

Identificar e Solucionar Problemas de Fluxo de Tráfego de Leste a Oeste de Encaminhamento SDA

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Introdução

Este documento descreve como validar o fluxo de tráfego leste-oeste como parte do SDA (Software Defined Access).

Pré-requisitos

Requisitos

A Cisco recomenda que você tenha conhecimento destes tópicos:

- Encaminhamento de Internet Protocol (IP)
- Protocolo de separação de localizador/ID (LISP)

Componentes Utilizados

As informações neste documento são baseadas nestas versões de software e hardware:

- C9000v no Cisco IOS® XE 17.10.1

- SDA 1.0 (não LISP PubSub)

As informações neste documento foram criadas a partir de dispositivos em um ambiente de laboratório específico. Todos os dispositivos utilizados neste documento foram iniciados com uma configuração (padrão) inicial. Se a rede estiver ativa, certifique-se de que você entenda o impacto potencial de qualquer comando.

Produtos Relacionados

Este documento também pode ser usado com as seguintes versões de hardware e software:

- C9200
- C9300
- C9400
- C9500
- C9600
- Cisco IOS® XE 16.12 e posterior


Informações de Apoio

O Fluxo de Tráfego SDA Leste-Oeste refere-se ao conceito em que um endpoint na Estrutura SDA deseja se comunicar com outro endpoint na mesma estrutura. Há ressalvas sobre o que é e não é considerado um fluxo leste-oeste. Um fluxo de tráfego leste-oeste pode ser um destes exemplos:

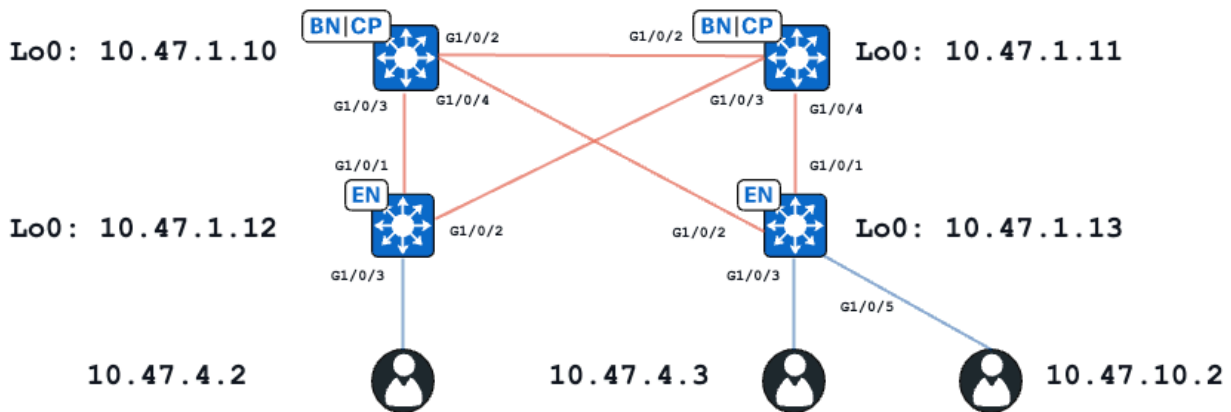
- Endpoints que estão na mesma sub-rede (172.17.10.2 conversando com 172.19.10.3) são considerados extensão L2LISP
- Endpoints que estão no mesmo VRF (VN) (172.19.10.2 conversando com 172.19.11.2 e ambos estão no Campus VRF) isso é considerado L3 LISP
- Endpoint que está dentro da malha conversando com um host conectado a uma borda de handoff L2, exatamente o mesmo que L2LISP

Os fluxos de tráfego leste-oeste não se referem a estes exemplos:

- O tráfego é originado da malha do SDA para fora da malha, ou seja, de norte a sul
- O roteamento entre VRF também não é considerado leste-oeste (um endpoint no campus VRF, endereço IP 172.19.10.2 conversando com um endpoint no convidado VRF, endereço IP 172.19.11.2)
- Domínios integrados de SD-WAN
- Trânsito SDA
- Afinidade da Borda
- Extranet

 Observação: os comandos de plataforma (feed) podem variar. O comando pode ser "show platform fed <ative|standby>" versus "show platform fed switch <ative|standby>". Se a sintaxe anotada nos exemplos não for analisada, tente a variante.

Topologia



Para a finalidade deste exemplo, os switches C9000v funcionam como bordas de estrutura e bordas agrupadas. Todos os endpoints estão na mesma rede virtual (VN), red_vn. Os endpoints em 10.47.4.2 e 10.47.4.2 estão na mesma sub-rede, o endpoint em 10.47.10.2 está em uma sub-rede diferente, mas na mesma VLAN.

Configuração

Supõe-se que o Cisco DNA-Center seja usado para provisionar a estrutura SDA com as configurações padrão:

- A extensão de Camada 2 está habilitada (isso força o tráfego a ser encaminhado com base em pesquisas de endereço MAC em vez de consultas de endereço IP).
- A inundação de Camada 2 está desativada (isso ativa a supressão de ARP em dispositivos de borda e a aprendizagem de ARP assistida por LISP).

Após o processo de integração de host adequado, a configuração da interface contém várias seções:

Configuração da interface da borda da estrutura (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
```

Fabric Edge (10.47.1.12) Configuração LISP:

```
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
```

Configuração da interface da borda da estrutura (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

```

Configuração LISP da borda da estrutura (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

```

Verificação de integração de host

Como parte do processo de integração do host, várias estruturas são criadas:

Entrada de rastreamento de dispositivo IPDT / IP

Após a integração bem-sucedida do host, há uma entrada válida na tabela IP Device Tracking (IPDT) e o host final deve ser marcado como REACHABLE:

```
<#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, DHCP - IPv4 DHCP
```

```
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
```

Entrada MAC / ARP

Quando o host final é integrado com êxito, ele pode fazer ping no gateway padrão (ou pode receber ping do gateway padrão se nenhum firewall estiver instalado no ponto final bloqueando essa comunicação):

```
<#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
```

No nó de borda, há um endereço MAC, bem como a entrada ARP correspondente na tabela (no 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

Programação de endereço MAC com alimentação de software**

Para verificar o endereço MAC no FED, use o 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****

Pegue o valor macHandle do comando anterior (0x7f65ec7bda68) e use em 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, learning 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

****Verificação de MVID****

O número 7 na saída anterior é a ID da VLAN mapeada (MVID) no hardware. Para verificar se eles correspondem à vlan "real", use 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	0x000000000420011	0x00007f65ec6a08b8	0x00007f65ec6a1138	0x00007f65ec77e838
7				

****Verificação do Número de Porta Global (GPN - Global Port Number)****

Para correlacionar o GPN com uma interface "real", use o 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
```

****Programação de siHandle de Endereço MAC****

Pegue o valor siHandle do comando anterior (0x7f65ec7c21f8) e utilize em `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/13u_ri_index0:0xc3
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 00 00
```

```
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
```

```
=====
```

****Verificação de Índice de Regravação de Endereço MAC****

Pegue o valor de RI do comando anterior (0x25) e utilize em 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

Verificação do Índice de Destino do Endereço MAC

Pegue o valor de DI do comando anterior (0x526e) e utilize em show platform hardware fed switch
ative 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 0x526e
```

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
```

****Verificação de porta****

Para correlacionar a porta vista anteriormente, use o comando `show platform software fed switch active ifm mappings` e observe a coluna Porta.

```
<#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
```

****Verificação de Endereço MAC Alimentado por Hardware****

Esta saída em um cenário de trabalho/ideal corresponde ao que a decodificação `macHandle` forneceu.

```
<#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
```

```
DST_AD: si 0xb7, bridge 0, replicate 0, blk_fwd_o 0, v4_mac 0, v6_mac 0, catchall 0, ign_src_lrn 0, por
```

```
Total Mac number of addresses:: 1
```

- O ID da VLAN no hardware (MVID) é 7
- Endereço MAC: 5254.0019.93e9
- GPN: 3

Entrada LISP

Após a integração bem-sucedida do host, as entradas LISP para o host final são criadas localmente no nó de borda, bem como registradas nos nós de controle (LISP MSMR - LISP Map Server / Map Resolver). Todas as verificações LISP precisam ser feitas em relação ao escopo específico de ID de instância que pode ser verificado para L2 e para 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
```

Verificação do banco de dados L2 LISP

Para verificar o banco de dados L2 LISP, use o comando `show lisp instance-id <L2 LISP IID> 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
```

Verificação do Banco de Dados de Resolução de Endereços (AR) L2 do LISP

Para verificar o banco de dados L2 AR do LISP, use o comando `show lisp instance-id <LISP L2 IID> 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
```

Verificação do Banco de Dados L3 do LISP

Para verificar o banco de dados L3 do LISP, use o comando `show lisp instance-id <LISP L3 IID> ipv4 database <endereço IP/Máscara de sub-rede>`

```
<#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

Verificação de CEF

Para verificar o CEF, use o comando `show ip cef vrf <vrf name> <IP address> 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, hwn]
  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
```

Além das entradas LISP locais no SDA Edge Node, os SDA Control Nodes (LISP MS/MR) também contêm informações adicionais sobre os pontos finais:

Verificação de servidor L2 LISP da borda colocalizada:

Para verificar o servidor L2 LISP, use o comando `show lisp instance-id <L2 LISP IID> 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)

Verificação do servidor de resolução de endereço (AR) L2 LISP da borda colocada:

Para verificar o Servidor L2 LISP AR, use o comando show lisp instance-id <LISP L2 IID> ethernet server address-resolution <IP address>

Para verificar o histórico de registros, use o comando show lisp instance-id <LISP L2 IID> 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

Verificação de Servidor LISP L3 de Borda Alocada

Para verificar o Servidor L3 LISP, use o comando `show lisp instance-id <LISP L3 IID> ipv4 server <endereço IP>`

Para verificar o histórico de registro do Servidor L3 LISP, use o comando `show lisp instance-id <LISP L3 IID> ipv4 server <endereço IP> 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

Resolução ARP em SDA

Supõe-se que o Cisco Catalyst Center tenha sido usado para provisionar a estrutura SDA com as configurações padrão. Isso significa que a extensão da camada 2 está habilitada e que todo o tráfego dentro da estrutura (na mesma VLAN/VN) é encaminhado com base em consultas de

endereço MAC/instância de Ethernet LISP, em vez de consultas de endereço IP/instância de IP LISP.

Do ponto de vista da solução de problemas, pode ser útil configurar entradas ARP estáticas em ambos os hosts para verificar rapidamente se o problema está na conectividade genérica na estrutura (nesse caso, o ping não funciona entre os hosts) ou apenas na resolução ARP.

O processo ARP na estrutura SDA aproveita o LISP para resolver a identificação e a localização dos hosts e é diferente do comportamento ARP em ambientes tradicionais de roteamento/switching.

Etapa 1: O ponto final de malha envia uma solicitação ARP para determinar a associação MAC/IP para o outro ponto final de malha

A captura de pacotes pode ser configurada na interface de entrada para confirmar que o pacote ARP seja recebido do 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 exist 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: 0000000000000000000000000000000000000000000000000000000000000000
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
```

Etapa 2. O Edge Node consome o pacote ARP e gera a solicitação LISP para determinar o endereço MAC do HOST-02.

Edge-1 envia uma solicitação de mapa LISP para resolver o endereço MAC de 10.47.4.3 para os planos de controle LISP (bordas agrupadas):

```
<#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'.
```

Etapa 3. O nó de controle recebe a solicitação LISP para o mapeamento IP/MAC e envia uma resposta de volta ao nó de borda SDA

A solicitação de mapa LISP é recebida da borda da malha e responde com uma resposta de mapa LISP com o endereço MAC que se liga 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.
```

O plano de controle LISP responde com uma resposta de proxy com base na entrada de resolução de endereço armazenada em seu banco de dados 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

Etapa 4. O nó de borda recebe resposta LISP com endereço MAC 10.47.4.3

A resposta do proxy LISP é recebida pelo nó de borda de malha:

```
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.
```

Etapa 5. O nó de borda envia o pacote de solicitação de mapa LISP para determinar o local RLOC para o endereço MAC

Após a conclusão bem-sucedida das três primeiras etapas, o Edge Node conhece o endereço MAC 10.47.4.3 para o qual o ARP foi inicialmente gerado. Como a extensão da Camada 2 está habilitada, o Edge Node não responde com essa informação para 10.47.4.2, mas sim usa-a para determinar a localização RLOC da Borda do Nó de Saída, para que possa encaminhar ARP para 10.47.4.3 como em uma rede tradicional da Camada 2.

Por esse motivo, o Edge Node gera mais um pacote de solicitação de mapa LISP na instância Ethernet, desta vez solicitando informações RLOC para o endereço 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
```

Etapa 6: O pacote de solicitação de mapa LISP é recebido pelo nó de controle para determinar o local RLOC para o endereço MAC

O nó de controle recebe o pacote LISP e responde a ele com base em seu estado de banco de dados 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
```

Etapa 7: Resposta do mapa LISP é recebida pelo nó de borda

A resposta do mapa LISP gerada pelo nó de controle é recebida pelo nó de borda:

```
<#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
```

Finalmente, isso cria uma entrada no cache de mapas da instância Ethernet do LISP e permite que o pacote ARP seja encaminhado para Edge-2, onde 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)
```

Etapa 8. O ARP é encapsulado em VXLAN e enviado para HOST-02

Todas as etapas relacionadas ao LISP foram necessárias para determinar onde 10.47.4.3 está localizado, de modo que o Edge Node possa enviar o pacote ARP (broadcast) original como unicast para o Edge Node apropriado. A solicitação ARP original é armazenada em cache (não descartada) pela CPU do Edge Node até que todas as etapas sejam concluídas, permitindo a resolução ARP adequada, mesmo quando um único pacote ARP foi enviado de 10.47.4.2.

O pacote ARP é encapsulado em VXLAN, como visto no exemplo:

```
<#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
```

A solicitação ARP foi encapsulada em VXLAN e também foi convertida de uma solicitação ARP de broadcast para uma solicitação ARP unicast.

```
<#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 default)
      .... .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 default)
      .... .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: 00000000000000000000000000000000
```

```
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
```

Etapa 9. A resposta ARP é gerada por 10.47.4.3 e enviada para 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
```

Neste momento, o pacote não se destina ao endereço de broadcast (como solicitação ARP original), mas ao endereço MAC de 10.47.4.2, quando ele alcança o nó de borda de entrada (Edge-2), a operação LISP normal é acionada. Inicialmente, o endereço MAC de 10.47.4.2 está ausente na instância LISP Ethernet do Edge Node, o pacote é apontado para a CPU para gerar a solicitação de mapa LISP para determinar o RLOC para HOST-01. Esse comportamento é exatamente o mesmo que o descrito em outras seções neste documento e permite criar a entrada de cache de mapa LISP para 10.47.4.2 em 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)
```

A entrada permite que a Resposta ARP seja enviada com êxito para a Borda 1 no Encapsulamento VXLAN e encaminhada posteriormente para o processo de resolução ARP inteiro concorrente 10.47.4.2.

Acessibilidade básica do host na estrutura SDA (mesma VLAN/mesma VLAN)

Supõe-se que a resolução ARP tenha sido concluída com êxito e que ambos os hosts 10.47.4.2 e 10.47.4.3 tenham entradas ARP apropriadas um para o outro.

Do ponto de vista da solução de problemas, é muito útil configurar entradas ARP estáticas em ambos os hosts para verificar rapidamente se o problema está na conectividade genérica na estrutura (nesse caso, o ping não funciona entre os hosts) ou apenas no processo ARP.

10.47.4.2 gera uma solicitação ICMP para 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 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: 68958c3d000000000000000000000000000000000000000b^@&
    [Length: 56]

```

O pacote ICMP é enviado em direção a 10.47.4.3 para o nó de borda especificado no campo Localizador: 10.47.1.13 (borda-2) e pode ser capturado por meio da captura de pacote incorporada.

À medida que o pacote é recebido na VLAN em que a extensão L2 está habilitada, a pesquisa é feita na instância de Ethernet 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 o endereço MAC do ponto final remoto, ele aponta para o L2LI0, o que é esperado

<#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 o endereço MAC no FED; é possível obter informações adicionais

<#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

Decodificação MAC Address macHandle

Retire o macHandle (0x7f65ecfdd3a8) do comando anterior e use o 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_WIFI_priv_r/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, learning
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
```


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_PAYLOAD  
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_PAYLOAD  
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)
```

Decodificação de Índice de Destino

Pegue o DI (0x5012) e use no 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 0x5012
```

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

Decodificação siHandle

Pegue o siHandle (0x7f65ecfdd048) e use o 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: 0x7f65ecfdd048 Hardware Indices/Handles: index0:0x12 mtu_index/13u_ri_index0:0x12
```

Features sharing this resource:58 (1)]

Cookie length: 56

00 00 00 00 00 00 02 04 00 00 00 00 00 00 00 00 07 00 61 00 00 00 00 00 00 00 00 00 00

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_PAYLOAD
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_PAYLOAD
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)

=====

Verificação de rota subjacente

O tráfego é encapsulado em VXLAN com IID 8190 usando 10.47.1.12 e tem a capacidade de ser balanceado em carga fora de Gig1/0/1 e 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 obter as informações de si_hdl, ri_hdl, use o 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	ri_hdl
225.0.0.0	GigabitEthernet1/0/1	0100.5e00.0000	0x7f65ec958128	0x7f65ec958128
10.47.1.10	LISPO.4100	4500.0000.0000	0x7f65ec895ed8	0x7f65ec895ed8
225.0.0.0	GigabitEthernet1/0/2	0100.5e00.0000	0x7f65ec958f68	0x7f65ec958f68
10.47.1.4	GigabitEthernet1/0/2	5254.001c.7de0	0x7f65ec8a5458	0x7f65ec8a5458
225.0.0.0	Null0	f800.0011.0000	0x7f65ec3740c8	0x7f65ec3740c8
10.47.1.0	GigabitEthernet1/0/1	5254.000a.42f3	0x7f65ec8b8468	0x7f65ec8b8468

Decodificação si_hdl do próximo salto subjacente

Para verificar o si_hdl (0x7f65ec8a5458) use o 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/13u_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 08 00 52 54 00 1c 7d e0 00 00 00 00 00 00
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

=====

Decodificação Subjacente do Índice de Regravação do Próximo Salto

Para decodificar o RI (0x1a), use o 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

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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

Decodificação Subjacente do Índice de Destino do Próximo Salto

Para decodificar o DI (0x526d), use em 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 0x526d
```

ASIC#0:

Destination index = 0x526d

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

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

```

Subjacente à Decodificação ri_hdl do Próximo Salto

Para decodificar o ri_hdl (0x7f65ec8a4eb8), use em 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/13u_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 08 00 52 54 00 1c 7d e0 00 00 00 00 00 00 00

```

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
```

Acessibilidade básica de host na estrutura SDA (VLANs diferentes / mesma VLAN)

Nesta seção, a comunicação entre 10.47.4.2 e 10.47.10.2 é examinada. Como esses hosts pertencem a VLANs diferentes, ambos precisam ter o gateway padrão configurado que aponte para o gateway padrão. Para 10.47.4.2 é 10.47.4.1 e 10.47.10.2 é 10.47.10.1.

Etapa 1. Confirme se a conectividade entre o ponto de extremidade e o gateway padrão funciona:

```
<#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
```

Etapa 2. Confirme se o pacote de 10.47.4.2 foi recebido com êxito por Edge-1:

O pacote pode ser capturado na interface de entrada voltada para 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 exist 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  ..
0020 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ..
0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  ..

```

```

Data: 2a46a8ee000000000000000000000000000000000000000000000000b^@&
[Length: 56]

```

Etapa 3 - Pesquisa LISP

O Ingress Edge Node deve determinar o local (RLOC) do HOST-03 para o qual ele envia pacotes. Como neste caso o host final HOST-03 está em VLAN diferente (mas o mesmo VN / VRF: USERS), a instância LISP IPv4 é usada como a pesquisa é baseada no endereço IP (o endereço MAC pertence ao próprio nó de borda).

```
<#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 prefix'
LISP[REMT ]-0: Map-Reply nonce matches pending request for IID 4099 EID 10.47.10.2/32, requester 'remote EID prefix'
```

A Solicitação de Mapa LISP alcança o Nó de Controle (Servidor de Mapa LISP) Borda-1:

```
<#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 10.47.10.2:4342
LISP[MR ]-0 IID 4099 IPv4: MS EID 10.47.10.2/32: Sending proxy reply to 10.47.1.12.
```

LISP Map-Reply alcança o nó de borda:

```
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.
```

A borda da malha consulta o RLOC para 10.47.10.2 e processa o mapa de resposta

```
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.
```

Caso a entrada não exista, as depurações precisam ser coletadas da perspectiva do processo LISP. Há também uma ferramenta, chamada LIG (LISP Grouper), que pode ser usada para acionar manualmente o processo LISP (essa é uma maneira muito eficaz de testar a configuração redundante do nó de controle e a consistência do banco de dados entre ambos os nós de controle):

```
<#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 msec  
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 msec  
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	-

Verificação de rota

O CEF usa LISP, e o LISP utiliza a entrada de cache de mapas que recebeu

```
<#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)

```

Verificação do próximo salto do LISP

Como esse pacote é encapsulado por VXLAN, a verificação do próximo salto do LISP precisa ocorrer. Use o comando `show platform software fed switch active ip adj` para obter informações adicionais sobre 10.47.1.13, o próximo salto do 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	0

Decodificação si_hdl do próximo salto do LISP

Pegue o si_hdl (0x7f65ed00f668) e use em 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/13u_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
```

```
=====
```

Decodificação de RI do próximo salto LISP

Pegue o RI (0x2c) e use em 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_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 <-- 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_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 <-- RLOC of Edge-2
```

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

Decodificação de ID do próximo salto LISP

Pegue o DI (0x5012) e use em `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 0x5012
```

```
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
```

Decodificação ri_hdl do próximo salto LISP

Pegue o ri_hdl (0x7f65ed00fd58) e use o 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/13u_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 00
```

```
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_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

=====

Subjacente à verificação do próximo salto

Para chegar ao Next-Hop LISP, há dois caminhos possíveis na subjacência, a verificação ocorre para um, a mesma lógica se aplica à verificação do próximo salto da outra subjacência.

<#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 obter mais informações sobre os próximos saltos, use 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>
```

Decodificação si_hdl do próximo salto subjacente

Pegue o si_hdl (0x7f65ec8a5458) e use no 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/13u_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 08 00 52 54 00 1c 7d e0 00 00 00 00 00 00 00 00
```

```
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
```

=====

Decodificação RI do próximo salto subjacente

Pegue o RI (0x1a) e use no 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
```

Decodificação de ID de Próximo Salto de Subjacência

Pegue o DI (0x526d) e use no 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 0x526d

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	0	1	0	1	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	3	NIF	Y			
GigabitEthernet1/0/4	0xc	0	0	0	3	0	4	3	4	4	4	NIF	Y			
GigabitEthernet1/0/5	0xd	0	0	0	4	0	5	4	5	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

Subjacente à Decodificação ri_hdl do Próximo Salto

Pegue o ri_hdl (0x7f65ec8b8158) e use o 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/13u_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 00 00
```

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
```

=====

Os pacotes são encapsulados em VXLAN e enviados com base em regras de balanceamento de carga. O Embedded Packet Capture (EPC) pode ser usado para capturar o tráfego em todas as interfaces ao mesmo tempo. Lembre-se de que neste ponto o pacote é encapsulado por VXLAN, o filtro EPC deve estar relacionado a RLOC para RLOC, não a endereços IPv4 internos.

<#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=63
3	1.984077	10.47.4.2 -> 10.47.10.2	ICMP 148 Echo (ping) request	id=0x0046, seq=2/512, ttl=63
4	2.999989	10.47.4.2 -> 10.47.10.2	ICMP 148 Echo (ping) request	id=0x0046, seq=3/768, ttl=63

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 ..
0020 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: 781edc1700b^&

[Length: 56]

O pacote de VXLAN encapsulado alcança 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 exist 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=63
4	0.097490	10.47.4.2 -> 10.47.10.2	ICMP 148 Echo (ping) request	id=0x0047, seq=1/256, ttl=63
5	1.150969	10.47.4.2 -> 10.47.10.2	ICMP 148 Echo (ping) request	id=0x0047, seq=2/512, ttl=63
6	1.163817	10.47.4.2 -> 10.47.10.2	ICMP 148 Echo (ping) request	id=0x0047, seq=2/512, ttl=63

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 default)
    .... ..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 00 00 00 .7.2.....
0010 00 00 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 00 00 ..
0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ..
      Data: e8370b3200000000000000000000000000000000000000000000b^@&
      [Length: 56]

```

Edge-2 desencapsula o cabeçalho VXLAN e consulta sua tabela ARP para encaminhar a solicitação ICMP para 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>
```

Decodificação si_hdl do ponto de extremidade

Use o si_hdl (0x7f5744f89988) e o 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/13u_ri_index0:0x
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 00 00

```

```
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
DI = 0x526e <-- Rewrite Index contains destination port information
```

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

```
=====
```

Decodificação de RI de ponto final

Pegue o RI (0x2c) e use no 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.cb f5 is 10.47.10.2

L3IF LE Index 50
```

Decodificação de ID de ponto final

Pegue o DI (0x526e) e use em 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 0x526e
```

```
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
```

```
a1_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
```

```
a1_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 o pacote e o envia para a interface de saída onde HOST-03 está conectado a:

```
<#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=62
3	1.985357	10.47.4.2	->	10.47.10.2	ICMP 106	Echo (ping) request	id=0x0048, seq=2/512, ttl=62

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 default)
.... ...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

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