary, so 0010, and then

pmap_intf : [GigabitEthernet1/0/2]
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
ASIC#1:

Destination index   = 0x526d

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

Edge-1#

show platform software fed switch active ifm mappings

Interface   IF_ID   Inst Asic Core

Port

 SubPort Mac Cntx LPN GPN Type Active
GigabitEthernet1/0/1   0x1a   0   0   0   0   0   1   0   1   1   NIF Y

GigabitEthernet1/0/2

 0x1b   0   0   0

1

      0   2   1   2   2   NIF Y

<-- Port 1 maps to Gig1/0/2

GigabitEthernet1/0/3   0xb   0   0   0   2   0   3   2   3   3   NIF Y
GigabitEthernet1/0/4   0xc   0   0   0   3   0   4   3   4   4   NIF Y
GigabitEthernet1/0/5   0xd   0   0   0   4   0   5   4   5   5   NIF Y

```
GigabitEthernet1/0/6      0xe         0   0   0    5      0      6    5    6    6    NIF  Y
GigabitEthernet1/0/7      0xf         0   0   0    6      0      7    6    7    7    NIF  Y
GigabitEthernet1/0/8      0x10        0   0   0    7      0      8    7    8    8    NIF  Y
```

Descodificación ri_hdl de próximo salto subyacente

Tome el ri_hdl (0x7f65ec8b8158) y utilícelo en el comando show platform hardware fed switch active fwd-asic abstraction print-resource-handle <ri_hdl> 1

<#root>

```
Edge-1#

show platform hardware fed switch active fwd-asic abstraction print-resource-handle 0x7f65ec8b8158 1

Handle:0x7f65ec8b8158 Res-Type:ASIC_RSC_RI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L3_UNICAST_
priv_ri/priv_si Handle: 0x7f65ec7a6338Hardware Indices/Handles: index0:0x1b  mtu_index/l3u_ri_index0:0x
Features sharing this resource:66 (1)]
Cookie length: 56
00 00 00 00 00 00 00 00 25 00 00 00 00 00 00 00 00 00 00 00 08 00 52 54 00 0a 42 f3 00 00 00 00 00 00 0

Detailed Resource Information (ASIC_INSTANCE# 0)
----------------------------------------
ASIC#:0 RI:27 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)
    MAC Addr: MAC Addr:

52:54:00:0a:42:f3

,
    L3IF LE Index 37


Detailed Resource Information (ASIC_INSTANCE# 1)
----------------------------------------
ASIC#:1 RI:27 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)
    MAC Addr: MAC Addr:

52:54:00:0a:42:f3

,
    L3IF LE Index 37


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

Los paquetes se encapsulan en VXLAN y se envían en función de las reglas de equilibrio de carga. La captura de paquetes integrada (EPC) se puede utilizar para capturar el tráfico en todas las interfaces al mismo tiempo. Recuerde que en este momento el paquete está encapsulado en VXLAN, el filtro EPC debe estar en contra de RLOC a RLOC, no en contra de las direcciones IPv4 internas.

<#root>

```
Edge-1#

monitor capture 1 interface range g1/0/1-2 out match ipv4 host 10.47.1.12 host 10.47.1.13

Edge-1#

monitor capture 1 start

Started capture point : 1
Edge-1#
Edge-1#

monitor capture 1 stop

Capture statistics collected at software:
    Capture duration - 18 seconds
    Packets received - 4
    Packets dropped - 0
    Packets oversized - 0

Number of Bytes dropped at asic not collected

Capture buffer will exists till exported or cleared

Stopped capture point : 1

Edge-1#

show monitor capture 1 buffer brief

Starting the packet display ........ Press Ctrl + Shift + 6 to exit

    1   0.000000    10.47.4.2 -> 10.47.10.2   ICMP 148 Echo (ping) request  id=0x0046, seq=0/0, ttl=63
    2   0.980849    10.47.4.2 -> 10.47.10.2   ICMP 148 Echo (ping) request  id=0x0046, seq=1/256, ttl=6
    3   1.984077    10.47.4.2 -> 10.47.10.2   ICMP 148 Echo (ping) request  id=0x0046, seq=2/512, ttl=6
    4   2.999989    10.47.4.2 -> 10.47.10.2   ICMP 148 Echo (ping) request  id=0x0046, seq=3/768, ttl=6

Edge-1#

show monitor capture 1 buffer detailed


Starting the packet display ........ Press Ctrl + Shift + 6 to exit

Frame 1: 148 bytes on wire (1184 bits), 148 bytes captured (1184 bits) on interface /tmp/epc_ws/wif_to_
    Interface id: 0 (/tmp/epc_ws/wif_to_ts_pipe)
        Interface name: /tmp/epc_ws/wif_to_ts_pipe
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 11, 2023 16:50:52.262553000 UTC
    [Time shift for this packet: 0.000000000 seconds]
    Epoch Time: 1697043052.262553000 seconds
    [Time delta from previous captured frame: 0.000000000 seconds]
    [Time delta from previous displayed frame: 0.000000000 seconds]
    [Time since reference or first frame: 0.000000000 seconds]
    Frame Number: 1
    Frame Length: 148 bytes (1184 bits)
    Capture Length: 148 bytes (1184 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:udp:vxlan:eth:ethertype:ip:icmp:data]
Ethernet II, Src:

00:00:00:00:00:00

 (00:00:00:00:00:00), Dst:
```

00:00:00:00:00:00

(00:00:00:00:00:00)

<-- EPC does not capture L3 rewrite on egress properly, this is OK

```
    Destination: 00:00:00:00:00:00 (00:00:00:00:00:00)
        Address: 00:00:00:00:00:00 (00:00:00:00:00:00)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Source: 00:00:00:00:00:00 (00:00:00:00:00:00)
        Address: 00:00:00:00:00:00 (00:00:00:00:00:00)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: IPv4 (0x0800)
Internet Protocol Version 4, Src:
```

10.47.1.12

, Dst:

10.47.1.13 <-- RLOC to RLOC

```
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
        0000 00.. = Differentiated Services Codepoint: Default (0)
        .... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
    Total Length: 134
    Identification: 0x1d6f (7535)
    Flags: 0x4000, Don't fragment
        0... .... .... .... = Reserved bit: Not set
        .1.. .... .... .... = Don't fragment: Set
        ..0. .... .... .... = More fragments: Not set
    Fragment offset: 0
    Time to live: 64
    Protocol: UDP (17)
    Header checksum: 0x0682 [validation disabled]
    [Header checksum status: Unverified]
    Source: 10.47.1.12
    Destination: 10.47.1.13
User Datagram Protocol, Src Port: 65354, Dst Port: 4789
    Source Port: 65354
    Destination Port: 4789
    Length: 114
    [Checksum: [missing]]
    [Checksum Status: Not present]
    [Stream index: 0]
    [Timestamps]
        [Time since first frame: 0.000000000 seconds]
        [Time since previous frame: 0.000000000 seconds]
Virtual eXtensible Local Area Network
    Flags: 0x8800, GBP Extension, VXLAN Network ID (VNI)
        1... .... .... .... = GBP Extension: Defined
        .... .... .0.. .... = Don't Learn: False
        .... 1... .... .... = VXLAN Network ID (VNI): True
        .... .... .... 0... = Policy Applied: False
        .000 .000 0.00 .000 = Reserved(R): 0x0000
    Group Policy ID: 0
    VXLAN Network Identifier (VNI):
```

4099 <-- LISP L3 IID

```
    Reserved: 0
Ethernet II, Src: 00:00:00:00:61:00 (
```

00:00:00:00:61:00

), Dst: ba:25:cd:f4:ad:38 (

ba:25:cd:f4:ad:38

)

<-- Dummy Ethernet header for VXLAN

```
    Destination: ba:25:cd:f4:ad:38 (ba:25:cd:f4:ad:38)
        Address: ba:25:cd:f4:ad:38 (ba:25:cd:f4:ad:38)
        .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory d
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Source: 00:00:00:00:61:00 (00:00:00:00:61:00)
        Address: 00:00:00:00:61:00 (00:00:00:00:61:00)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: IPv4 (0x0800)
Internet Protocol Version 4, Src:
```

10.47.4.2

, Dst:

10.47.10.2 <-- True IPv4 addresses

```
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
        0000 00.. = Differentiated Services Codepoint: Default (0)
        .... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
    Total Length: 84
    Identification: 0x92f6 (37622)
    Flags: 0x4000, Don't fragment
        0... .... .... .... = Reserved bit: Not set
        .1.. .... .... .... = Don't fragment: Set
        ..0. .... .... .... = More fragments: Not set
    Fragment offset: 0
    Time to live: 63
    Protocol: ICMP (1)
    Header checksum: 0x8651 [validation disabled]
    [Header checksum status: Unverified]
    Source: 10.47.4.2
    Destination: 10.47.10.2
Internet Control Message Protocol
    Type: 8 (Echo (ping) request)
    Code: 0
    Checksum: 0xa383 [correct]
    [Checksum Status: Good]
    Identifier (BE): 70 (0x0046)
    Identifier (LE): 17920 (0x4600)
    Sequence number (BE): 0 (0x0000)
    Sequence number (LE): 0 (0x0000)
    Data (56 bytes)

0000  78 1e dc 17 00 00 00 00 00 00 00 00 00 00 00 00   x...............
0010  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
0020  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
0030  00 00 00 00 00 00 00 00                           ........
        Data: 781edc17000000000000000000000000000000000000000b^@&
        [Length: 56]
```

El paquete VXLAN encapsulado alcanza el Edge-2:

<#root>

```
Edge-2#

monitor capture 1 interface range g1/0/1-2 in match ipv4 host 10.47.1.12 host 10.47.1.13

Edge-2#

monitor capture 1 start

Started capture point : 1
Edge-2#

monitor capture 1 stop

Capture statistics collected at software:
    Capture duration - 7 seconds
    Packets received - 6
    Packets dropped - 0
    Packets oversized - 0

Number of Bytes dropped at asic not collected

Capture buffer will exists till exported or cleared

Stopped capture point : 1

Edge-2#

show monitor capture 1 buffer brief

Starting the packet display ........ Press Ctrl + Shift + 6 to exit

    1   0.000000    10.47.4.2 -> 10.47.10.2   ICMP 148 Echo (ping) request  id=0x0047, seq=0/0, ttl=63
    2   0.007826    10.47.4.2 -> 10.47.10.2   ICMP 148 Echo (ping) request  id=0x0047, seq=0/0, ttl=63
    3   0.086345    10.47.4.2 -> 10.47.10.2   ICMP 148 Echo (ping) request  id=0x0047, seq=1/256, ttl=6
    4   0.097490    10.47.4.2 -> 10.47.10.2   ICMP 148 Echo (ping) request  id=0x0047, seq=1/256, ttl=6
    5   1.150969    10.47.4.2 -> 10.47.10.2   ICMP 148 Echo (ping) request  id=0x0047, seq=2/512, ttl=6
    6   1.163817    10.47.4.2 -> 10.47.10.2   ICMP 148 Echo (ping) request  id=0x0047, seq=2/512, ttl=6

Edge-2#

show monitor capture 1 buffer detailed


Starting the packet display ........ Press Ctrl + Shift + 6 to exit

Frame 1: 148 bytes on wire (1184 bits), 148 bytes captured (1184 bits) on interface /tmp/epc_ws/wif_to_
    Interface id: 0 (/tmp/epc_ws/wif_to_ts_pipe)
        Interface name: /tmp/epc_ws/wif_to_ts_pipe
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 11, 2023 16:58:12.702159000 UTC
    [Time shift for this packet: 0.000000000 seconds]
    Epoch Time: 1697043492.702159000 seconds
    [Time delta from previous captured frame: 0.000000000 seconds]
    [Time delta from previous displayed frame: 0.000000000 seconds]
    [Time since reference or first frame: 0.000000000 seconds]
    Frame Number: 1
    Frame Length: 148 bytes (1184 bits)
    Capture Length: 148 bytes (1184 bits)
    [Frame is marked: False]
```

```
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:ip:udp:vxlan:eth:ethertype:ip:icmp:data]
Ethernet II, Src: 52:54:00:0a:42:11 (
```

52:54:00:0a:42:11

```
), Dst: 52:54:00:17:fe:65 (
```

52:54:00:17:fe:65

```
)
```

<-- True MAC addresses post L3 rewrite

```
    Destination: 52:54:00:17:fe:65 (52:54:00:17:fe:65)
        Address: 52:54:00:17:fe:65 (52:54:00:17:fe:65)
        .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory d
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Source: 52:54:00:0a:42:11 (52:54:00:0a:42:11)
        Address: 52:54:00:0a:42:11 (52:54:00:0a:42:11)
        .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory d
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: IPv4 (0x0800)
Internet Protocol Version 4, Src:
```

10.47.1.12

```
, Dst:
```

10.47.1.13 <-- RLOC to RLOC

```
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
        0000 00.. = Differentiated Services Codepoint: Default (0)
        .... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
    Total Length: 134
    Identification: 0x1d7b (7547)
    Flags: 0x4000, Don't fragment
        0... .... .... .... = Reserved bit: Not set
        .1.. .... .... .... = Don't fragment: Set
        ..0. .... .... .... = More fragments: Not set
    Fragment offset: 0
    Time to live: 62
    Protocol: UDP (17)
    Header checksum: 0x0876 [validation disabled]
    [Header checksum status: Unverified]
    Source: 10.47.1.12
    Destination: 10.47.1.13
User Datagram Protocol, Src Port: 65354, Dst Port: 4789
    Source Port: 65354
    Destination Port: 4789
    Length: 114
    [Checksum: [missing]]
    [Checksum Status: Not present]
    [Stream index: 0]
    [Timestamps]
        [Time since first frame: 0.000000000 seconds]
        [Time since previous frame: 0.000000000 seconds]
Virtual eXtensible Local Area Network
    Flags: 0x8800, GBP Extension, VXLAN Network ID (VNI)
        1... .... .... .... = GBP Extension: Defined
        .... .... .0.. .... = Don't Learn: False
        .... 1... .... .... = VXLAN Network ID (VNI): True
        .... .... .... 0... = Policy Applied: False
```

```
        .000 .000 0.00 .000 = Reserved(R): 0x0000
    Group Policy ID: 0
    VXLAN Network Identifier (VNI):
```

4099 <-- LISP L3 IID

```
    Reserved: 0
Ethernet II, Src: 00:00:00:00:61:00 (
```

00:00:00:00:61:00

```
), Dst: ba:25:cd:f4:ad:38 (
```

ba:25:cd:f4:ad:38

```
)
```

<-- Dummy Ethernet header for VXLAN

```
    Destination: ba:25:cd:f4:ad:38 (ba:25:cd:f4:ad:38)
        Address: ba:25:cd:f4:ad:38 (ba:25:cd:f4:ad:38)
        .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory d
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Source: 00:00:00:00:61:00 (00:00:00:00:61:00)
        Address: 00:00:00:00:61:00 (00:00:00:00:61:00)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: IPv4 (0x0800)
Internet Protocol Version 4, Src:
```

10.47.4.2

```
, Dst:
```

10.47.10.2

```
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
        0000 00.. = Differentiated Services Codepoint: Default (0)
        .... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
    Total Length: 84
    Identification: 0x1abb (6843)
    Flags: 0x4000, Don't fragment
        0... .... .... .... = Reserved bit: Not set
        .1.. .... .... .... = Don't fragment: Set
        ..0. .... .... .... = More fragments: Not set
    Fragment offset: 0
    Time to live: 63
    Protocol: ICMP (1)
    Header checksum: 0xfe8c [validation disabled]
    [Header checksum status: Unverified]
    Source: 10.47.4.2
    Destination: 10.47.10.2
Internet Control Message Protocol
    Type: 8 (Echo (ping) request)
    Code: 0
    Checksum: 0x044f [correct]
    [Checksum Status: Good]
    Identifier (BE): 71 (0x0047)
    Identifier (LE): 18176 (0x4700)
    Sequence number (BE): 0 (0x0000)
    Sequence number (LE): 0 (0x0000)
    Data (56 bytes)
```

```
0000  e8 37 0b 32 00 00 00 00 00 00 00 00 00 00 00 00   .7.2............
0010  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
0020  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
0030  00 00 00 00 00 00 00 00                           ........
        Data: e8370b320000000000000000000000000000000000000000b^@&
        [Length: 56]
```

Edge-2 desencapsula el encabezado VXLAN y consulta su tabla ARP para reenviar la solicitud ICMP hacia 10.47.10.2

<#root>

```
Edge-2#
```

show ip cef vrf red_vn 10.47.10.2

```
10.47.10.2/32
  nexthop 10.47.10.2 Vlan1028

Edge-2#
```

show platform software fed switch active ip adj

```
IPV4 Adj entries
dest                                    if_name                dst_mac          si_hdl         r
----                                    -------                -------          ------         -

10.47.10.2                              Vlan1028               5254.0002.cbf5   0x7f5744f89988 0x


<snip>
```

Descodificación si_hdl de terminal

Tome el si_hdl (0x7f5744f89988) y úselo en show platform hardware fed switch active fwd-asic abstraction print-resource-handle <si_hdl> 1

<#root>

```
Edge-2#
```

show platform hardware fed switch active fwd-asic abstraction print-resource-handle 0x7f5744f89988 1

```
Handle:0x7f5744f89988 Res-Type:ASIC_RSC_SI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L3_UNICAST_
priv_ri/priv_si Handle: 0x7f5744f8afa8Hardware Indices/Handles: index0:0xc8  mtu_index/l3u_ri_index0:0x0
Features sharing this resource:66 (1)]
57 (1)]
Cookie length: 56
00 00 00 00 00 00 00 00 04 04 00 00 00 00 00 00 00 00 00 00 07 00 52 54 00 02 cb f5 00 00 00 00 00 00 0


Detailed Resource Information (ASIC_INSTANCE# 0)
----------------------------------------
```

Station Index (SI) [0xc8] <-- Station Index contains RI and DI

```
RI = 0x2c <-- Rewrite Index contains information for L2 Forwarding
DI = 0x526e <-- Rewrite Index contains destination port information

stationTableGenericLabel = 0
stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0
rcpServiceId = 0
dejaVuPreCheckEn = 0x1
Replication Bitmap: LD


Detailed Resource Information (ASIC_INSTANCE# 1)
----------------------------------------

Station Index (SI) [0xc8] <-- Station Index contains RI and DI
RI = 0x2c <-- Rewrite Index contains information for L2 Forwarding
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stationTableGenericLabel = 0
stationFdConstructionLabel = 0x7
lookupSkipIdIndex = 0
rcpServiceId = 0
dejaVuPreCheckEn = 0x1
Replication Bitmap: CD

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

Descodificación de RI de terminales

Tome el RI (0x2c) y use en el comando show platform hardware fed switch active fwd-asic resource asic all rewrite-index range <RI> <RI>

<#root>

```
Edge-2#

show platform hardware fed switch active fwd-asic resource asic all rewrite-index range 0x2c 0x2c

ASIC#:0

RI:44

 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)

 <-- Decimal 44 is hex 0x2c

    MAC Addr: MAC Addr:

52:54:00:02:cb:f5

,

<-- MAC Address 5254.0002.cbf5 is 10.47.10.2

    L3IF LE Index 50


ASIC#:1 RI:44 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)

 <-- Decimal 44 is hex 0x2c
```

```
    MAC Addr: MAC Addr:
52:54:00:02:cb:f5
,
<-- MAC Address 5254.0002.cbf5 is 10.47.10.2
    L3IF LE Index 50
```

Decodificación de ID de terminal

Tome el DI (0x526e) y utilícelo en show platform hardware fed switch active fwd-asic resource asic all destination-index range <DI> <DI>

<#root>

```
Edge-2#
show platform hardware fed switch active fwd-asic resource asic all destination-index range 0x526e 0x526
ASIC#0:
Destination index   = 0x526e
pmap                = 0x00000000 0x00000010 <-- Convert 10 into binary, 0001 and 0000, so 00010000, and
pmap_intf : [GigabitEthernet1/0/5]
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
ASIC#1:
Destination index   = 0x526e
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
Edge-2#
```

```
show platform software fed switch active ifm mappings

Interface                IF_ID    Inst Asic Core Port SubPort Mac  Cntx LPN  GPN  Type Active
GigabitEthernet1/0/1     0x1a       0   0    0    0      0      1    0    1    1    NIF  Y
GigabitEthernet1/0/2     0x1b       0   0    0    1      0      2    1    2    2    NIF  Y
GigabitEthernet1/0/3     0xb        0   0    0    2      0      3    2    3    3    NIF  Y
GigabitEthernet1/0/4     0xc        0   0    0    3      0      4    3    4    4    NIF  Y

GigabitEthernet1/0/5

      0xd        0   0   0

4

     0      5    4    5    5    NIF  Y

<-- Port 4 corresponds to Gig1/0/5

GigabitEthernet1/0/6     0xe        0   0    0    5      0      6    5    6    6    NIF  Y
GigabitEthernet1/0/7     0xf        0   0    0    6      0      7    6    7    7    NIF  Y
GigabitEthernet1/0/8     0x10       0   0    0    7      0      8    7    8    8    NIF  Y
```

Edge-2 desencapsula el paquete y lo envía hacia la interfaz de egreso a la que HOST-03 está conectado:

<#root>

```
Edge-2#

monitor capture 1 interface g1/0/5 out match ipv4 host 10.47.4.2 host 10.47.10.2

Edge-2#

monitor capture 1 start

Started capture point : 1
Edge-2#

monitor capture 1 stop

Capture statistics collected at software:
    Capture duration - 6 seconds
    Packets received - 3
    Packets dropped - 0
    Packets oversized - 0

Number of Bytes dropped at asic not collected

Capture buffer will exists till exported or cleared

Stopped capture point : 1

Edge-2#

show monitor capture 1 buffer brief


Starting the packet display ........ Press Ctrl + Shift + 6 to exit

    1   0.000000    10.47.4.2 -> 10.47.10.2   ICMP 106 Echo (ping) request  id=0x0048, seq=0/0, ttl=62
    2   0.984985    10.47.4.2 -> 10.47.10.2   ICMP 106 Echo (ping) request  id=0x0048, seq=1/256, ttl=6
    3   1.985357    10.47.4.2 -> 10.47.10.2   ICMP 106 Echo (ping) request  id=0x0048, seq=2/512, ttl=6
```

```
Edge-2#
```

show monitor capture 1 buffer detailed

```
Starting the packet display ........ Press Ctrl + Shift + 6 to exit

Frame 1: 106 bytes on wire (848 bits), 106 bytes captured (848 bits) on interface /tmp/epc_ws/wif_to_ts
    Interface id: 0 (/tmp/epc_ws/wif_to_ts_pipe)
        Interface name: /tmp/epc_ws/wif_to_ts_pipe
    Encapsulation type: Ethernet (1)
    Arrival Time: Oct 11, 2023 17:22:20.730331000 UTC
    [Time shift for this packet: 0.000000000 seconds]
    Epoch Time: 1697044940.730331000 seconds
    [Time delta from previous captured frame: 0.000000000 seconds]
    [Time delta from previous displayed frame: 0.000000000 seconds]
    [Time since reference or first frame: 0.000000000 seconds]
    Frame Number: 1
    Frame Length: 106 bytes (848 bits)
    Capture Length: 106 bytes (848 bits)
    [Frame is marked: False]
    [Frame is ignored: False]
    [Protocols in frame: eth:ethertype:cmd:ethertype:ip:icmp:data]
Ethernet II, Src:
```

00:00:00:00:61:00

```
 (00:00:00:00:61:00), Dst:
```

ff:ff:ff:ff:ff:ff

```
 (ff:ff:ff:ff:ff:ff)
```

<-- Dummy Ethernet header, EPC does not capture it properly

```
    Destination: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
        Address: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
        .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory d
        .... ...1 .... .... .... .... = IG bit: Group address (multicast/broadcast)
    Source: 00:00:00:00:61:00 (00:00:00:00:61:00)
        Address: 00:00:00:00:61:00 (00:00:00:00:61:00)
        .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
        .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: CiscoMetaData (0x8909)
Cisco MetaData
    Version: 1
    Length: 1
    Options: 0x0001
    SGT: 0
    Type: IPv4 (0x0800)
Internet Protocol Version 4, Src:
```

10.47.4.2

```
, Dst:
```

10.47.10.2 <-- True IP addresses

```
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
    Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
        0000 00.. = Differentiated Services Codepoint: Default (0)
        .... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
    Total Length: 84
```

```
    Identification: 0x35e4 (13796)
    Flags: 0x4000, Don't fragment
        0... .... .... .... = Reserved bit: Not set
        .1.. .... .... .... = Don't fragment: Set
        ..0. .... .... .... = More fragments: Not set
    Fragment offset: 0
    Time to live: 62
    Protocol: ICMP (1)
    Header checksum: 0xe463 [validation disabled]
    [Header checksum status: Unverified]
    Source: 10.47.4.2
    Destination: 10.47.10.2
Internet Control Message Protocol
    Type: 8 (Echo (ping) request)
    Code: 0
    Checksum: 0x2693 [correct]
    [Checksum Status: Good]
    Identifier (BE): 72 (0x0048)
    Identifier (LE): 18432 (0x4800)
    Sequence number (BE): 0 (0x0000)
    Sequence number (LE): 0 (0x0000)
    Data (56 bytes)

0000  69 9c 67 88 00 00 00 00 00 00 00 00 00 00 00 00   i.g.............
0010  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
0020  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
0030  00 00 00 00 00 00 00 00                           ........
        Data: 699c67880000000000000000000000000000000000000000b^@&
        [Length: 56]
```

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