

Probleemoplossing voor SDA-doorsturen van Oost-West-verkeersstroom

Inhoud

[Inleiding](#)

[Voorwaarden](#)

[Vereisten](#)

[Gebruikte componenten](#)

[Verwante producten](#)

[Achtergrondinformatie](#)

[Topologie](#)

[Configuratie](#)

[Verificatie van host-onboarding](#)

[Invoer voor IPDT/IP-apparaattracering](#)

[MAC/ARP-vermeldingen](#)

[LISP-vermeldingen](#)

[ARP-resolutie in SDA](#)

[Basis bereik van host in SDA Fabric \(hetzelfde VLAN/dezelfde VPN\)](#)

[Basis hostbereikbaarheid in SDA-fabric \(verschillende VLAN's/hetzelfde VPN\)](#)

Inleiding

Dit document beschrijft hoe u de Oost-West Traffic Flow kunt valideren als onderdeel van Software Defined Access (SDA).

Voorwaarden

Vereisten

Cisco raadt kennis van de volgende onderwerpen aan:

- Doorsturen van Internet Protocol (IP)
- Locator/ID-scheidingsprotocol (LISP)

Gebruikte componenten

De informatie in dit document is gebaseerd op de volgende software- en hardware-versies:

- C900v op Cisco IOS® XE 17.10.1
- SDA 1.0 (niet LISP PubSub)

De informatie in dit document is gebaseerd op de apparaten in een specifieke laboratoriumomgeving. Alle apparaten die in dit document worden beschreven, hadden een opgeschoonde (standaard)configuratie. Als uw netwerk live is, moet u zorgen dat u de potentiële impact van elke opdracht begrijpt.

Verwante producten

Dit document kan ook worden gebruikt voor de volgende hardware- en softwareversies:

- C9200
- C9300
- C9400
- C9500
- C9600
- Cisco IOS® XE 16.12 en hoger


Achtergrondinformatie

SDA East-West Traffic Flow verwijst naar het concept waarbij een eindpunt binnen de SDA Fabric wil communiceren met een ander eindpunt binnen dezelfde stof. Er zijn voorbehouden ten aanzien van wat wel en niet beschouwd wordt als een Oost-West-stroom. Een Oost-West verkeersstroom kan als volgt worden beschreven:

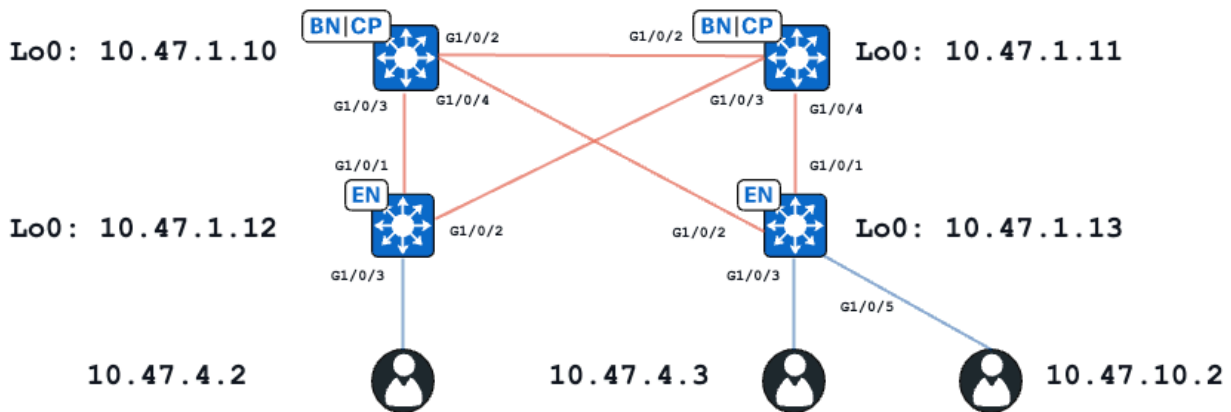
- Endpoints die in hetzelfde subnet voorkomen (172.17.10.2 praten tegen 172.19.10.3) dit wordt als L2LISP-uitbreiding beschouwd
- Endpoints die zich in dezelfde VRF (VN) bevinden (172.19.10.2 met 172.19.11.2 en die zich beide in VRF-campus bevinden), worden als L3 LISP beschouwd
- Endpoint dat zich in de stof bevindt en dat praat met een host die is verbonden met een L2 Handoff Border, precies hetzelfde als L2LISP

De Oost-West-verkeersstromen noemen deze voorbeelden niet:

- Verkeer afkomstig van de SDA Fabric naar buiten de stof, dat is Noord-Zuid
- Inter-VRF-routing wordt ook niet beschouwd als Oost-West (een endpoint in VRF-campus, IP-adres 172.19.10.2 voor gesprekken met een endpoint in VRF-gast, IP-adres 172.19.11.2)
- SD-WAN geïntegreerde domeinen
- SDA-doorvoer
- border-affiniteit
- Extranet

 Opmerking: de opdrachten voor het platform (fed) kunnen verschillen. De opdracht kan zijn "show platform fed <active|standby>" versus "show platform fed switch <active|standby>". Als de syntaxis die in de voorbeelden is genoteerd, niet wordt geparseerd, probeer dan de variant.

Topologie



In dit voorbeeld fungeren C9000v-switches als de fabric-randen en gecollocerde randen. Alle endpoints vallen binnen hetzelfde virtuele netwerk (VPN), red_vn. De endpoints op 10.47.4.2 en 10.47.4.2 bevinden zich in hetzelfde subnetnummer; het eindpunt op 10.47.10.2 bevindt zich in een ander subnetnummer maar in hetzelfde VPN.

Configuratie

Er wordt aangenomen dat Cisco DNA-Center wordt gebruikt om SDA-stof met de standaardinstellingen te voorzien:

- Layer-2-extensie is ingeschakeld (hierdoor wordt verkeer doorgestuurd op basis van MAC-adreslookups in plaats van IP-adreslookups).
- Layer 2-overstroming is uitgeschakeld (dit maakt ARP-onderdrukking op randapparaten en LISP-ondersteunde ARP-training mogelijk).

Na een correct hostonboardingsproces bevat de interfaceconfiguratie verschillende secties:

Fabric Edge (10.47.1.12) interfaceconfiguratie:

```
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
```

Configuratie van Fabric Edge (10.47.1.12) 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
```

Fabric Edge (10.47.1.13) interfaceconfiguratie:

```

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

```

Fabric Edge (10.47.1.13) LISP-configuratie

```

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

```

Verificatie van host-onboarding

Als onderdeel van het host on-boarding proces worden verschillende structuren gecreëerd:

Invoer voor IPDT/IP-apparaattracering

Na succesvolle host-onboarding is er een geldige vermelding in de IPDT-tabel (IP Device Tracking) en wordt de end-host gemarkeerd als BEREIKBAAR:

```
<#root>
```

```
Edge-1#
```

```
show device-tracking database interface gi1/0/3
```

```

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

MAC/ARP-vermeldingen

Wanneer de end-host met succes onboarded is, kan het de standaardgateway pingen (of kan van de standaardgateway worden gepingeld als geen firewall op het eindpunt wordt geïnstalleerd dat deze communicatie blokkeert):

```
<#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
```

Op het Edge-knooppunt is er een MAC-adres en een corresponderende ARP-ingang in de tabel (in 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
```

Software FED MAC-adresprogrammering**

Om het MAC-adres in FED te controleren, gebruikt u de opdracht `show platform software fed switch actieve 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-adresomzetting****

Neem de macHandle-waarde van de vorige opdracht (0x7f65ec7bda68) en gebruik in show platform hardwarematige switch actieve 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_peerid 0, learning_peerid 0
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_asic: 0
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
=====

****MVID-verificatie****

Nummer 7 in de vorige uitvoer is de toegewezen VLAN-id (MVID) in hardware. Om te verifiëren dat zij tot "echt"VLAN aanpassen, gebruik tonen platformsoftware gevoed switch actief vlan <vlan nummer>

<#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
-------	-----------	------------	--------------	-----------

1026
0x0000000000420011 0x00007f65ec6a08b8 0x00007f65ec6a1138 0x00007f65ec77e838 0x000000000000

7

****GPN-verificatie (Global Port Number)****

Om de GPN te correleren met een "echte" interface, gebruik de opdracht tonen platformsoftware gevoede switch actieve ifm-toewijzingen 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

****MAC-adresomzetting****

Neem de siHandle-waarde van de vorige opdracht (0x7f65ec7c21f8) en gebruik in show platform hardwarematige switch actieve 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

=====

Verificatie ****MAC-adresherschrijvingsindex****

Neem de RI-waarde van de vorige opdracht (0x25) en gebruik in show platform hardwarefed switch actieve fwd-asic resource asic alle herschrijf-index bereik <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

Verificatie **MAC-adresbestemming-index**

Neem de DI-waarde van het vorige commando (0x526e) en gebruik in show platform hardwarematig switch actieve fwd-asic resource asic voor alle bestemmings-indexbereik <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
```

****Poortverificatie****

Om de poort die eerder gezien is te correleren, gebruikt u de commandshow platform software gevoed switch actieve ifm-toewijzingen en kijkt u naar de Port column.

<#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
```

****Hardware FED MAC-adresverificatie****

Deze output in een werkend/ideaal scenario komt overeen met wat de macHandle decodeer voorzag.

<#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

- VLAN-id in hardware (MVID) is 7
- MAC-adres: 5254.0019.93e9
- GPN: 3

LISP-vermeldingen

Na succesvolle host-onboarding worden LISP-vermeldingen voor de end-host lokaal gemaakt op Edge Node en geregistreerd op Control Nodes (LISP MSMR. - LISP Map Server / Map Resolver). Alle LISP-controles moeten worden uitgevoerd met betrekking tot het specifieke toepassingsgebied van de instantie-id die kan worden gecontroleerd voor L2 en 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

L2 LISP-databaseverificatie

Om de L2 LISP-database te controleren, gebruik de opdracht toon lisp instantie-id <L2 LISP ID> Ethernet-database <mac address>

<#root>

Edge-1#

show lisp instance-id 8190 ethernet database 5254.0019.93e9

LISP ETR MAC Mapping Database for LISP 0 EID-table Vlan 1026 (IID 8190), LSBs: 0x1

Entries total 1, no-route 0, inactive 0, do-not-register 2

5254.0019.93e9/48, dynamic-eid Auto-L2-group-8190, inherited from default locator-set rloc_222e1707-175

Uptime: 2d17h, Last-change: 2d17h

Domain-ID: local

Service-Insertion: N/A

Locator	Pri/Wgt	Source	State
---------	---------	--------	-------

10.47.1.12

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

```
-----> Our own RLOC
```

```
Map-server      Uptime          ACK  Domain-ID
```

```
10.47.1.10
```

```
1d11h          Yes  0
```

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

```
10.47.1.11
```

```
2d17h          Yes  0
```

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

LISP L2 Adresoplossing (AR) Databaseverificatie

Om de LISP L2 AR Database te controleren, gebruik de opdracht toon lisp instantie-id <LISP L2 IID> ethernetdatabase adres-resolutie <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
```

LISP L3 databaseverificatie

Om de LISP L3 Database te controleren, gebruikt u de opdracht show lisp instantie-id <LISP L3 ID> ipv4 database <IP-adres/subnetmasker>

```
<#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

****CEF-verificatie****

Om CEF te controleren, gebruik de opdracht tonen ip cef vrf <vrf name> <IP-adres> intern

<#root>

Edge-1#

show ip cef vrf red_vn 10.47.4.2 internal

10.47.4.2/32, epoch 1, flags [att, sc], RIB[D], refcnt 6, per-destination sharing

sources: RIB, Adj, IPL

feature space:

 IPRM: 0x00058000

 Broker: linked, distributed at 3rd priority

subblocks:

 SC owned,sourced:

LISP local EID

-

 SC inherited: LISP remote EID - locator status bits 0x00000000

 SC inherited: LISP cfg dyn-EID - LISP configured dynamic-EID

 LISP EID attributes: localEID Yes, c-dynEID Yes, d-dynEID Yes, a-dynEID No

 SC owned,sourced: LISP generalised SMR - [disabled, not inheriting, 0x7F06D0A67E40 locks: 1]

 Adj source:

IP adj out of Vlan1026

,

addr 10.47.4.2


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

```
IP adj out of Vlan1026, addr 10.47.4.2
```

```
7F06D300B738
```

Naast lokale LISP-vermeldingen op het SDA Edge-knooppunt bevat SDA Control Nodes (LISP MS/MR) ook extra informatie over de eindpunten:

Verificatie van samengestelde rand L2 LISP-server:

Om de L2 LISP Server te controleren, gebruik de opdracht `show lisp instantie-id <L2 LISP ID>`
Ethernet-server <MAC Address>

```
<#root>
```

```
Border-1#
```

```
show lisp instance-id 8190 ethernet server 5254.0019.93e9
```

```
LISP Site Registration Information
```

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

```
  EID-prefix:
```

```
5254.0019.93e9
```

```
/48 instance-id 8190
```

```
<-- Endpoint MAC Address
```

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

ETR

10.47.1.12

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

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

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

Locator	Local	State	Pri/Wgt	Scope
---------	-------	-------	---------	-------

10.47.1.12

yes	up	10/10	IPv4	none
-----	----	-------	------	------

<--(Fabric Edge IP address)

Verificatie van samengestelde grens L2 LISP-adresresolutie (AR):

Om de L2 LISP AR Server te controleren, gebruik de opdracht toon lisp instantie-id <LISP L2 IID>
Ethernet-server-adresresolutie <IP-adres>

Om de registratiegeschiedenis te controleren, gebruik de opdracht toon lisp instantie-id <LISP L2
ID> Ethernet-server-adresresolutie <IP-adres> registratiegeschiedenis

<#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

Verificatie van samengestelde rand L3 LISP-server

Om de L3 LISP Server te controleren, gebruik de opdracht `show lisp instantie-id <LISP L3 ID> ipv4 server <IP adres>`

Om de registratiegeschiedenis van de L3 LISP-server te controleren, gebruikt u de opdracht `toon lisp instantie-id <LISP L3 IID> ipv4 server <IP adres> registratiegeschiedenis`

<#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

ARP-resolutie in SDA

Er wordt aangenomen dat Cisco Catalyst Center is gebruikt om SDA-stof met standaardinstellingen te provisioneren. Dit betekent dat Layer 2-extensie is ingeschakeld en dat al het verkeer binnen de Fabric (in hetzelfde VLAN / VPN) wordt doorgestuurd op basis van MAC-

adreslookups / LISP Ethernet-instantie, in plaats van IP-adreslookups / LISP IP-instantie.

Vanuit het perspectief van probleemoplossing kan het handig zijn om statische ARP-vermeldingen op beide hosts te configureren om snel te controleren of het probleem zich voordoet met generieke connectiviteit in de stof (in dat geval ping werkt niet tussen hosts) of alleen met ARP-resolutie.

ARP-proces in SDA Fabric maakt gebruik van LISP om de identificatie en locatie van hosts op te lossen en is anders dan ARP-gedrag in traditionele Routing/Switching-omgevingen.

Stap 1: Fabric Endpoint stuurt een ARP-verzoek om de MAC/IP-binding voor het andere Fabric-endpoint te bepalen

Packet Capture kan op de toegangsinterface worden geconfigureerd om te bevestigen dat ARP-pakket van de host wordt ontvangen:

```
<#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: 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

```

Stap 2. Edge Node gebruikt ARP-pakket en genereert LISP-verzoek om het MAC-adres van HOST-02 te bepalen.

Edge-1 stuurt een LISP Map-request om het MAC-adres van 10.47.4.3 op te lossen naar de LISP Control-Planes (Collocation Borders):

```
<#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'.
```

Stap 3. Control Node ontvangt LISP-verzoek voor IP/MAC-toewijzing en stuurt een antwoord terug naar SDA Edge-knooppunt

LISP Map-request wordt ontvangen van de Fabric Edge en reageert met een LISP Map-Reactie met het MAC-adres dat gekoppeld is aan 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.
```

De LISP Control-Plane reageert met een Proxy-antwoord op basis van de adresresolutie-ingang die is opgeslagen in de lokale database

```
<#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

Stap 4. Edge Node ontvangt LISP-antwoord met MAC-adres van 10.47.4.3

Het antwoord van de LISP-proxy wordt ontvangen door het Fabric Edge-knooppunt:

```
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.
```

Stap 5. Edge Node verstuurt LISP-pakket met plattegrond-aanvraag om RLOC-locatie voor MAC-adres te bepalen

Na succesvolle voltooiing van de eerste drie stappen kent Edge Node het MAC-adres van 10.47.4.3 waarvoor ARP oorspronkelijk is gegenereerd. Aangezien Layer-2-uitbreiding is ingeschakeld, antwoordt Edge Node niet terug met deze informatie naar 10.47.4.2, maar gebruikt het eerder om de locatie van uitgaande knooppunt Edge te bepalen, zodat ARP naar 10.47.4.3 kan worden doorgestuurd als in een traditioneel Layer-2-netwerk.

Om deze reden genereert Edge Node nog een LISP Map request-pakket in Ethernet Instance, dit keer met RLOC-informatie voor het MAC-adres van 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
```

Stap 6: LISP Map-request-pakket wordt ontvangen door Control Node om de RLOC-locatie voor MAC-adres te bepalen

Control Node ontvangt het LISP-pakket en reageert erop op basis van de lokale databasestatus

```
<#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
```

Stap 7: LISP-kaartantwoord wordt ontvangen door Edge Node

Het antwoord van de kaart dat door Control Node wordt geproduceerd wordt ontvangen door Edge Node:

```
<#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
```

Hierdoor wordt uiteindelijk een ingang in LISP Ethernet-instantiekaart-cache gemaakt en kan ARP-pakket worden doorgestuurd naar Edge-2 waar 10.47.4.3 is aangesloten op

```
<#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)
```

Stap 8. ARP is ingekapseld in VXLAN en wordt naar HOST-02 verzonden

Alle aan LISP verwante stappen moesten bepalen waar 10.47.4.3 zich bevindt, zodat Edge Node oorspronkelijk ARP-pakket (broadcast) als unicast naar de juiste Edge-knooppunt kan verzenden. Het oorspronkelijke ARP-verzoek wordt door Edge Node CPU in een cachegeheugen (niet gedropt) totdat alle stappen zijn voltooid, waardoor een juiste ARP-resolutie mogelijk is, zelfs wanneer één ARP-pakket vanaf 10.47.4.2 is verzonden.

ARP-pakket is ingesloten in VXLAN, zoals in het voorbeeld:

```
<#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
```

Het ARP verzoek is ingekapseld in VXLAN en ook omgezet van een uitzending ARP verzoek naar een unicast ARP verzoek.

```
<#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
```

Stap 9. ARP Antwoord wordt gegenereerd door 10.47.4.3 en verzonden naar 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
```

Op dit moment is het pakket niet bestemd om adres uit te zenden (als origineel ARP verzoek) maar naar het MAC-adres van 10.47.4.2, wanneer het toegangsknooppunt Edge Node (Edge-2) bereikt, wordt de normale LISP-handeling geactiveerd. Aanvankelijk ontbreekt het MAC-adres van 10.47.4.2 in het geval LISP Ethernet van Edge Node, wordt het pakket gestraft aan CPU om LISP Map Verzoek te produceren om RLOC voor HOST-01 te bepalen. Dit gedrag is precies hetzelfde als dat in andere secties in dit document wordt beschreven en maakt het mogelijk om LISP Map Cache entry for 10.4.4.2 op Edge-2 te maken:

<#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)
```

Met deze vermelding kan ARP-antwoord met succes naar Edge-1 in VXLAN-insluiting worden verzonden en vervolgens naar 10.47.4.2 worden doorgestuurd, zodat het hele ARP-resolutieproces kan worden uitgevoerd.

Basis bereikbaarheid van host in SDA Fabric (hetzelfde VLAN/dezelfde VPN)

Aangenomen wordt dat ARP resolutie met succes voltooid en beide hosts 10.47.4.2 en 10.47.4.3 hebben juiste ARP waarden voor elkaar.

Vanuit het perspectief van het oplossen van problemen, is het zeer nuttig om statische ARP ingangen op beide gastheren te vormen om snel te controleren als het probleem met generische connectiviteit in de stof is (in dergelijk geval pingelt werkt niet tussen gastheren) of slechts met

ARP proces.

10.47.4.2 genereert een ICMP-verzoek naar 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:


```
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)
```

Controleer het MAC-adres van het externe eindpunt, het wijst de L2LI0, die wordt verwacht

```
<#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
```

Controleer het MAC-adres in de FED.

```
<#root>
```

```
Edge-1#
```

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

```
VLAN  MAC              Type  Seq#  EC_Bi  Flags
```

```
machandle
```

```
siHandle
```

```
riHandle
```

```
diHandle          *a_time *e_time  ports
```

```
-----  
1026
```

```
5254.001e.ad00
```

```
0x1000001      0      0      64
```


0x7f65ecfdd3a8

0x7f65ecfdd1f8

0x7f65ecfdd048

0x0 0 2 RLOC 10.47.1.13 adj_id 97

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

Asic: 0

htm-handle = 0x7f65ecc4d188 MVID = 7 gpn = 1

SI = 0xc7 RI = 0x12 DI = 0x5012

Asic: 1

SI = 0xc7 RI = 0x12 DI = 0x5013

MAC-adresomzetting voor decoderen

Neem de macHandle (0x7f65ecfd3a8) van de vorige opdracht en gebruik in de opdracht tonen platform hardwareleverde switch actieve fwd-asic abstraction print-resource-handle <macHandle>
1

<#root>

Edge-1#

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

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

Detailed Resource Information (ASIC_INSTANCE# 0)

Number of HTM Entries: 1

Entry 0: (handle 0x7f65ecc4d188)

Absolute Index: 4706

Time Stamp: 14

KEY -

vlan:7

mac:0x5254001ead00

l3_if:0

gpn:3401

epoch:0 static:0 flood_en:0 vlan_lead_wless_flood_en: 0 client_home_asic: 0 learning_peerid 0, learning

Indexdecode herschrijven

Neem de RI (0x12) en gebruik in het commando show platform hardwaregevoede switch actieve fwd-asic resource asic alle herschrijven-index bereik <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)
```

Decodering op bestemming-index

Neem de DI (0x5012) en gebruik in het commando show platform hardwarefeed switch actieve fwd-asic resource base alle bestemming-index bereik <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
```

Handle-decoderen

Neem de siHandle (0x7f65ecfd048) en gebruik in het commando show platform hardwareleverde switch actieve fwd-asic abstraction print-resource-handle <siHandle> 1

<#root>

Onderliggende routeverificatie

Het verkeer is ingekapseld in VXLAN met IID 8190 met behulp van 10.47.1.12 en heeft de mogelijkheid om taakverdeling te maken tussen Gig1/0/1 en 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

Om si_hdl, ri_hdl informatie te krijgen, gebruik de opdracht tonen platformsoftware gevoed switch actieve ip adj

<#root>

Edge-1#

```
show platform software fed switch active ip adj
```

IPV4 Adj entries

dest	if_name	dst_mac	si_hdl	r
225.0.0.0	GigabitEthernet1/0/1	0100.5e00.0000	0x7f65ec958128	0
10.47.1.10	LISPO.4100	4500.0000.0000	0x7f65ec895ed8	0
225.0.0.0	GigabitEthernet1/0/2	0100.5e00.0000	0x7f65ec958f68	0
10.47.1.4	GigabitEthernet1/0/2	5254.001c.7de0	0x7f65ec8a5458	0
225.0.0.0	Null0	f800.0011.0000	0x7f65ec3740c8	0
10.47.1.0	GigabitEthernet1/0/1	5254.000a.42f3	0x7f65ec8b8468	0

Underlay Next-hop si_hdl decoderen

Om het gebruik van si_hdl (0x7f65ec8a5458) in de opdracht te controleren toon platformhardware gevoede switch actieve 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_index0:0x0
Features sharing this resource:66 (1)]
```

```
Cookie length: 56
```

```
00 00 00 00 00 00 00 00 26 00 00 00 00 00 00 00 00 00 00 00 08 00 52 54 00 1c 7d e0 00 00 00 00 00 00 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
```

```
=====
```

Indexdecode voor volgende hop onderliggend

Om het RI (0x1a) gebruik in het bevel te decoderen toon platformhardware gevoede switch actieve fwd-asic bron asic alle herschrijven-index bereik <RI>

<#root>

Edge-1#

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

```
ASIC#:0
```

```
RI:26
```

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

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

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

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

```
L3IF LE Index 38
```

```
ASIC#:1 RI:26 Rewrite_type:AL_RRM_REWRITE_L3_UNICAST_IPV4_SHARED(1) Mapped_rii:L3_UNICAST_IPV4(9)
```

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

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

```
L3IF LE Index 38
```

Decodering van index voor volgende hop-bestemmingen

Om het DI (0x526d) gebruik in show platform hardware gevoed switch actieve fwd-asic resource asic alle bestemming-index bereik te decoderen <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 bit
```

```
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 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

```

Underlay Next-hop ri_hdl decoderen

Om het ri_hdl (0x7f65ec8a4eb8) gebruik in show platform hardware gevoed switch actieve fwd-asic abstraction print-resource-handle (ri_hdl) te decoderen 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_index0:0x1a
Features sharing this resource:66 (1)]
Cookie length: 56
00 00 00 00 00 00 00 00 26 00 00 00 00 00 00 00 00 00 00 00 08 00 52 54 00 1c 7d e0 00 00 00 00 00 00 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
```

Basis bereikbaarheid van host in SDA Fabric (verschillende VLAN's/dezelfde VPN)

In dit punt wordt de communicatie tussen 10.47.4.2 en 10.47.10.2 onderzocht. Aangezien deze hosts tot verschillende VLAN's behoren, moeten beide een standaardgateway hebben die aanwijst op een standaardgateway. Voor 10.47.4.2 is het 10.47.4.1 en 10.47.10.2 is het 10.47.10.1.

Stap 1. Bevestig dat de connectiviteit tussen het eindpunt en de standaardgateway werkt:

```
<#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
```

Stap 2. Bevestig dat het pakket van 10.47.4.2 met succes door Edge-1 wordt ontvangen:

Packet kan worden opgenomen op de ingangside interface met uitzicht op 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]

```

Stap 3 - LISP Lookup

Ingress Edge Node moet de locatie (RLOC) van HOST-03 bepalen waarnaar pakketten worden verzonden. Zoals in dit geval is de end-host HOST-03 in verschillende VLAN's (maar dezelfde VPN / VRF: GEBRUIKERS), wordt LISP IPv4-instantie gebruikt omdat de raadpleging is gebaseerd op IP-adres (MAC-adres behoort tot Edge Node zelf).

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

LISP-kaartaanvraag bereikt controle-knooppunt (LISP-kaartserver) grens-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.
LISP[MR ]-0 IID 4099 IPv4: MS EID 10.47.10.2/32: Sending proxy reply to 10.47.1.12.
```

LISP-kaartantwoord bereikt Edge-knooppunt:

```
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.
```

De Fabric Edge-vragen voor de RLOC voor 10.47.10.2 en verwerken het Map-Reply

```
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.
```

Als de ingang niet bestaat, moet debugs worden verzameld vanuit het LISP-procesperspectief. Er is ook een tool, genaamd LIG (LISP Grouper) die kan worden gebruikt om handmatig LISP-proces te activeren (dit is een zeer effectieve manier om redundante configuratie van het controleknooppunt en databaseconsistentie tussen beide controleknooppunten te testen):

```
<#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	-

Routeverificatie

CEF maakt gebruik van LISP en LISP maakt gebruik van de map-cache-ingang die het heeft ontvangen

```
<#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)

```

LISP-verificatie van volgende hop

Aangezien dit pakket VXLAN ingekapseld is, moet de verificatie van de LISP next-hop plaatsvinden. Gebruik de opdracht tonen platform software gevoed switch actieve ip adj om extra informatie over 10.47.1.13, de LISP next-hop

<#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

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
```

LISP-decoding van Next-Hop DI

Neem de DI (0x5012) en gebruik in show platform hardware gevoed switch actieve fwd-asic resource asic alle bestemming-index bereik <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
```


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

=====

Verificatie van volgende hop ondergraven

Om naar de LISP Next-Hop te gaan, zijn er twee mogelijke paden in de onderlaag, verificatie gebeurt voor één, dezelfde logica is van toepassing in verificatie van de andere onderliggend volgende-hop.

<#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

Om meer informatie over de volgende-hop te krijgen, gebruik tonen platformsoftware gevoed switch actieve 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>

Underlay Next-hop si_hdl decoderen

Neem de si_hdl (0x7f65ec8a5458) en gebruik in het commando show platform hardwareleverde switch actieve 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
```

=====

Underlay Next-hop RI-decodering

Neem de RI (0x1a) en gebruik in het commando tonen platform hardwarematige switch actieve fwd-asic resource asic alle herschrijven-index bereik <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

Volgende hop-DI decoderen

Neem de DI (0x526d) en gebruik in het commando show platform hardwarefed switch actieve fwd-asic resource asic alle bestemming-index bereik <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

Underlay Next-hop ri_hdl decoderen

Neem de ri_hdl (0x7f65ec8b8158) en gebruik in het commando show platform hardwareleverde switch actieve 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
```

```
=====
```

Pakketten worden ingesloten in VXLAN en verzonden op basis van regels voor taakverdeling. Ingesloten Packet Capture (EPC) kan worden gebruikt om verkeer op alle interfaces tegelijkertijd op te nemen. Denk er op dit punt aan dat het pakket is ingekapseld met VXLAN, het EPC-filter moet zijn tegen RLOC naar RLOC, niet tegen interne IPv4-adressen.

<#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 (

Ingesloten VXLAN-pakket bereikt 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)

```



```
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
=====
```

Endpoint RI Decode

Neem de RI (0x2c) en gebruik in het commando show platform hardwarefeed switch actieve fwd-asic resource asic alle herschrijf-index bereik <RI>

```
<#root>
```

```
Edge-2#
```

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

```
ASIC#:0
```

```
RI:44
```

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

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

```
    MAC Addr: MAC Addr:
```

```
52:54:00:02:cb:f5
```

```
,
```

```
<-- MAC Address 5254.0002.cbF5 is 10.47.10.2
```

```
  L3IF LE Index 50
```

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

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

```
MAC Addr: MAC Addr:
52:54:00:02:cb:f5
,
<-- MAC Address 5254.0002.cbF5 is 10.47.10.2

L3IF LE Index 50
```

Endpoint-DI-decodering

Neem de DI (0x526e) en gebruik in show platform hardware gevoed switch actieve fwd-asic resource asic alle bestemming-index bereik <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 decapsuleert het pakket en stuurt het naar de uitgangsinterface waar HOST-03 is aangesloten op:

```
<#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

Over deze vertaling

Cisco heeft dit document vertaald via een combinatie van machine- en menselijke technologie om onze gebruikers wereldwijd ondersteuningscontent te bieden in hun eigen taal. Houd er rekening mee dat zelfs de beste machinevertaling niet net zo nauwkeurig is als die van een professionele vertaler. Cisco Systems, Inc. is niet aansprakelijk voor de nauwkeurigheid van deze vertalingen en raadt aan altijd het oorspronkelijke Engelstalige document ([link](#)) te raadplegen.