

Fehlerbehebung: SDA leitet Ost-West-Datenverkehr weiter

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Einleitung

In diesem Dokument wird beschrieben, wie der Ost-West-Datenverkehrsfluss als Teil von Software Defined Access (SDA) validiert wird.

Voraussetzungen

Anforderungen

Cisco empfiehlt, dass Sie über Kenntnisse in folgenden Bereichen verfügen:

- Internet Protocol (IP)-Weiterleitung
- Locator/ID Separation Protocol (LISP)

Verwendete Komponenten

Die Informationen in diesem Dokument basierend auf folgenden Software- und Hardware-Versionen:

- C9000v auf Cisco IOS® XE 17.10.1
- SDA 1.0 (nicht LISP PubSub)

Die Informationen in diesem Dokument beziehen sich auf Geräte in einer speziell eingerichteten Testumgebung. Alle Geräte, die in diesem Dokument benutzt wurden, begannen mit einer gelöschten (Nichterfüllungs) Konfiguration. Wenn Ihr Netzwerk in Betrieb ist, stellen Sie sicher, dass Sie die möglichen Auswirkungen aller Befehle kennen.

Verwandte Produkte

Dieses Dokument kann auch mit folgenden Hardware- und Softwareversionen verwendet werden:

- C9200
- C9300
- C9400
- C9500
- C9600
- Cisco IOS® XE 16.12 und höher


Hintergrundinformationen

SDA-Ost-West-Datenverkehrsfluss bezieht sich auf das Konzept, bei dem ein Endpunkt innerhalb der SDA-Fabric mit einem anderen Endpunkt innerhalb derselben Fabric kommunizieren möchte. Es gibt Vorbehalte hinsichtlich dessen, was ein Ost-West-Fluss ist und was nicht. Ein Ost-West-Datenverkehrsfluss kann beispielsweise wie folgt aussehen:

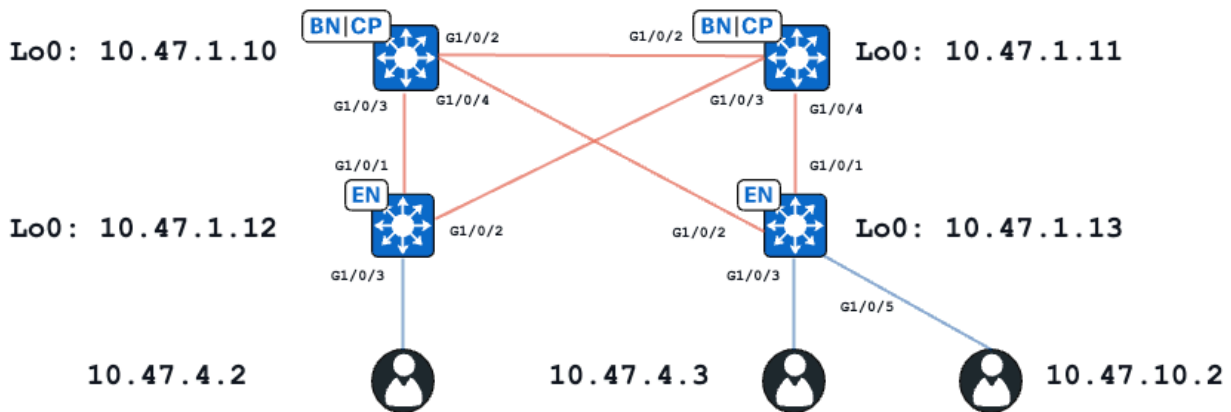
- Endpunkte, die sich im gleichen Subnetz befinden (172.17.10.2 im Gespräch mit 172.19.10.3), werden als L2LISP-Durchwahlen betrachtet.
- Endpunkte mit derselben VRF-Instanz (VN) (172.19.10.2 im Gespräch mit 172.19.11.2 und beide befinden sich im VRF-Campus). Dies gilt als L3-LISP.
- Endpunkt in der Fabric, der mit einem Host kommuniziert, der mit einer L2-Übergabegrenze verbunden ist, genau wie L2LISP

Ost-West-Verkehrsströme verweisen nicht auf folgende Beispiele:

- Datenverkehr, der von der SDA-Fabric zu externen Fabricen geführt hat (Nord-Süd)
- Inter-VRF-Routing wird ebenfalls nicht als Ost-West-Routing betrachtet (ein Endpunkt im VRF-Campus, IP-Adresse 172.19.10.2 im Gespräch mit einem Endpunkt im VRF-Gast, IP-Adresse 172.19.11.2)
- Integrierte SD-WAN-Domänen
- SDA-Transit
- Randaffinität
- Extranet

 Hinweis: Die Plattformbefehle (Eingabe) können variieren. Der Befehl kann "show platform fed <active|standby>" oder "show platform fed switch <active|standby>" sein. Wenn die in den Beispielen angegebene Syntax nicht analysiert wird, versuchen Sie es mit der Variante.

Topologie



Im vorliegenden Beispiel fungieren C9000v-Switches als Fabric-Ränder und als verbundene Ränder. Alle Endpunkte befinden sich im selben virtuellen Netzwerk (Virtual Network, VN), red_vn. Endpunkte mit 10.47.4.2 und 10.47.4.2 befinden sich im gleichen Subnetz, der Endpunkt mit 10.47.10.2 befindet sich in einem anderen Subnetz, aber in derselben VN.

Konfiguration

Es wird davon ausgegangen, dass Cisco DNA-Center verwendet wird, um SDA-Fabrics mit den Standardeinstellungen bereitzustellen:

- Die Layer-2-Erweiterung ist aktiviert (dadurch wird die Weiterleitung des Datenverkehrs auf der Grundlage von MAC-Adressen-Suchvorgängen statt IP-Adressen-Suchvorgängen erzwungen).
- Layer-2-Flooding ist deaktiviert (dadurch wird ARP-Unterdrückung auf Edge-Geräten aktiviert und LISP-unterstütztes ARP-Lernen).

Nach dem ordnungsgemäßen Host-Onboarding-Prozess umfasst die Schnittstellenkonfiguration mehrere Abschnitte:

Fabric Edge-Schnittstellenkonfiguration (10.47.1.12):

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

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

```
ip helper-address 10.47.9.9
no ip redirects
ip route-cache same-interface
no lisp mobility liveness test
lisp mobility red-IPV4
end
```

Fabric Edge (10.47.1.12) LISP-Konfiguration:

```
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-Schnittstellenkonfiguration (10.47.1.13):

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

LISP-Konfiguration für Fabric Edge (10.47.1.13)

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

```

!
dynamic-eid red-helpdesk-IPV4
  database-mapping 10.47.10.0/24 locator-set rloc_691b1fe4-5264-44c2-bb1b-0903b3eb2c51
  exit-dynamic-eid
!
service ipv4
  eid-table vrf red_vn
  map-cache 0.0.0.0/0 map-request
  sgt distribution
  sgt
  exit-service-ipv4
!
exit-instance-id
!
instance-id 8190
  remote-rloc-probe on-route-change
  service ethernet
    eid-table vlan 1026
    database-mapping mac locator-set rloc_691b1fe4-5264-44c2-bb1b-0903b3eb2c51
    dynamic-eid detection multiple-addr bridged-vm
    exit-service-ethernet
  !
  exit-instance-id
!
instance-id 8192
  remote-rloc-probe on-route-change
  service ethernet
    eid-table vlan 1028
    database-mapping mac locator-set rloc_691b1fe4-5264-44c2-bb1b-0903b3eb2c51
    dynamic-eid detection multiple-addr bridged-vm
    exit-service-ethernet
  !
  exit-instance-id

```

Host-Onboarding-Verifizierung

Im Rahmen des Host-Onboarding-Prozesses werden verschiedene Strukturen erstellt:

IPDT-/IP-Geräteverfolgungseintrag

Nach erfolgreichem Host-Onboarding gibt es einen gültigen Eintrag in der IPDT-Tabelle (IP Device Tracking), und der End-Host wird als REACHABLE markiert:

```
<#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	prlv1	ag
DH4 10.47.4.2	5254.0019.93e9	Gi1/0/3	1026	0024	3m

MAC-/ARP-Eintrag

Wenn der End-Host erfolgreich integriert wurde, kann er einen Ping an das Standard-Gateway senden (oder einen Ping an das Standard-Gateway senden, wenn auf dem die Kommunikation blockierenden Endpunkt keine Firewall installiert ist):

<#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

Am Edge-Knoten befinden sich eine MAC-Adresse sowie ein entsprechender ARP-Eintrag in der Tabelle (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 Address Programming**

Um die MAC-Adresse in FED zu überprüfen, verwenden Sie den Befehl show platform software fed switch active matm macTable vlan <vlan id> mac <mac address>.

<#root>

Edge-1#

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

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

```
machandle
```

```
siHandle
```

```
riHandle
```

```
diHandle
```

```
          *a_time  *e_time  ports                                     Con
-----
1026    5254.0019.93e9          0x1      9      0      0
0x7f65ec7bda68
```

```
0x7f65ec7c21f8
```

```
0x0
```

```
0x7f65ec6e1368
```

```
300      7  GigabitEthernet1/0/3
```

```
Yes
```

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

```
Asic: 0
```

```
  htm-handle = 0x7f65ec95dc68 MVID = 7 gpn = 1
```

```
  SI = 0xc3 RI = 0x25 DI = 0x526e
```

```
  DI = 0x526e pmap = 0x00000000 0x00000004 pmap_intf : [GigabitEthernet1/0/3]
```

```
Asic: 1
```

```
  SI = 0xc3 RI = 0x25 DI = 0x526e
```

```
  DI = 0x526e pmap = 0x00000000 0x00000000
```

****MAC-Adresse macHandle-Programmierung****

Nehmen Sie den macHandle-Wert aus dem vorherigen Befehl (0x7f65ec7bda68) und verwenden Sie in show platform hardware fed switch active fwd-asic abstraction print-resource-handle <macHandle> 1

<#root>

Edge-1#

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


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

Detailed Resource Information (ASIC_INSTANCE# 0)

Number of HTM Entries: 1

Entry 0: (handle 0x7f65ec95dc68)

Absolute Index: 6778

Time Stamp: 4

KEY -

vlan:7

mac:0x5254001993e9

l3_if:0

gpn:3

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

****MVID-Verifizierung****

Die Nummer 7 in der vorherigen Ausgabe ist die zugeordnete VLAN-ID (MVID) der Hardware.
Verwenden Sie `show platform software fed switch active vlan <VLAN-Nummer>`, um
sicherzustellen, dass sie dem "echten" VLAN entsprechen.

<#root>

Edge-1#

`show platform software fed switch active vlan 1026`

VLAN Fed Information

vlan

id

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

MVID

1026

0x0000000000420011 0x00007f65ec6a08b8 0x00007f65ec6a1138 0x00007f65ec77e838 0x000000000000

7

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

Um das GPN mit einer "echten" Schnittstelle zu korrelieren, verwenden Sie den Befehl `show platform software fed switch active ifm mappings gpn`.

<#root>

Edge-1#

`show platform software fed switch active ifm mappings gpn`

Mappings Table

GPN	Interface	IF_ID	IF_TYPE
1	GigabitEthernet1/0/1	0x0000001a	ETHER
2	GigabitEthernet1/0/2	0x0000001b	ETHER
3			

GigabitEthernet1/0/3

0x0000000b ETHER

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

****MAC-Adresse siHandle-Programmierung****

Nehmen Sie den siHandle-Wert aus dem vorherigen Befehl (0x7f65ec7c21f8) und verwenden Sie in `show platform hardware fed switch active fwd-asic abstraction print-resource-handle`

<si_handle> 1

<#root>

Edge-1#

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

Handle:0x7f65ec7c21f8 Res-Type:ASIC_RSC_SI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L3_UNICAST.
priv_ri/priv_si Handle: 0x7f65ec7c2498Hardware Indices/Handles: index0:0xc3 mtu_index/13u_ri_index0:0x
Features sharing this resource:66 (1)]

57 (1)]

Cookie length: 56

00 00 00 00 00 00 00 02 04 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

=====

Überprüfung des MAC Address Rewrite-Index

Den RI-Wert aus dem vorherigen Befehl (0x25) verwenden und in show platform hardware fed switch active fwd-asic resource asic all rewrite-index range <RI> <RI> verwenden

<#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

Überprüfung des MAC-Adresszielindex

Nehmen Sie den DI-Wert aus dem vorherigen Befehl (0x526e) und verwenden Sie in show platform hardware fed switch active fwd-asic resource asic all destination-index range <DI> <DI>

<#root>

Edge-1#

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

****Port-Verifizierung****

Um den zuvor erkannten Port zu korrelieren, verwenden Sie die Software-Feed-Switch-Zuordnungen des Befehls `Show Platform` und sehen Sie sich die Spalte `Port` an.

<#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-Adressverifizierung****

Diese Ausgabe in einem Arbeits-/Idealszenario entspricht dem, was der `macHandle-Decoder` bereitgestellt hat.

<#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

```

- Die VLAN-ID in der Hardware (MVID) ist 7.
- MAC-Adresse: 5254.0019.93e9
- GPN: 3

LISP-Eintrag

Nach erfolgreichem Host-Onboarding werden die LISP-Einträge für den End-Host lokal auf dem Edge-Knoten erstellt und auf den Steuerungsknoten (LISP MSMR - LISP Map Server / Map Resolver) registriert. Alle LISP-Prüfungen müssen für einen bestimmten Instanz-ID-Bereich durchgeführt werden, der für L2 und L3 überprüft werden kann:

```
<#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-Datenbankverifizierung

Um die L2 LISP-Datenbank zu überprüfen, verwenden Sie den Befehl `show lisp instance-id <L2 LISP IID> ethernet database <MAC-Adresse>`.

```
<#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-Adressauflösung (AR) Datenbankverifizierung

Um die LISP L2 AR-Datenbank zu überprüfen, verwenden Sie den Befehl `show lisp instance-id <LISP L2 ID> ethernet database address-resolution <MAC-Adresse>`.

```
<#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-Datenbankverifizierung

Um die LISP L3-Datenbank zu überprüfen, verwenden Sie den Befehl `show lisp instance-id <LISP L3 ID> ipv4 database <IP-Adresse/Subnetzmaske>`.

```
<#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-Verifizierung****

Um CEF zu überprüfen, verwenden Sie den Befehl `show ip cef vrf <vrf name> <IP address>`
internal.

<#root>

Edge-1#

`show ip cef vrf red_vn 10.47.4.2 internal`

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

sources: RIB, Adj, IPL

feature space:

IPRM: 0x00058000

Broker: linked, distributed at 3rd priority

subblocks:

SC owned,sourced:

LISP local EID

-

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

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

LISP EID attributes: localEID Yes, c-dynEID Yes, d-dynEID Yes, a-dynEID No
SC owned,sourced: LISP generalised SMR - [disabled, not inheriting, 0x7F06D0A67E40 locks: 1]
Adj source:

IP adj out of Vlan1026

,

addr 10.47.4.2

7F06D300B738

Dependent covered prefix type adjfib, cover 10.47.4.0/24

2 IPL sources [no flags]

ifnums:

Vlan1026(29): 10.47.4.2

path list 7F06CEE8D720, 3 locks, per-destination, flags 0x49 [shble, rif, hwc]

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

Zusätzlich zu lokalen LISP-Einträgen auf dem SDA Edge Node enthalten SDA Control Nodes (LISP MS/MR) zusätzliche Informationen zu den Endpunkten:

Überprüfung des L2-LISP-Servers für den gemeinsamen Rand:

Um den L2 LISP-Server zu überprüfen, verwenden Sie den Befehl show lisp instance-id <L2 LISP ID> Ethernet server <MAC Address>.

<#root>

Border-1#

show lisp instance-id 8190 ethernet server 5254.0019.93e9

LISP Site Registration Information

Site name: site_uci

Description: map-server configured from Cisco DNA-Center

Allowed configured locators: any

Requested EID-prefix:

EID-prefix:

5254.0019.93e9

/48 instance-id 8190

<-- Endpoint MAC Address

First registered: 2w5d

Last registered: 3d16h

Routing table tag: 0

Origin: Dynamic, more specific of any-mac

Merge active: No

Proxy reply: Yes

```
Skip Publication:    No
Force Withdraw:    No
TTL:               1d00h
State:             complete
Extranet IID:     Unspecified
Registration errors:
  Authentication failures: 0
  Allowed locators mismatch: 0
```

ETR

10.47.1.12

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

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

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

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

10.47.1.12

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

<--(Fabric Edge IP address)

Server-Verifizierung für LISP-Adressenauflösung (AR) an der gemeinsamen Grenze L2:

Um den L2 LISP AR-Server zu überprüfen, verwenden Sie den Befehl `show lisp instance-id <LISP L2 ID> Ethernet server address-resolution <IP-Adresse>`.

Um den Registrierungsverlauf zu überprüfen, verwenden Sie den Befehl `show lisp instance-id <LISP L2 ID> Ethernet server address-resolution <IP address> registration-history`

<#root>

Border-1#

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

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

```
Site name: site_uci
```

```
Host Address:
```

```
10.47.4.2
```

```
/32
```

Hardware Address:

5254.0019.93e9

First registered: 2w5d

Last registered: 3d16h

Registration errors:

Authentication failures: 0

ETR

10.47.1.12

:21038

Last registered: 3d16h

TTL: 1d00h

xTR-ID: 0xAB3179F6-0xC774F22C-0x00F2C82E-0x3A66738D

Site-ID: unspecified

Registered addr: 5254.0019.93e9

L3 Instance ID: 4099

Border-1#

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

Map-Server registration history

Roam = Did host move to a new location?

WLC = Did registration come from a Wireless Controller?

Prefix qualifier: + = Register Event, - = Deregister Event, * = AR register event

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

L3-LISP-Serververifizierung mit lokalisiertem Rand

Um den L3 LISP-Server zu überprüfen, verwenden Sie den Befehl `show lisp instance-id <LISP L3 ID> ipv4 server <IP-Adresse>`.

Um den Registrierungsverlauf für den L3 LISP-Server zu überprüfen, verwenden Sie den Befehl `show lisp instance-id <LISP L3 ID> ipv4 server <IP-Adresse> registration-history`

<#root>

Border-1#

```
show lisp instance-id 4099 ipv4 server 10.47.4.2
```

LISP Site Registration Information

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

EID-prefix:

10.47.4.2

/32 instance-id 4099
First registered: 2w5d
Last registered: 02:39:39
Routing table tag: 0
Origin: Dynamic, more specific of 10.47.4.0/24
Merge active: No
Proxy reply: Yes
Skip Publication: No
Force Withdraw: No
TTL: 1d00h
State: complete
Extranet IID: Unspecified
Registration errors:
Authentication failures: 0
Allowed locators mismatch: 0
ETR

10.47.1.12

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

Locator Local State Pri/Wgt Scope

10.47.1.12

yes up 10/10 IPv4 none

Border-1#

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

Map-Server registration history

Roam = Did host move to a new location?

WLC = Did registration come from a Wireless Controller?

Prefix qualifier: + = Register Event, - = Deregister Event, * = AR register event

Table with 6 columns: Timestamp (UTC), Instance, Proto, Roam, WLC, Source. It contains three rows of registration history data for instance 4099.

ARP-Auflösung in SDA

Es wird davon ausgegangen, dass Cisco Catalyst Center verwendet wurde, um SDA-Fabric mit Standardeinstellungen bereitzustellen. Das bedeutet, dass die Layer-2-Erweiterung aktiviert ist und der gesamte Datenverkehr innerhalb des Fabric (im selben VLAN/VN) auf der Grundlage von MAC-Adressensuchvorgängen/LISP-Ethernet-Instanzen und nicht auf der Grundlage von IP-Adressensuchvorgängen/LISP-IP-Instanzen weitergeleitet wird.

Im Hinblick auf die Fehlerbehebung kann es hilfreich sein, statische ARP-Einträge auf beiden Hosts zu konfigurieren, um schnell zu überprüfen, ob das Problem mit generischen Verbindungen in der Fabric (in diesem Fall funktioniert Ping nicht zwischen Hosts) oder nur mit ARP-Auflösung vorliegt.

Der ARP-Prozess in der SDA-Struktur verwendet LISP, um die Identifizierung und den Standort von Hosts aufzulösen, und unterscheidet sich vom ARP-Verhalten in herkömmlichen Routing-/Switching-Umgebungen.

Schritt 1: Fabric-Endpunkt sendet ARP-Anfrage, um die MAC/IP-Bindung für den anderen Fabric-Endpunkt zu bestimmen

Die Paketerfassung kann auf der Eingangsschnittstelle konfiguriert werden, um zu bestätigen, dass ein ARP-Paket vom Host empfangen wird:

```
<#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 default)
.... ..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 default)
.... ..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

Schritt 2: Edge Node verwendet ARP-Pakete und generiert eine LISP-Anforderung, um die MAC-Adresse von HOST-02 zu bestimmen.

Edge-1 sendet eine LISP-Zuordnungsanforderung zum Auflösen der MAC-Adresse 10.47.4.3 an die LISP-Kontrollebenen (nebeneinander liegende Ränder):

```
<#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'.
```

Schritt 3: Control Node empfängt LISP-Anfrage für IP/MAC-Zuordnung und sendet Antwort an SDA Edge Node

LISP-Map-Request wird vom Fabric Edge empfangen und antwortet mit einer LISP-Map-Reply mit der MAC-Adresse, die auf 10.47.4.3 verweist

```
<#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.
```

Die LISP-Kontrollebene antwortet mit einer Proxy-Antwort, die auf dem in der lokalen Datenbank gespeicherten Eintrag für die Adressauflösung basiert.

```
<#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
```

Schritt 4: Edge-Knoten erhält LISP-Antwort mit der MAC-Adresse 10.47.4.3

Die LISP-Proxyantwort wird vom Fabric Edge-Knoten empfangen:

```
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.
```

Schritt 5: Edge-Knoten sendet LISP-Map-Request-Paket, um den RLOC-Standort für die MAC-Adresse zu bestimmen

Nach erfolgreichem Abschluss der ersten drei Schritte erkennt der Edge-Knoten die MAC-Adresse

10.47.4.3, für die ARP ursprünglich generiert wurde. Wenn die Layer-2-Erweiterung aktiviert ist, antwortet der Edge-Knoten nicht mit diesen Informationen auf 10.47.4.2, sondern verwendet sie, um den RLOC-Standort des Edge des Ausgangsknotens zu bestimmen, sodass ARP wie in einem herkömmlichen Layer-2-Netzwerk an 10.47.4.3 weitergeleitet werden kann.

Aus diesem Grund generiert Edge Node ein weiteres LISP Map Request-Paket in einer Ethernet-Instanz, das diesmal RLOC-Informationen für die MAC-Adresse von 10.47.4.2 anfordert:

```
<#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
```

Schritt 6: Das LISP-Map-Request-Paket wird vom Steuerungsknoten empfangen, um den RLOC-Standort für die MAC-Adresse zu bestimmen.

Der Steuerungsknoten empfängt das LISP-Paket und antwortet auf dieses basierend auf dem Status der lokalen Datenbank.

```
<#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
```

Schritt 7: LISP Map-Reply wird von Edge Node empfangen

Die vom Kontrollknoten generierte LISP-Zuordnungsantwort wird vom Randknoten empfangen:

```
<#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
```

Schließlich wird ein Eintrag im LISP-Ethernet-Instanz-Map-Cache erstellt, sodass ARP-Pakete an Edge-2 weitergeleitet werden können, mit dem 10.47.4.3 verbunden ist.

<#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)
```

Schritt 8: ARP wird in VXLAN gekapselt und an HOST-02 gesendet

Alle Schritte in Bezug auf LISP waren erforderlich, um zu bestimmen, wo sich 10.47.4.3 befindet, damit Edge Node das ursprüngliche ARP-Paket (Broadcast) als Unicast an den richtigen Edge Node senden kann. Die ursprüngliche ARP-Anforderung wird von der Edge-Knoten-CPU zwischengespeichert (nicht verworfen), bis alle Schritte abgeschlossen sind, sodass eine ordnungsgemäße ARP-Auflösung auch dann möglich ist, wenn ein einzelnes ARP-Paket von 10.47.4.2 gesendet wurde.

Das ARP-Paket wird in VXLAN gekapselt, wie im Beispiel gezeigt:

<#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
```

Die ARP-Anforderung wurde in VXLAN gekapselt und außerdem von einer Broadcast-ARP-Anforderung in eine Unicast-ARP-Anforderung konvertiert.

<#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

Schritt 9. ARP-Antwort wird von 10.47.4.3 generiert und an 10.47.4.2 gesendet.

```
<#root>
```

```
Edge-2#
```

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

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

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

Zu diesem Zeitpunkt ist das Paket nicht für die Übertragung der Adresse (als ursprüngliche ARP-Anforderung), sondern für die MAC-Adresse von 10.47.4.2 bestimmt. Wenn es den Edge-Eingangsknoten (Edge-2) erreicht, wird der normale LISP-Betrieb ausgelöst. Anfangs fehlt die MAC-Adresse 10.47.4.2 in der LISP-Ethernet-Instanz des Edge-Knotens. Das Paket wird an die CPU gesendet, um eine LISP-Zuordnungsanforderung zu generieren, um den RLOC für HOST-01 zu bestimmen. Dieses Verhalten entspricht exakt dem in anderen Abschnitten dieses Dokuments beschriebenen und ermöglicht das Erstellen eines LISP-Zuordnungscacheeintrags für 10.47.4.2 am Edge-2:

```
<#root>
```

```
Edge-2#
```

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

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

```
5254.0019.93e9/48, uptime: 03:18:28, expires: 20:41:32, via map-reply, complete
```

```
Sources: map-reply
```

```
State: complete, last modified: 03:18:28, map-source: 10.47.1.12
```

```
Active, Packets out: 386(0 bytes), counters are not accurate (~ 00:00:12 ago)
```

```
Encapsulating dynamic-EID traffic
```

```
Locator      Uptime      State  Pri/Wgt      Encap-IID
```

```
10.47.1.12
```

```
03:18:28 up      10/10      -
```

```
Last up-down state change:      03:18:28, state change count: 1
```

```
Last route reachability change: 03:18:28, state change count: 1
```

```
Last priority / weight change:  never/never
```

```
RLOC-probing loc-status algorithm:
```

```
Last RLOC-probe sent:      03:18:28 (rtt 710ms)
```

Mit diesem Eintrag kann ARP Reply erfolgreich an Edge-1 in VXLAN-Kapselung gesendet und weiter an 10.47.4.2 konkurrierende ARP-Auflösungsprozesse weitergeleitet werden.

Grundlegende Host-Erreichbarkeit in SDA-Fabric (dasselbe VLAN/dasselbe VN)

Es wird davon ausgegangen, dass die ARP-Auflösung erfolgreich abgeschlossen wurde und beide Hosts 10.47.4.2 und 10.47.4.3 über korrekte ARP-Einträge verfügen.

Im Hinblick auf die Fehlerbehebung ist es sehr nützlich, statische ARP-Einträge auf beiden Hosts zu konfigurieren, um schnell zu überprüfen, ob das Problem mit generischen Verbindungen in der Fabric (in diesem Fall funktioniert Ping nicht zwischen Hosts) oder nur mit dem ARP-Prozess besteht.

10.47.4.2 erzeugt eine ICMP-Anforderung an 10.47.4.3:

```
<#root>
```

```
Edge-1#
```

```
show monitor capture 1 buffer brief
```

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

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

```
Edge-1#
```

```
show monitor capture 1 buffer detail
```

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

```
Frame 1: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface /tmp/epc_ws/wif_to_ts_p
```

```
Interface id: 0 (/tmp/epc_ws/wif_to_ts_pipe)
```

```
Interface name: /tmp/epc_ws/wif_to_ts_pipe
```

```
Encapsulation type: Ethernet (1)
```

```
Arrival Time: Oct 10, 2023 18:21:21.484694000 UTC
```

```
[Time shift for this packet: 0.000000000 seconds]
```

```
Epoch Time: 1696962081.484694000 seconds
```

```
[Time delta from previous captured frame: 0.000000000 seconds]
```

```
[Time delta from previous displayed frame: 0.000000000 seconds]
```

```
[Time since reference or first frame: 0.000000000 seconds]
```

```
Frame Number: 1
```

```
Frame Length: 98 bytes (784 bits)
```

```
Capture Length: 98 bytes (784 bits)
```

```
[Frame is marked: False]
```

```
[Frame is ignored: False]
```

```
[Protocols in frame: eth:ethertype:ip:icmp:data]
```

```
Ethernet II, Src:
```

```
52:54:00:19:93:e9
```

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

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

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

```
<-- Endpoint MAC, Anycast GW MAC respectively
```

```

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

```

10.47.4.2

, Dst:

10.47.4.3

```

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

```

```

0000 68 95 8c 3d 00 00 00 00 00 00 00 00 00 00 00 h..=.....
0010 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0020 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0030 00 00 00 00 00 00 00 00 .....

```

```

Data: 68958c3d0000000000000000000000000000000000000000b^@&
[Length: 56]

```

Das ICMP-Paket wird in Richtung 10.47.4.3 an den Edge-Knoten gesendet, der im Feld Locator (Standort) 10.47.1.13 (Edge-2) angegeben ist, und kann über die integrierte Paketerfassung erfasst werden.

Wenn ein Paket in einem VLAN empfangen wird, in dem die L2-Erweiterung aktiviert ist, wird die Suche in der LISP-Ethernet-Instanz durchgeführt:

<#root>

Edge-1#

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

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

5254.001e.ad00/48, uptime: 00:22:29, expires: 23:37:32, via map-reply, complete

Sources: map-reply

State: complete, last modified: 00:22:29, map-source: 10.47.1.13

Active, Packets out: 42(0 bytes), counters are not accurate (~ 00:00:58 ago)

Encapsulating dynamic-EID traffic

Locator Uptime State Pri/Wgt Encap-IID

10.47.1.13

00:22:29 up 10/10 -

Last up-down state change: 00:22:29, state change count: 1

Last route reachability change: 00:22:29, state change count: 1

Last priority / weight change: never/never

RLOC-probing loc-status algorithm:

Last RLOC-probe sent: 00:22:28 (rtt 1609ms)

Überprüfen Sie die MAC-Adresse des Remote-Endpunkts, es zeigt auf L2LI0, was erwartet wird

<#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

Prüfen Sie die MAC-Adresse in FED, zusätzliche Informationen können gesammelt werden

<#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-Adresse macHandle-Dekodierung

Nehmen Sie den macHandle (0x7f65ecfdd3a8) aus dem vorherigen Befehl und verwenden Sie im Befehl show platform hardware fed switch active fwd-asic abstraction print-resource-handle <macHandle> 1

<#root>

Edge-1#

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

Handle:0x7f65ecfdd3a8 Res-Type:ASIC_RSC_HASH_TCAM Res-Switch-Num:0 Asic-Num:255 Feature-ID:AL_FID_L2_WI

priv_ri/priv_si Handle: (nil)Hardware Indices/Handles: handle [ASIC: 0]: 0x7f65ecc4d188

Features sharing this resource:Cookie length: 12

1e 00 54 52 00 ad 07 80 07 00 00 00

Detailed Resource Information (ASIC_INSTANCE# 0)

Number of HTM Entries: 1

Entry 0: (handle 0x7f65ecc4d188)

Absolute Index: 4706


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

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

=====

Indexdekodierung umschreiben

Nehmen Sie den RI (0x12) und verwenden Sie im Befehl show platform hardware fed switch active fwd-asic resource asic all rewrite-index range <RI> <RI>

<#root>

Edge-1#

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

```
ASIC#:0 RI:18 Rewrite_type:AL_RRM_REWRITE_L2_PAYLOAD_L2LISP_ENCAP(115) Mapped_rii:LVX_L2_ENCAP_L2_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)
```

Ziel-Index-Dekodierung

Nehmen Sie die DI (0x5012) und verwenden Sie sie in dem Befehl `show platform hardware fed switch active fwd-asic resource asic all destination-index range <DI> <DI>`

```
<#root>
```

```
Edge-1#
```

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

```
ASIC#0:
```

```
Destination index = 0x5012
```

```
DI_RCP_PORT1 <-- Recirculation port for VXLAN imposition
```

```
pmap          = 0x00000000 0x00000000
cmi           = 0x0
rcp_pmap      = 0x1
al_rsc_cmi
CPU Map Index (CMI) [0]
ctiLo0       = 0
ctiLo1       = 0
ctiLo2       = 0
cpuQNum0     = 0
cpuQNum1     = 0
cpuQNum2     = 0
npuIndex     = 0
stripSeg     = 0
copySeg      = 0
```

```
ASIC#1:
```

```
Destination index = 0x5012
```

```
DI_RCP_PORT1 <-- Recirculation port for VXLAN imposition
```

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

```
stripSeg          = 0
copySeg           = 0
```

siHandle-Dekodierung

Nehmen Sie den siHandle (0x7f65ecfdd048) und verwenden Sie im Befehl show platform hardware fed switch active fwd-asic abstraction print-resource-handle <siHandle> 1

```
<#root>
```

```
Edge-1#
```

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

```
Handle:0x7f65ecfdd048 Res-Type:ASIC_RSC_RI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L2_WIRELES
priv_ri/priv_si Handle: 0x7f65ecfdcd78Hardware Indices/Handles: index0:0x12 mtu_index/13u_ri_index0:0x
Features sharing this resource:58 (1)]
```

```
Cookie length: 56
```

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

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

```
-----
ASIC#:0 RI:18 Rewrite_type:AL_RRM_REWRITE_L2_PAYLOAD_L2LISP_ENCAP(115) Mapped_rii:LVX_L2_ENCAP_L2_PAYLOAD
Src IP:
```

```
10.47.1.12 <-- Local RLOC
```

```
Dst IP:
```

```
10.47.1.13 <-- Remote RLOC
```

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

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

```
-----
ASIC#:1 RI:18 Rewrite_type:AL_RRM_REWRITE_L2_PAYLOAD_L2LISP_ENCAP(115) Mapped_rii:LVX_L2_ENCAP_L2_PAYLOAD
Src IP:
```

```
10.47.1.12 <-- Local RLOC
```

```
Dst IP:
```

```
10.47.1.13 <-- Remote RLOC
```

```
iVxlan dstMac:      0x610:0x00:0x00
```

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

=====

Underlay-Routenverifizierung

Datenverkehr wird mithilfe von 10.47.1.12 mit ID 8190 in VXLAN gekapselt und kann per Lastausgleich über Gig1/0/1 und G1/0/2 abgewickelt werden.

<#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

Um si_hdl- und ri_hdl-Informationen abzurufen, verwenden Sie den Befehl show platform software fed switch active ip adj.

<#root>

Edge-1#

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

IPV4 Adj entries

dest	if_name	dst_mac	si_hdl	r
225.0.0.0	GigabitEthernet1/0/1	0100.5e00.0000	0x7f65ec958128	0
10.47.1.10	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 Decode

Um den Befehl si_hdl (0x7f65ec8a5458) zu überprüfen, verwenden Sie den Befehl show platform hardware fed switch active fwd-asic abstraction print-resource-handle <si_hdl> 1

<#root>

Edge-1#

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

```
Handle:0x7f65ec8a5458 Res-Type:ASIC_RSC_SI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L3_UNICAST
priv_ri/priv_si Handle: 0x7f65ec8a4eb8Hardware Indices/Handles: index0:0xbc mtu_index/13u_ri_index0:0x
Features sharing this resource:66 (1)
Cookie length: 56
00 00 00 00 00 00 00 00 26 00 00 00 00 00 00 00 00 00 00 00 08 00 52 54 00 1c 7d e0 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
```

=====

Next-Hop Rewrite Index-Decode unterlegen

Zum Decodieren des RI (0x1a) verwenden Sie den Befehl show platform hardware fed switch active fwd-asic resource asic all rewrite-index range <RI> <RI>

<#root>

Edge-1#

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

ASIC#:0

RI:26

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

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

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

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

L3IF LE Index 38

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

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

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

L3IF LE Index 38

Decode des Next-Hop-Zielindex unterlegen

Zum Decodieren der DI (0x526d) verwenden Sie in show platform hardware fed switch active fwd-asic resource asic all destination-index range <DI> <DI>

<#root>

Edge-1#

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

ASIC#0:

Destination index = 0x526d

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

pmap_intf : [GigabitEthernet1/0/2]

cmi = 0x0

rcp_pmap = 0x0

al_rsc_cmi

CPU Map Index (CMI) [0]

ctiLo0 = 0


```

ctiLo1          = 0
ctiLo2          = 0
cpuQNum0        = 0
cpuQNum1        = 0
cpuQNum2        = 0
npuIndex        = 0
stripSeg        = 0
copySeg         = 0
ASIC#1:

```

```

Destination index = 0x526d
pmap              = 0x00000000 0x00000000
cmi               = 0x0
rcp_pmap         = 0x0
al_rsc_cmi
CPU Map Index (CMI) [0]
ctiLo0           = 0
ctiLo1           = 0
ctiLo2           = 0
cpuQNum0         = 0
cpuQNum1         = 0
cpuQNum2         = 0
npuIndex         = 0
stripSeg         = 0
copySeg          = 0

```

Edge-1#

show platform software fed switch active ifm mappings

Interface	IF_ID	Inst	Asic	Core													
Port																	
	SubPort	Mac	Cntx	LPN	GPN	Type	Active										
GigabitEthernet1/0/1					0x1a		0	0	0	0	0	1	0	1	1	NIF	Y
GigabitEthernet1/0/2																	
	0x1b		0	0	0												
1																	
	0		2	1	2	2										NIF	Y
<-- Port 1 lines up to G1/0/2																	
GigabitEthernet1/0/3					0xb		0	0	0	2	0	3	2	3	3	NIF	Y
GigabitEthernet1/0/4					0xc		0	0	0	3	0	4	3	4	4	NIF	Y
GigabitEthernet1/0/5					0xd		0	0	0	4	0	5	4	5	5	NIF	Y
GigabitEthernet1/0/6					0xe		0	0	0	5	0	6	5	6	6	NIF	Y
GigabitEthernet1/0/7					0xf		0	0	0	6	0	7	6	7	7	NIF	Y
GigabitEthernet1/0/8					0x10		0	0	0	7	0	8	7	8	8	NIF	Y

Nächster Hop-ri_hdl-Decode unterlegen

Um ri_hdl (0x7f65ec8a4eb8) zu dekodieren, verwenden Sie in show platform hardware fed switch active fwd-asic abstraction print-resource-handle (ri_hdl) 1

<#root>

Edge-1#

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

```
Handle:0x7f65ec8a4eb8 Res-Type:ASIC_RSC_RI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L3_UNICAST.  
priv_ri/priv_si Handle: 0x7f65ec903b28Hardware Indices/Handles: index0:0x1a mtu_index/13u_ri_index0:0x  
Features sharing this resource:66 (1)]
```

```
Cookie length: 56
```

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

```
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```

```
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
```

```
=====
```

Grundlegende Host-Erreichbarkeit in SDA-Fabric (verschiedene

VLANs/dasselbe VN)

In diesem Abschnitt wird die Kommunikation zwischen 10.47.4.2 und 10.47.10.2 geprüft. Da diese Hosts verschiedenen VLANs angehören, muss für beide ein Standard-Gateway konfiguriert sein, das auf das Standard-Gateway verweist. Für 10.47.4.2 ist es 10.47.4.1 und 10.47.10.2 ist es 10.47.10.1.

Schritt 1: Vergewissern Sie sich, dass die Verbindung zwischen dem Endpunkt und dem Standardgateway funktioniert:

```
<#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
```

Schritt 2: Bestätigen Sie, dass das Paket von 10.47.4.2 erfolgreich von Edge-1 empfangen wurde:

Das Paket kann an der Eingangsschnittstelle (Version 10.47.4.2) erfasst werden:

```
<#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 .....
      Data: 2a46a8ee000000000000000000000000000000000000000000000000b^@&
      [Length: 56]

```

Schritt 3 - LISP-Suche

Der Eingangs-Edge-Knoten muss den Standort (RLOC) von HOST-03 bestimmen, an den Pakete gesendet werden. Wie in diesem Fall befindet sich der End-Host HOST-03 in einem anderen VLAN (aber dasselbe VN/VRF: BENUTZER), wird die LISP IPv4-Instanz verwendet, da die Suche auf der IP-Adresse basiert (die MAC-Adresse gehört zum Edge-Knoten selbst).

<#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-Zuordnungsanforderung erreicht Kontrollknoten (LISP Map Server) Border-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 Map-Reply erreicht Edge Node:

```
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.
```

Fabric Edge fragt den RLOC für 10.47.10.2 ab und verarbeitet die 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.
```

Falls der Eintrag nicht vorhanden ist, müssen die Debug-Meldungen aus Sicht des LISP-Prozesses erfasst werden. Es gibt auch ein Tool namens LIG (LISP-Gruppierung), das verwendet werden kann, um manuell LISP-Prozesse auszulösen (dies ist eine sehr effektive Möglichkeit, redundante Control Node-Konfigurationen und Datenbankkonsistenz zwischen beiden Control Nodes zu 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      -
```

Routenüberprüfung

CEF verwendet LISP, und LISP verwendet den Map-Cache-Eintrag, den es empfangen hat

```
<#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 Next-Hop-Überprüfung

Da dieses Paket VXLAN-gekapselt ist, muss die Überprüfung des LISP Next-Hop erfolgen. Verwenden Sie den Befehl `show platform software fed switch active ip adj`, um zusätzliche

Informationen über 10.47.1.13, den LISP next-hop, zu erhalten.

<#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

LISP Next-Hop si_hdl-Decode

Nehmen Sie den si_hdl (0x7f65ed00f668) und verwenden Sie in show platform hardware fed switch active fwd-asic abstraction print-resource-handle <si_hdl> 1

<#root>

Edge-1#

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

Handle:0x7f65ed00f668 Res-Type:ASIC_RSC_SI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_LISP Lkp-f
priv_ri/priv_si Handle: 0x7f65ed00fd58Hardware Indices/Handles: index0:0xc8 mtu_index/13u_ri_index0:0x
Features sharing this resource:109 (1)]

Cookie length: 56
00 00 00 00 00 00 00 00 38 5f 84 ec 0a 2f 01 0d ff ff ff ff 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Detailed Resource Information (ASIC_INSTANCE# 0)

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

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

Detailed Resource Information (ASIC_INSTANCE# 1)

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

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

LISP Next-Hop RI-Decode

Nehmen Sie den RI (0x2c) und verwenden Sie in show platform hardware fed switch active fwd-asic resource asic alle rewrite-index-Bereich <RI> <RI>

<#root>

Edge-1#

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

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

10.47.1.12 <-- Local RLOC

Dst IP:

10.47.1.13 <-- RLOC of Edge-2

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

```
ASIC#:1 RI:44 Rewrite_type:AL_RRM_REWRITE_IPV4_VXLAN_INNER_IPV4_ENCAP(110) Mapped_rii:LVX_L3_ENCAP_L2_P  
  Dst Mac:      MAC Addr: ba:25:cd:f4:ad:38,  
  Src IP:
```

10.47.1.12 <-- Local RLOC

Dst IP:

10.47.1.13 <-- RLOC of Edge-2

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

LISP-Next-Hop-DI-Dekodierung

Nehmen Sie die DI (0x5012) und verwenden Sie in show platform hardware fed switch active fwd-

asic resource asic all destination-index range <DI> <DI>

<#root>

Edge-1#

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

ASIC#0:

Destination index = 0x5012

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

```
pmap = 0x00000000 0x00000000
cmi = 0x0
rcp_pmap = 0x1
al_rsc_cmi
CPU Map Index (CMI) [0]
ctiLo0 = 0
ctiLo1 = 0
ctiLo2 = 0
cpuQNum0 = 0
cpuQNum1 = 0
cpuQNum2 = 0
npuIndex = 0
stripSeg = 0
copySeg = 0
```

ASIC#1:

Destination index = 0x5012

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

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

LISP-Next-Hop ri_hdl-Dekodierung

Nehmen Sie ri_hdl (0x7f65ed00fd58) und verwenden Sie im Befehl show platform hardware fed switch active fwd-asic abstraction print-resource-handle <ri_hdl> 1

<#root>

Edge-1#

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

```
Handle:0x7f65ed00fd58 Res-Type:ASIC_RSC_RI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_LISP Lkp-f
priv_ri/priv_si Handle: 0x7f65ed00b618Hardware Indices/Handles: index0:0x2c mtu_index/13u_ri_index0:0x
Features sharing this resource:109 (1)]
Cookie length: 56
00 00 00 00 00 00 00 00 2e 00 00 00 0a 2f 01 0d ff ff ff ff 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

Detailed Resource Information (ASIC_INSTANCE# 0)

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

```
10.47.1.12 <-- Local RLOC
```

```
Dst IP:
```

```
10.47.1.13 <-- Edge-2 RLOC
```

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

Detailed Resource Information (ASIC_INSTANCE# 1)

```
-----
ASIC#:1 RI:44 Rewrite_type:AL_RRM_REWRITE_IPV4_VXLAN_INNER_IPV4_ENCAP(110) Mapped_rii:LVX_L3_ENCAP_L2_P
Dst Mac:      MAC Addr: ba:25:cd:f4:ad:38,
Src IP:
```

```
10.47.1.12 <-- Local RLOC
```

```
Dst IP:
```

```
10.47.1.13 <-- Edge-2 RLOC
```

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

Underlay Next-Hop-Verifizierung

Um zum LISP Next-Hop zu gelangen, gibt es zwei mögliche Pfade im Underlay. Die Überprüfung erfolgt für den einen, die gleiche Logik gilt für die Überprüfung des anderen Underlay Next-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

Weitere Informationen zu den nächsten Hops erhalten Sie, wenn Sie show platform software fed switch active ip adj verwenden.

<#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 Decode

Nehmen Sie den si_hdl (0x7f65ec8a5458) und verwenden Sie im Befehl show platform hardware fed switch active fwd-asic abstraction print-resource-handle <si_hdl> 1

<#root>

Edge-1#

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

Handle:0x7f65ec8a5458 Res-Type:ASIC_RSC_SI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L3_UNICAST
priv_ri/priv_si Handle: 0x7f65ec8a4eb8Hardware Indices/Handles: index0:0xbc mtu_index/13u_ri_index0:0x
Features sharing this resource:66 (1)
Cookie length: 56
00 00 00 00 00 00 00 00 26 00 00 00 00 00 00 00 00 00 08 00 52 54 00 1c 7d e0 00 00 00 00 00 00 00 00

Detailed Resource Information (ASIC_INSTANCE# 0)

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

DI = 0x526d <-- Destination index contains information for the destination port

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

Detailed Resource Information (ASIC_INSTANCE# 1)

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

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

=====

Underlay Next-Hop RI-Decode

Nehmen Sie den RI (0x1a) und verwenden Sie im Befehl show platform hardware fed switch active fwd-asic resource asic all rewrite-index range <RI> <RI>

<#root>

Edge-1#

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

ASIC#:0

RI:26

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

<-- Decimal 26 is hex 0x1a

MAC Addr: MAC Addr:

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

,

<-- MAC Address 5254.001c.7de0 corresponds to the next-hop

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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

Nächsten Hop-DI-Decoder unterlegen

Nehmen Sie die DI (0x526d) und verwenden Sie im Befehl `show platform hardware fed switch active fwd-asic resource asic all destination-index range <DI> <DI>`

<#root>

Edge-1#

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

ASIC#0:

Destination index = 0x526d

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

pmap_intf : [GigabitEthernet1/0/2]

cmi = 0x0

rcp_pmap = 0x0

al_rsc_cmi

CPU Map Index (CMI) [0]

ctiLo0 = 0

ctiLo1 = 0

ctiLo2 = 0

cpuQNum0 = 0

cpuQNum1 = 0

cpuQNum2 = 0

npuIndex = 0

stripSeg = 0

copySeg = 0

ASIC#1:

Destination index = 0x526d

pmap = 0x00000000 0x00000000

cmi = 0x0

rcp_pmap = 0x0

al_rsc_cmi

CPU Map Index (CMI) [0]

ctiLo0 = 0

ctiLo1 = 0

ctiLo2 = 0

cpuQNum0 = 0

cpuQNum1 = 0

cpuQNum2 = 0

npuIndex = 0

stripSeg = 0

copySeg = 0

Edge-1#

show platform software fed switch active ifm mappings

Interface	IF_ID	Inst	Asic	Core													
Port																	
	SubPort	Mac	Cntx	LPN	GPN	Type	Active								NIF	Y	
GigabitEthernet1/0/1					0x1a		0	0	0	0	0	1	0	1	1	NIF	Y
GigabitEthernet1/0/2																	
	0x1b		0	0	0												
1																	
	0		2	1	2	2										NIF	Y
<-- Port 1 maps to Gig1/0/2																	
GigabitEthernet1/0/3					0xb		0	0	0	2	0	3	2	3	3	NIF	Y
GigabitEthernet1/0/4					0xc		0	0	0	3	0	4	3	4	4	NIF	Y
GigabitEthernet1/0/5					0xd		0	0	0	4	0	5	4	5	5	NIF	Y
GigabitEthernet1/0/6					0xe		0	0	0	5	0	6	5	6	6	NIF	Y
GigabitEthernet1/0/7					0xf		0	0	0	6	0	7	6	7	7	NIF	Y
GigabitEthernet1/0/8					0x10		0	0	0	7	0	8	7	8	8	NIF	Y

Nächster Hop-ri_hdl-Decode unterlegen

Nehmen Sie den Befehl ri_hdl (0x7f65ec8b8158) und verwenden Sie im Befehl show platform hardware fed switch active fwd-asic abstraction print-resource-handle <ri_hdl> 1

<#root>

Edge-1#

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

Handle:0x7f65ec8b8158 Res-Type:ASIC_RSC_RI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L3_UNICAST_priv_ri/priv_si Handle: 0x7f65ec7a6338Hardware Indices/Handles: index0:0x1b mtu_index/13u_ri_index0:0x1b
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 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

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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
```

```
=====

Pakete werden in VXLAN gekapselt und basierend auf Lastverteilungsregeln gesendet.
Embedded Packet Capture (EPC) kann verwendet werden, um Datenverkehr auf allen
Schnittstellen gleichzeitig zu erfassen. Denken Sie daran, dass zu diesem Zeitpunkt das Paket
VXLAN-gekapselt ist. Der EPC-Filter muss sich gegen RLOC zu RLOC richten und nicht gegen
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 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 148 Echo (ping) request	id=0x0046, seq=0/0, ttl=63
2	0.980849	10.47.4.2 -> 10.47.10.2	ICMP 148 Echo (ping) request	id=0x0046, seq=1/256, ttl=63
3	1.984077	10.47.4.2 -> 10.47.10.2	ICMP 148 Echo (ping) request	id=0x0046, seq=2/512, ttl=63
4	2.999989	10.47.4.2 -> 10.47.10.2	ICMP 148 Echo (ping) request	id=0x0046, seq=3/768, ttl=63

```
Edge-1#
```

```
show monitor capture 1 buffer detailed
```


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

Frame 1: 148 bytes on wire (1184 bits), 148 bytes captured (1184 bits) on interface /tmp/epc_ws/wif_to_

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

Ethernet II, Src:

00:00:00:00:00:00

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

00:00:00:00:00:00

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

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

Destination: 00:00:00:00:00:00 (00:00:00:00:00:00)
Address: 00:00:00:00:00:00 (00:00:00:00:00:00)
.... ..0. = LG bit: Globally unique address (factory default)
.... ...0 = IG bit: Individual address (unicast)
Source: 00:00:00:00:00:00 (00:00:00:00:00:00)
Address: 00:00:00:00:00:00 (00:00:00:00:00:00)
.... ..0. = LG bit: Globally unique address (factory default)
.... ...0 = IG bit: Individual address (unicast)
Type: IPv4 (0x0800)

Internet Protocol Version 4, Src:

10.47.1.12

, Dst:

10.47.1.13 <-- RLOC to RLOC

0100 = Version: 4
.... 0101 = Header Length: 20 bytes (5)
Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
0000 00.. = Differentiated Services Codepoint: Default (0)
.... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
Total Length: 134
Identification: 0x1d6f (7535)
Flags: 0x4000, Don't fragment
0... = Reserved bit: Not set
.1.. = Don't fragment: Set
..0. = More fragments: Not set
Fragment offset: 0
Time to live: 64
Protocol: UDP (17)
Header checksum: 0x0682 [validation disabled]
[Header checksum status: Unverified]
Source: 10.47.1.12

Destination: 10.47.1.13
User Datagram Protocol, Src Port: 65354, Dst Port: 4789
Source Port: 65354
Destination Port: 4789
Length: 114
[Checksum: [missing]]
[Checksum Status: Not present]
[Stream index: 0]
[Timestamps]

[Time since first frame: 0.000000000 seconds]
[Time since previous frame: 0.000000000 seconds]

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

4099 <-- LISP L3 IID

Reserved: 0
Ethernet II, Src: 00:00:00:00:61:00 (00:00:00:00:61:00), Dst: ba:25:cd:f4:ad:38 (ba:25:cd:f4:ad:38)

<-- Dummy Ethernet header for VXLAN

Destination: ba:25:cd:f4:ad:38 (ba:25:cd:f4:ad:38)
Address: ba:25:cd:f4:ad:38 (ba:25:cd:f4:ad:38)
.... ..1. = LG bit: Locally administered address (this is NOT the factory 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 <-- True IPv4 addresses

0100 = Version: 4
.... 0101 = Header Length: 20 bytes (5)
Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
0000 00.. = Differentiated Services Codepoint: Default (0)
.... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
Total Length: 84
Identification: 0x92f6 (37622)
Flags: 0x4000, Don't fragment
0... .. = Reserved bit: Not set
.1.. .. = Don't fragment: Set
..0. = More fragments: Not set
Fragment offset: 0

```

Time to live: 63
Protocol: ICMP (1)
Header checksum: 0x8651 [validation disabled]
[Header checksum status: Unverified]
Source: 10.47.4.2
Destination: 10.47.10.2
Internet Control Message Protocol
Type: 8 (Echo (ping) request)
Code: 0
Checksum: 0xa383 [correct]
[Checksum Status: Good]
Identifier (BE): 70 (0x0046)
Identifier (LE): 17920 (0x4600)
Sequence number (BE): 0 (0x0000)
Sequence number (LE): 0 (0x0000)
Data (56 bytes)

```

```

0000  78 1e dc 17 00 00 00 00 00 00 00 00 00 00 00 00 00  x.....
0010  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
0020  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
0030  00 00 00 00 00 00 00 00  .....
      Data: 781edc17000000000000000000000000000000000000000000000000000000b^@&
      [Length: 56]

```

Kapseltes VXLAN-Paket erreicht Edge-2:

```
<#root>
```

```
Edge-2#
```

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

```
Edge-2#
```

```
monitor capture 1 start
```

```
Started capture point : 1
```

```
Edge-2#
```

```
monitor capture 1 stop
```

```
Capture statistics collected at software:
```

```

  Capture duration - 7 seconds
  Packets received - 6
  Packets dropped - 0
  Packets oversized - 0

```

```
Number of Bytes dropped at asic not collected
```

```
Capture buffer will exists till exported or cleared
```

```
Stopped capture point : 1
```

```
Edge-2#
```

```
show monitor capture 1 buffer brief
```

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

```
1  0.000000  10.47.4.2 -> 10.47.10.2  ICMP 148 Echo (ping) request id=0x0047, seq=0/0, ttl=63
```

```

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

```

Edge-2#

show monitor capture 1 buffer detailed

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

```

Frame 1: 148 bytes on wire (1184 bits), 148 bytes captured (1184 bits) on interface /tmp/epc_ws/wif_to_
  Interface id: 0 (/tmp/epc_ws/wif_to_ts_pipe)
    Interface name: /tmp/epc_ws/wif_to_ts_pipe
  Encapsulation type: Ethernet (1)
  Arrival Time: Oct 11, 2023 16:58:12.702159000 UTC
  [Time shift for this packet: 0.000000000 seconds]
  Epoch Time: 1697043492.702159000 seconds
  [Time delta from previous captured frame: 0.000000000 seconds]
  [Time delta from previous displayed frame: 0.000000000 seconds]
  [Time since reference or first frame: 0.000000000 seconds]
  Frame Number: 1
  Frame Length: 148 bytes (1184 bits)
  Capture Length: 148 bytes (1184 bits)
  [Frame is marked: False]
  [Frame is ignored: False]
  [Protocols in frame: eth:ethertype:ip:udp:vxlan:eth:ethertype:ip:icmp:data]
Ethernet II, Src: 52:54:00:0a:42:11 (
52:54:00:0a:42:11
), Dst: 52:54:00:17:fe:65 (
52:54:00:17:fe:65
)
<-- True MAC addresses post L3 rewrite
  Destination: 52:54:00:17:fe:65 (52:54:00:17:fe:65)
    Address: 52:54:00:17:fe:65 (52:54:00:17:fe:65)
      .... ..1. .... = LG bit: Locally administered address (this is NOT the factory d
      .... ..0. .... = IG bit: Individual address (unicast)
  Source: 52:54:00:0a:42:11 (52:54:00:0a:42:11)
    Address: 52:54:00:0a:42:11 (52:54:00:0a:42:11)
      .... ..1. .... = LG bit: Locally administered address (this is NOT the factory d
      .... ..0. .... = IG bit: Individual address (unicast)
  Type: IPv4 (0x0800)
Internet Protocol Version 4, Src:
10.47.1.12
, Dst:
10.47.1.13 <-- RLOC to RLOC
  0100 .... = Version: 4
  .... 0101 = Header Length: 20 bytes (5)
  Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    0000 00.. = Differentiated Services Codepoint: Default (0)
    .... ..00 = Explicit Congestion Notification: Not ECN-Capable Transport (0)
  Total Length: 134
  Identification: 0x1d7b (7547)

```

```

Flags: 0x4000, Don't fragment
  0... .... = Reserved bit: Not set
  .1.. .... = Don't fragment: Set
  ..0. .... = More fragments: Not set
Fragment offset: 0
Time to live: 62
Protocol: UDP (17)
Header checksum: 0x0876 [validation disabled]
[Header checksum status: Unverified]
Source: 10.47.1.12
Destination: 10.47.1.13
User Datagram Protocol, Src Port: 65354, Dst Port: 4789
Source Port: 65354
Destination Port: 4789
Length: 114
[Checksum: [missing]]
[Checksum Status: Not present]
[Stream index: 0]
[Timestamps]
  [Time since first frame: 0.000000000 seconds]
  [Time since previous frame: 0.000000000 seconds]

```

```

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

```

4099 <-- LISP L3 IID

```

Reserved: 0
Ethernet II, Src: 00:00:00:00:61:00 (
00:00:00:00:61:00
), Dst: ba:25:cd:f4:ad:38 (
ba:25:cd:f4:ad:38
)

```

<-- Dummy Ethernet header for VXLAN

```

Destination: ba:25:cd:f4:ad:38 (ba:25:cd:f4:ad:38)
Address: ba:25:cd:f4:ad:38 (ba:25:cd:f4:ad:38)
  .... ..1. .... = LG bit: Locally administered address (this is NOT the factory d
  .... ..0. .... = IG bit: Individual address (unicast)
Source: 00:00:00:00:61:00 (00:00:00:00:61:00)
Address: 00:00:00:00:61:00 (00:00:00:00:61:00)
  .... ..0. .... = LG bit: Globally unique address (factory default)
  .... ..0. .... = IG bit: Individual address (unicast)
Type: IPv4 (0x0800)
Internet Protocol Version 4, Src:
10.47.4.2
, Dst:
10.47.10.2
0100 .... = Version: 4
.... 0101 = Header Length: 20 bytes (5)

```

```

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

```

```

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

```

Edge-2 entkapselt den VXLAN-Header und leitet die ICMP-Anforderung an 10.47.10.2 weiter (siehe ARP-Tabelle)

```
<#root>
```

```
Edge-2#
```

```
show ip cef vrf red_vn 10.47.10.2
```

```
10.47.10.2/32
```

```
  nexthop 10.47.10.2 Vlan1028
```

```
Edge-2#
```

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

```
IPV4 Adj entries
```

dest	if_name	dst_mac	si_hdl	r
----	-----	-----	-----	-
10.47.10.2	vlan1028	5254.0002.cbF5	0x7f5744f89988	0x

```
<snip>
```

Endpunkt si_hdl decodieren

Nehmen Sie den si_hdl (0x7f5744f89988) und verwenden Sie in show platform hardware fed switch active fwd-asic abstraction print-resource-handle <si_hdl> 1

<#root>

Edge-2#

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

```
Handle:0x7f5744f89988 Res-Type:ASIC_RSC_SI Res-Switch-Num:255 Asic-Num:255 Feature-ID:AL_FID_L3_UNICAST.  
priv_ri/priv_si Handle: 0x7f5744f8afa8Hardware Indices/Handles: index0:0xc8 mtu_index/13u_ri_index0:0x  
Features sharing this resource:66 (1)]
```

```
57 (1)]
```

```
Cookie length: 56
```

```
00 00 00 00 00 00 00 00 04 04 00 00 00 00 00 00 00 00 00 00 07 00 52 54 00 02 cb f5 00 00 00 00 00 00 00 00
```

Detailed Resource Information (ASIC_INSTANCE# 0)

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

RI = 0x2c <-- Rewrite Index contains information for L2 Forwarding

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

stationTableGenericLabel = 0

stationFdConstructionLabel = 0x7

lookupSkipIdIndex = 0

rcpServiceId = 0

dejaVuPreCheckEn = 0x1

Replication Bitmap: LD

Detailed Resource Information (ASIC_INSTANCE# 1)

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

RI = 0x2c <-- Rewrite Index contains information for L2 Forwarding

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

stationTableGenericLabel = 0

stationFdConstructionLabel = 0x7

lookupSkipIdIndex = 0

rcpServiceId = 0

dejaVuPreCheckEn = 0x1

Replication Bitmap: CD

=====

RI-Decodierung für Endpunkte

Nehmen Sie den RI (0x2c) und verwenden Sie im Befehl show platform hardware fed switch active fwd-asic resource asic all rewrite-index range <RI> <RI>

<#root>

Edge-2#

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

ASIC#:0

RI:44

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

<-- Decimal 44 is hex 0x2c

MAC Addr: MAC Addr:

52:54:00:02:cb:f5

,

<-- MAC Address 5254.0002.cbf5 is 10.47.10.2

L3IF LE Index 50

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

<-- Decimal 44 is hex 0x2c

MAC Addr: MAC Addr:

52:54:00:02:cb:f5

,

<-- MAC Address 5254.0002.cbf5 is 10.47.10.2

L3IF LE Index 50

Endpunkt-DI-Dekodierung

Nehmen Sie die DI (0x526e) und verwenden Sie sie in show platform hardware fed switch active fwd-asic resource asic all destination-index range <DI> <DI>

<#root>

Edge-2#

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

ASIC#0:

Destination index = 0x526e

pmap = 0x00000000 0x00000010 <-- Convert 10 into binary, 0001 and 0000, so 00010000, and

pmap_intf : [GigabitEthernet1/0/5]

cmi = 0x0

rcp_pmap = 0x0

al_rsc_cmi

CPU Map Index (CMI) [0]

ctiLo0 = 0

ctiLo1 = 0


```

ctiLo2          = 0
cpuQNum0        = 0
cpuQNum1        = 0
cpuQNum2        = 0
npuIndex        = 0
stripSeg        = 0
copySeg         = 0
ASIC#1:

```

```

Destination index = 0x526e
pmap              = 0x00000000 0x00000000
cmi               = 0x0
rcp_pmap         = 0x0
al_rsc_cmi
CPU Map Index (CMI) [0]
ctiLo0           = 0
ctiLo1           = 0
ctiLo2           = 0
cpuQNum0         = 0
cpuQNum1         = 0
cpuQNum2         = 0
npuIndex         = 0
stripSeg         = 0
copySeg          = 0

```

Edge-2#

```
show platform software fed switch active ifm mappings
```

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

```
GigabitEthernet1/0/5
```

```
0xd 0 0 0
```

```
4
```

```
0 5 4 5 5 NIF Y
```

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

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

Edge-2 entkapselt das Paket und sendet es an die Ausgangsschnittstelle, mit der HOST-03 verbunden ist:

```
<#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)

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