

Verifica del multicast nativo in SD-Access Fabric

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Introduzione

In questo documento viene descritto come verificare il multicast nativo nella struttura SD-Access

(SDA).

Prerequisiti

Requisiti

Cisco raccomanda la conoscenza dei seguenti argomenti:

- Inoltro IP (Internet Protocol)
- Locator ID/Separation Protocol (LISP)
- PIM (Protocol Independent Multicast) in modalità sparse

Componenti usati

- C9000v su Cisco IOS® XE 17.10.1
- Cisco Catalyst Center versione 2.3.5.3

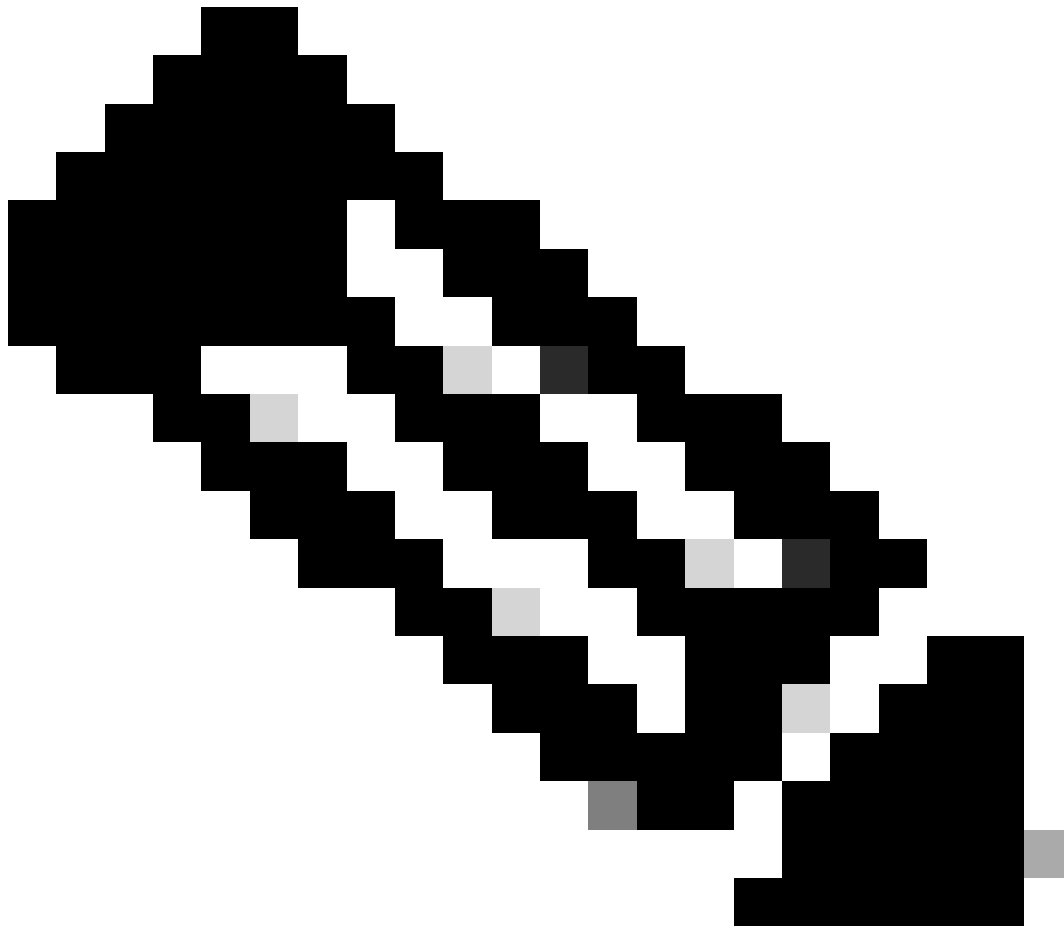
Le informazioni discusse in questo documento fanno riferimento a dispositivi usati in uno specifico ambiente di emulazione. Su tutti i dispositivi menzionati nel documento la configurazione è stata ripristinata ai valori predefiniti. Se la rete è operativa, valutare attentamente eventuali conseguenze derivanti dall'uso dei comandi.

Il presente documento può essere utilizzato anche per le seguenti versioni hardware e software:

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

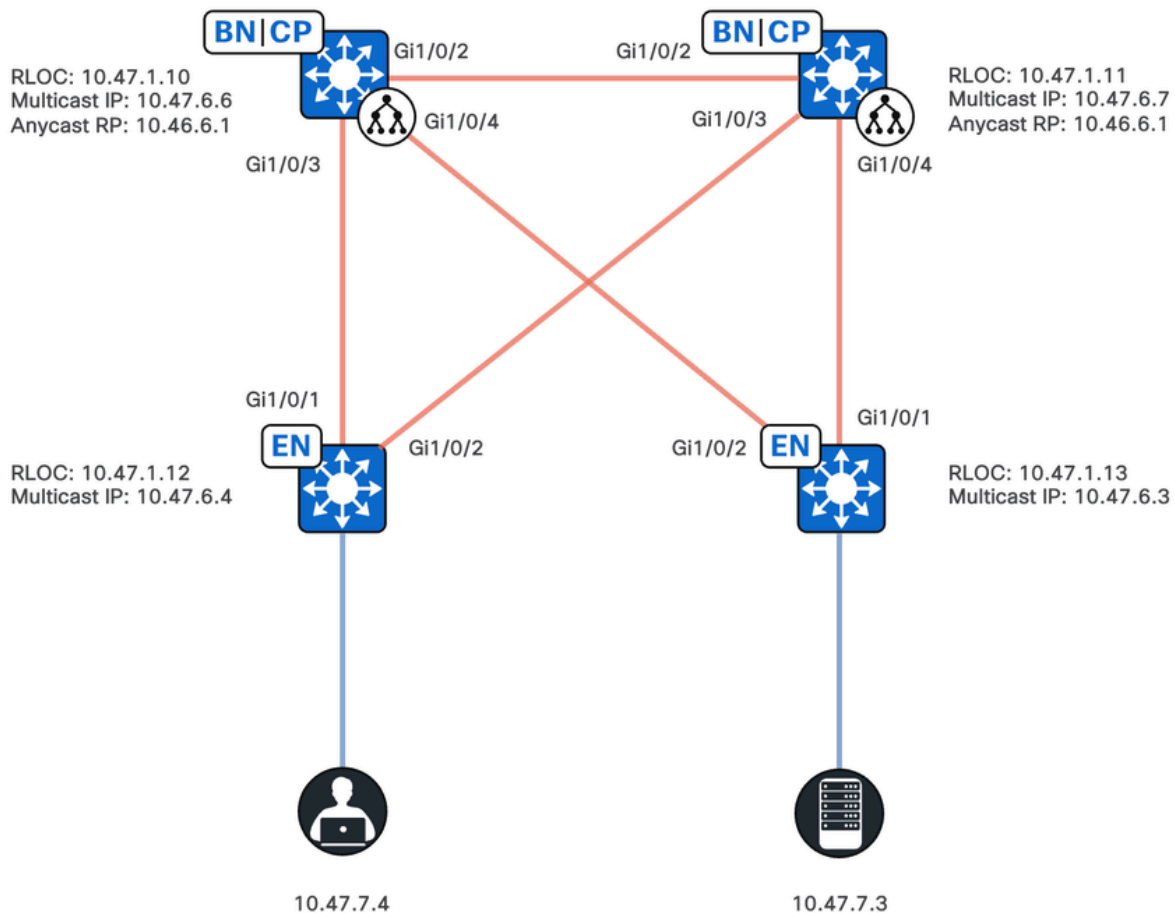
Premesse

Il multicast nativo SDA è una forma di multicast di overlay, utilizzato per trasportare il traffico multicast tra i dispositivi fabric, incapsulando il traffico multicast in un altro gruppo multicast. Il multicast nativo può indirizzare il traffico multicast tra le origini e i ricevitori che si trovano sulla stessa VLAN o su una VLAN diversa (è possibile indirizzare il multicast della stessa VLAN). Il traffico multicast tra le origini e le ricezioni sullo stesso Fabric Edge (FE) non vengono inoltrati utilizzando l'overlay multicast (incapsulamento VXLAN), ma viene instradato localmente da FE. Il multicast nativo non è in grado di indirizzare il traffico multicast per i gruppi che corrispondono a 224.0.0.0/24 o a un valore TTL (Time To Live) =1. Tali gruppi vengono gestiti tramite Flooding Layer 2 (L2). Il multicast nativo può essere configurato per inoltrare qualsiasi multicast di origine (ASM), multicast specifico di origine (SSM) o una combinazione di entrambi. Il multicast nativo si basa sul multicast sottostante.



Nota: i comandi della piattaforma (feed) possono variare. Il comando può essere "show platform fed <active|standby>" oppure "show platform fed switch <active|standby>". Se la sintassi indicata negli esempi non viene analizzata, provare a utilizzare la variante.

Topologia



Topologia della rete

In questa topologia:

- Gli ID RLOC (Remote Locator ID) 10.47.1.10 e 10.47.1.10 sono collocati ovunque ai confini e funzionano anche come Anycast Rendezvous Point (RP) con Multicast Source Discovery Protocol (MSDP) tra i due nella rete virtuale (VN) o Virtual Routing and Forwarding (VRF).
- 10.47.1.12 e 10.47.1.3 sono nodi FE
- 10.47.7.4 è il ricevitore multicast
- 10.47.7.3 è la fonte multicast
- 239.0.0.5 è l'indirizzo di destinazione del gruppo multicast (GDA)

Configurazione

Si presume che Cisco Catalyst Center venga utilizzato per effettuare il provisioning del fabric SDA con queste impostazioni:

- L'implementazione della modalità di replica è multicast nativo
- La modalità multicast è Any Source Multicast (ASM)
- Anycast Rendezvous Point (RP) con protocollo MSDP (Multicast Source Discovery Protocol) configurato sui bordi sparsi

- Il multicast inferiore è stato configurato manualmente o come parte dell'automazione LAN iniziale. Per il corretto funzionamento del multicast inferiore, il multicast nativo si basa sul multicast inferiore.

Configurazione di Fabric Edge (10.47.1.12)

```

ip access-list standard ASM_ACL_IPV4_blue_vn_10.47.6.1
permit 239.0.0.0 0.0.0.255
ip multicast-routing vrf blue_vn
interface LISP0.4100
ip pim lisp transport multicast
ip pim lisp core-group-range 232.0.0.1 1000
interface Vlan1025
ip pim passive
exit
interface Loopback4100
vrf forwarding blue_vn
ip address 10.47.6.4 255.255.255.255
ip pim sparse-mode
ip pim vrf blue_vn rp-address 10.47.6.1 ASM_ACL_IPV4_blue_vn_10.47.6.1
ip pim vrf blue_vn register-source Loopback4100
ip pim vrf blue_vn ssm default
router lisp
service ipv4
etr map-server 10.47.1.11 key *****
etr map-server 10.47.1.10 key *****
etr map-server 10.47.1.10 proxy-reply
etr map-server 10.47.1.11 proxy-reply
service ethernet
etr map-server 10.47.1.11 key *****
etr map-server 10.47.1.10 key *****
etr map-server 10.47.1.10 proxy-reply
etr map-server 10.47.1.11 proxy-reply
instance-id-range 8188 , 8190 , 8192 , 8193 override
remote-rloc-probe on-route-change
service ethernet
eid-table vlan 1025 , 1026 , 1028 , 2727
database-mapping mac locator-set rloc_222e1707-175d-4019-a783-060404f8bc2f
instance-id 4099
service ipv4
sgt
instance-id 4100
service ipv4
sgt
database-mapping 10.47.6.4/32 locator-set rloc_222e1707-175d-4019-a783-060404f8bc2f
instance-id 8188
service ethernet
eid-table vlan 1025
dynamic-eid detection multiple-addr bridged-vm
instance-id 8190
service ethernet
eid-table vlan 1026
dynamic-eid detection multiple-addr bridged-vm
instance-id 8192
service ethernet
eid-table vlan 1028
dynamic-eid detection multiple-addr bridged-vm
ip domain lookup source-interface Loopback0
ip domain lookup

```

```
ip multicast vrf blue_vn multipath
```

Configurazione di Fabric Edge (10.47.1.13)

```
ip access-list standard ASM_ACL_IPV4_blue_vn_10.47.6.1
permit 239.0.0.0 0.0.0.255
ip multicast-routing vrf blue_vn
interface LISP0.4100
ip pim lisp transport multicast
ip pim lisp core-group-range 232.0.0.1 1000
interface Vlan1025
ip pim passive
exit
interface Loopback4100
vrf forwarding blue_vn
ip address 10.47.6.3 255.255.255.255
ip pim sparse-mode
ip pim vrf blue_vn rp-address 10.47.6.1 ASM_ACL_IPV4_blue_vn_10.47.6.1
ip pim vrf blue_vn register-source Loopback4100
ip pim vrf blue_vn ssm default
router lisp
service ipv4
etr map-server 10.47.1.11 key *****
etr map-server 10.47.1.10 key *****
etr map-server 10.47.1.10 proxy-reply
etr map-server 10.47.1.11 proxy-reply
service ethernet
etr map-server 10.47.1.11 key *****
etr map-server 10.47.1.10 key *****
etr map-server 10.47.1.10 proxy-reply
etr map-server 10.47.1.11 proxy-reply
instance-id-range 8188 , 8190 , 8192 , 8193 override
remote-rloc-probe on-route-change
service ethernet
eid-table vlan 1025 , 1026 , 1028 , 2727
database-mapping mac locator-set rloc_691b1fe4-5264-44c2-bb1b-0903b3eb2c51
instance-id 4099
service ipv4
sgt
instance-id 4100
service ipv4
sgt
database-mapping 10.47.6.3/32 locator-set rloc_691b1fe4-5264-44c2-bb1b-0903b3eb2c51
instance-id 8188
service ethernet
eid-table vlan 1025
dynamic-eid detection multiple-addr bridged-vm
instance-id 8190
service ethernet
eid-table vlan 1026
dynamic-eid detection multiple-addr bridged-vm
instance-id 8192
service ethernet
eid-table vlan 1028
dynamic-eid detection multiple-addr bridged-vm
ip domain lookup source-interface Loopback0
```

```
ip domain lookup
ip multicast vrf blue_vn multipath
```

Configurazione Anywhere Border/Anycast RP (10.47.1.10)

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

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

Configurazione Anywhere Border/Anycast RP (10.47.1.10)

```
ip access-list standard ASM_ACL_IPV4_blue_vn_10.47.6.1
permit 239.0.0.0 0.0.0.255
ip multicast-routing vrf blue_vn
interface LISP0.4100
ip pim lisp transport multicast
ip pim lisp core-group-range 232.0.0.1 1000
interface Vlan3001
ip pim sparse-mode
exit
interface Loopback4100
vrf forwarding blue_vn
ip address 10.47.6.1 255.255.255.255
ip pim sparse-mode
interface Loopback4600
vrf forwarding blue_vn
ip address 10.47.6.6 255.255.255.255
ip pim sparse-mode
ip pim vrf blue_vn rp-address 10.47.6.1 ASM_ACL_IPV4_blue_vn_10.47.6.1
ip pim vrf blue_vn register-source Loopback4100
ip pim vrf blue_vn ssm default
ip msdp vrf blue_vn cache-sa-state
ip msdp vrf blue_vn originator-id Loopback4600
ip msdp vrf blue_vn peer 10.47.6.7 connect-source Loopback4600
ip msdp originator-id Loopback4600
router bgp 69420
address-family ipv4 vrf blue_vn
aggregate-address 10.47.6.0 255.255.255.0 summary-only
network 10.47.6.1 mask 255.255.255.255
router lisp
service ipv4
etr map-server 10.47.1.11 key *****
etr map-server 10.47.1.10 key *****
etr map-server 10.47.1.10 proxy-reply
etr map-server 10.47.1.11 proxy-reply
service ethernet
etr map-server 10.47.1.11 key *****
etr map-server 10.47.1.10 key *****
etr map-server 10.47.1.10 proxy-reply
etr map-server 10.47.1.11 proxy-reply
instance-id 4099
service ipv4
sgt
route-export site-registrations
route-import database bgp 69420 route-map DENY-red_vn locator-set rloc_9080ed56-a6c6-482d-9f46-28eda0e18501
distance site-registrations 250
```



```

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

```

Verifica del Control Plane

La verifica del PIM (Protocol Independent Multicast) viene effettuata in questa sezione, a partire dalla convalida della creazione di (S,G) sul router del primo hop (FHR)

FHR (S,G) Creazione

La sorgente multicast, 10.47.7.3, invia i pacchetti multicast UDP a 239.0.0.5. Verificare che IP Device-Tracking (IPDT), Cisco Express Forwarding (CEF) e Reverse Path Forwarding (RPF) puntino correttamente verso l'origine multicast. Inoltre, accertarsi che l'SVI del gateway Anycast sia il router designato PIM (DR) per questo segmento.

Utilizzare il comando "show device-tracking database address <ip address>" per verificare che esista una voce IPDT valida

```
<#root>
```

```
Edge-2#
```

```
show device-tracking database address 10.47.7.3
```

```
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol, DH4 - IPv4 DHCP
Preflevel flags (prlvl):
```

```
0001:MAC and LLA match 0002:Orig trunk 0004:Orig access
```

```
0008:Orig trusted trunk 0010:Orig trusted access 0020:DHCP assigned
```

```
0040:Cga authenticated 0080:Cert authenticated 0100:Statically assigned
```

	Network Layer Address	Link Layer Address	Interface	vlan	prlvl	age	state	Time left
DH4	10.47.7.3	5254.0012.521d	Gi1/0/4	1025	0024	166s		

```
REACHABLE
```

```
81 s try 0(2276 s)
```

Usare il comando "show ip cef vrf <nome VN> <indirizzo ip>" e verificare che la fonte multicast sia

collegata direttamente

```
<#root>
```

```
Edge-2#
```

```
show ip cef vrf blue_vn 10.47.7.3
```

```
10.47.7.3/32
```

```
nexthop 10.47.7.3 Vlan1025
```

Quindi, usare il comando "show ip rpf vrf <VN> <indirizzo ip>" per verificare che l'interfaccia RPF sia la VLAN su cui si trova l'origine, non il LISP.

```
<#root>
```

```
Edge-1#
```

```
show ip rpf vrf blue_vn 10.47.7.3
```

```
RPF information for (10.47.7.2)
```

```
RPF interface: Vlan1025
```

```
RPF neighbor: ? (
```

```
10.47.7.3
```

```
) - directly connected
```

```
RPF route/mask: 10.47.7.3/32
```

```
RPF type:
```

```
unicast (lisp)
```

```
Doing distance-preferred lookups across tables
```

```
Multicast Multipath enabled.
```

```
RPF topology: ipv4 multicast base, originated from ipv4 unicast base
```

Usare il comando "show ip pim vrf <nome VN> interface vlan <vlan> detail | include DR|enabled" per verificare che il nodo FE sia il DR PIM per il segmento e che sia FHR.

```
<#root>
```

```
Edge-2#
```

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

```
PIM: enabled
```

```
PIM DR: 10.47.7.1 (this system)
```

```
PIM State-Refresh processing: enabled
```

```
PIM Non-DR-Join: FALSE
```

Per convalidare la creazione del file (S,G), usare il comando "show ip route vrf <nome VN> <indirizzo gruppo multicast>". (S,G) avrà un elenco di interfacce in uscita (OIL) nullo perché non è stato interessato un ricevitore o un router PIM che si sia unito all'FHR.

<#root>

Edge-2#

```
show ip mroute vrf blue_vn 239.0.0.5
```

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,

L - Local, P - Pruned, R - RP-bit set, F - Register flag,

T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,

X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,

U - URD, I - Received Source Specific Host Report,

Z - Multicast Tunnel, z - MDT-data group sender,

Y - Joined MDT-data group, y - Sending to MDT-data group,

G - Received BGP C-Mroute, g - Sent BGP C-Mroute,

N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,

Q - Received BGP S-A Route, q - Sent BGP S-A Route,

V - RD & Vector, v - Vector, p - PIM Joins on route,

x - VxLAN group, c - PFP-SA cache created entry,

* - determined by Assert, # - iif-starg configured on rpf intf,

e - encap-helper tunnel flag, l - LISP decap ref count contributor

Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join

t - LISP transit group

Timers: Uptime/Expires

Interface state: Interface, Next-Hop or VCD, State/Mode

(* , 239.0.0.5), 00:00:10/stopped, RP 10.47.6.1, flags: SPF1

Incoming interface: LISPO.4100, RPF nbr 10.47.1.10

Outgoing interface list: Null

(

10.47.7.3

,

239.0.0.5

), 00:00:10/00:02:50, flags: PFT

Incoming interface: Vlan1025, RPF nbr 0.0.0.0

Outgoing interface list:

Null

Registrazione FHR (S,G)

L'FHR registra l'origine unicast sull'RP Anycast, utilizzando l'interfaccia configurata come messaggi di registro PIM "origine registrata".

- Intestazione esterna, da RLOC a RLOC (da 10.47.1.13 a 10.47.1.10)
- Intestazione interna, loopback a loopback (da 10.47.6.3 a 10.47.6.1)

- Multicast reale

```
<#root>
```

```
Edge-2#
```

```
show ip pim vrf blue_vn tunnel
```

```
Tunnel1
```

```
Type : PIM Encap
```

```
RP : 10.47.6.1
```

```
Source : 10.47.6.3
```

```
State : UP
```

```
Last event : Created (00:42:43)
```

```
Edge-2#
```

```
show ip cef vrf blue_vn 10.47.6.1
```

```
10.47.6.1/32
```

```
nexthop
```

```
10.47.1.10
```

```
LISP0.4100
```

```
<-- FHR happened to register to this RP
```

```
nexthop 10.47.1.11 LISP0.4100
```

Rapporto appartenenza LHR IGMP

Il ricevitore multicast invia un rapporto/join di appartenenza IGMP per indicare l'interesse alla ricezione del traffico multicast, che crea voci IGMP Snooping e IGMP Group sul router LHR (Last Hop Router). Usare il comando "show ip igmp snooping groups vlan <id vlan> <indirizzo di destinazione del gruppo>" e "show ip igmp vrf <nome VN> groups <gruppo>"

```
<#root>
```

```
Edge-1#
```

```
show ip igmp snooping groups vlan 1025 239.0.0.5
```

```
Vlan Group      Type Version Port List
```

```
-----  
1025 239.0.0.5 igmp v2      Gi1/0/5
```

```
Edge-1#
```

```
show ip igmp vrf blue_vn groups 239.0.0.5
```

```
IGMP Connected Group Membership
```

```
Group Address Interface Uptime Expires Last Reporter Group Accounted
```

239.0.0.5 Vlan1025 00:02:01 00:02:58 10.47.7.4

Quindi, verificare che l'LHR sia effettivamente il DR PIM per questo segmento, usare il comando "show ip pim vrf <nome VN> interface vlan <vlan> detail | includere DR|enabled"

<#root>

Edge-1#

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

PIM: enabled

PIM DR: 10.47.7.1 (this system)

PIM State-Refresh processing: enabled

PIM Non-DR-Join: FALSE

Creazione sovrapposizione LHR (*,G)

Quando l'LHR riceve il report sull'appartenenza IGMP, crea anche lo stato PIM, in particolare (*,G). È possibile utilizzare il comando "show ip mroute vrf <VN Name><overlay group> verbose" per visualizzare lo stato (*,G)

<#root>

Edge-1#

```
show ip mroute vrf blue_vn 239.0.0.5 verbose
```

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,

L - Local, P - Pruned, R - RP-bit set, F - Register flag,

T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,

X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,

U - URD, I - Received Source Specific Host Report,

Z - Multicast Tunnel, z - MDT-data group sender,

Y - Joined MDT-data group, y - Sending to MDT-data group,

G - Received BGP C-Mroute, g - Sent BGP C-Mroute,

N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,

Q - Received BGP S-A Route, q - Sent BGP S-A Route,

V - RD & Vector, v - Vector, p - PIM Joins on route,

x - VxLAN group, c - PFP-SA cache created entry,

* - determined by Assert, # - iif-starg configured on rpf intf,

e - encap-helper tunnel flag, l - LISP decap ref count contributor

Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join

t - LISP transit group

Timers: Uptime/Expires

Interface state: Interface, Next-Hop or VCD, State/Mode

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

10.47.6.1

, flags: SJC1

<-- Anycast RP IP address

Incoming interface: LISP0.4100,

RPF nbr 10.47.1.10

, LISP: [

10.47.1.10

,

232.0.2.245

]

<-- RPF neighbor to reach the Anycast RP, Overlay Group 239.0.0.5 is mapped to Underlay Group 232.0.2.245

Outgoing interface list:

vlan1025

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

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

Mapping LHR (*,G) nel gruppo SSM sottostante

Dall'SSM sottostante (*,G) si deriva l'SSM sottostante (S,G). L'origine è RP RPF e Gruppo è il Mapping sovrapposizione.

<#root>

Edge-1#

show ip mroute 232.0.2.245 10.47.1.10

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,

L - Local, P - Pruned, R - RP-bit set, F - Register flag,

T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,

X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,

U - URD, I - Received Source Specific Host Report,

Z - Multicast Tunnel, z - MDT-data group sender,

Y - Joined MDT-data group, y - Sending to MDT-data group,

G - Received BGP C-Mroute, g - Sent BGP C-Mroute,

N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,

Q - Received BGP S-A Route, q - Sent BGP S-A Route,

V - RD & Vector, v - Vector, p - PIM Joins on route,

x - VxLAN group, c - PFP-SA cache created entry,

* - determined by Assert, # - iif-starg configured on rpf intf,

e - encap-helper tunnel flag, l - LISP decap ref count contributor

Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join

t - LISP transit group

```

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

(
10.47.1.10, 232.0.2.245
), 2d01h/00:02:28, flags: sT
<-- 10.47.1.10 in this example is the RPF IP/neighbor to get to the RP, 232.0.2.245 is the Underlay Group

Incoming interface:
GigabitEthernet1/0/1
, RPF nbr 10.47.1.0
<-- RPF interface to reach 10.47.1.10

Outgoing interface list:
Null0
, Forward/Dense, 2d01h/stopped, flags:
<-- The Outgoing Interface List (OIL) is Null0, and in Native Multicast, this is treated as a De-Encapsu

```

Bordo/RP crea (*,G) nell'overlay e (S,G) nell'underlay

L'LHR invia un'unione PIM (*,G) nella sovrapposizione. È possibile utilizzare il comando "show ip route vrf <nome VN> <gruppo sovrapposizione> verbose" per visualizzare (*,G) nella sovrapposizione

```
<#root>
```

```
Border-1#
```

```
show ip mroute vrf blue_vn 239.0.0.5 verbose
```

```
IP Multicast Routing Table
```

```
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
```

```
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
```

```
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
```

```
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
```

```
U - URD, I - Received Source Specific Host Report,
```

```
Z - Multicast Tunnel, z - MDT-data group sender,
```

```
Y - Joined MDT-data group, y - Sending to MDT-data group,
```

```
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
```

```
N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,
```

```
Q - Received BGP S-A Route, q - Sent BGP S-A Route,
```

```
V - RD & Vector, v - Vector, p - PIM Joins on route,
```

```
x - VxLAN group, c - PFP-SA cache created entry,
```

```
* - determined by Assert, # - iif-starg configured on rpf intf,
```

```
e - encaps-helper tunnel flag, l - LISP decap ref count contributor
```

```
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
```

```
t - LISP transit group
```

```
Timers: Uptime/Expires
```

Interface state: Interface, Next-Hop or VCD, State/Mode

(

*, 239.0.0.5

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

Incoming interface:

Null

,

RPF nbr 0.0.0.0

Outgoing interface list:

LISPO.4100, (

10.47.1.10, 232.0.2.245

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

10.47.1.12

, 2d01h/00:03:05

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

Nella visualizzazione sottostante, è possibile usare il comando "show ip mroute <indirizzo del gruppo sottostante> <RP RLOC>"

<#root>

Border-1#

show ip mroute 232.0.2.245 10.47.1.10

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,

L - Local, P - Pruned, R - RP-bit set, F - Register flag,

T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,

X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,

U - URD, I - Received Source Specific Host Report,

Z - Multicast Tunnel, z - MDT-data group sender,

Y - Joined MDT-data group, y - Sending to MDT-data group,

G - Received BGP C-Mroute, g - Sent BGP C-Mroute,

N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,

Q - Received BGP S-A Route, q - Sent BGP S-A Route,

V - RD & Vector, v - Vector, p - PIM Joins on route,

x - VxLAN group, c - PFP-SA cache created entry,

* - determined by Assert, # - iif-starg configured on rpf intf,

e - encap-helper tunnel flag, l - LISP decap ref count contributor

Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join

t - LISP transit group

Timers: Uptime/Expires

Interface state: Interface, Next-Hop or VCD, State/Mode

(

10.47.1.10


```

,
232.0.2.245
), 2d01h/00:03:13, flags: sT
Incoming interface:
Null0
,
RPF nbr 0.0.0.0

Outgoing interface list:
GigabitEthernet1/0/3
, Forward/Sparse, 2d01h/00:03:13, flags:
<-- Interface that connects to Edge-1, which is the LHR, a PIM Join was received off this interface

```

Border-1 Crea (S,G) da MSDP SA-Cache

L'FHR ha registrato la fonte multicast su Border-2. Border-2 annuncia l'origine multicast a Border-1 tramite MSDP. È possibile utilizzare il comando "show ip msdp vrf <VN Name> summary" per visualizzare lo stato di MSDP.

```
<#root>
```

```
Border-1#
```

```
show ip msdp vrf blue_vn summary
```

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

Utilizzare il comando "show ip msdp vrf <Nome VN> peer <Indirizzo peer> accept-SA" per verificare le SA accettate dal peer

```
<#root>
```

```
Border-1#
```

```
show ip msdp vrf blue_vn peer 10.47.6.7 accepted-SAs
```

```
MSDP SA accepted from peer 10.47.6.7 (?)
```

```
239.0.0.5
```

```
10.47.7.3
```

(?) RP:

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

Utilizzare il comando "show ip mroute vrf <nome VN> <indirizzo di destinazione del gruppo> verbose" per visualizzare (S,G)

<#root>

Border-1#

```
show ip mroute vrf blue_vn 239.0.0.5 verbose
```

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,

L - Local, P - Pruned, R - RP-bit set, F - Register flag,

T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,

X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,

U - URD, I - Received Source Specific Host Report,

Z - Multicast Tunnel, z - MDT-data group sender,

Y - Joined MDT-data group, y - Sending to MDT-data group,

G - Received BGP C-Mroute, g - Sent BGP C-Mroute,

N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,

Q - Received BGP S-A Route, q - Sent BGP S-A Route,

V - RD & Vector, v - Vector, p - PIM Joins on route,

x - VxLAN group, c - PFP-SA cache created entry,

* - determined by Assert, # - iif-starg configured on rpf intf,

e - encap-helper tunnel flag, l - LISP decap ref count contributor

Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join

t - LISP transit group

Timers: Uptime/Expires

Interface state: Interface, Next-Hop or VCD, State/Mode

(* , 239.0.0.5), 2d02h/00:03:27, RP 10.47.6.1, flags: Sp

Incoming interface: Null, RPF nbr 0.0.0.0

Outgoing interface list:

LISP0.4100, (10.47.1.10, 232.0.2.245), Forward/Sparse, 2d02h/stopped, Pkts:0, flags: p

10.47.1.12, 2d02h/00:03:27

(

10.47.7.3

,

239.0.0.5

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

<-- True multicast source

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

10.47.1.13

,

232.0.2.245

```

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

Outgoing interface list:
10.47.1.12, 00:00:05/00:03:24

<-- RLOC of Edge-1

```

Sovrapposizione bordo (S,G) crea la sovrapposizione (S,G)

Border-1 crea la sovrapposizione (S,G) come risultato della sovrapposizione (S,G). Per ulteriori informazioni, usare il comando "show ip route <indirizzo di destinazione gruppo>".

Ci sono due (S,G), per la FHR, e per se stesso. Il valore Null0 per 10.47.1.13, 232.0.2.245 indica la decapsulazione, il valore Null0 per 10.47.1.10 indica l'incapsulamento.

```
<#root>
```

```
Border-1#
```

```
show ip mroute 232.0.2.245
```

```

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

(
10.47.1.13
,
232.0.2.245
), 00:02:34/00:00:25, flags: sPT

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

```

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

Outgoing interface list: Null <-- Indicates decapsulation

```
(  
10.47.1.10  
,  
232.0.2.245  
) , 2d02h/00:02:41, flags: sT  
<-- RLOC of Border-1, underlay multicast group IP
```

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

Outgoing interface list:

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

FHR riceve (S,G) l'unione in sovrapposizione e sovrapposizione

Il bordo/RP invia i join PIM (S,G) verso l'FHR. Per ottenere le informazioni, usare il comando "show ip route". Nell'overlay, usare "show ip route vrf <nome VN> <indirizzo del gruppo di overlay"

```
<#root>
```

```
Edge-2#
```

```
show ip mroute vrf blue_vn 239.0.0.5
```

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,

L - Local, P - Pruned, R - RP-bit set, F - Register flag,

T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,

X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,

U - URD, I - Received Source Specific Host Report,

Z - Multicast Tunnel, z - MDT-data group sender,

Y - Joined MDT-data group, y - Sending to MDT-data group,

G - Received BGP C-Mroute, g - Sent BGP C-Mroute,

N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,

Q - Received BGP S-A Route, q - Sent BGP S-A Route,

V - RD & Vector, v - Vector, p - PIM Joins on route,

x - VxLAN group, c - PFP-SA cache created entry,

* - determined by Assert, # - iif-starg configured on rpf intf,

e - encaps-helper tunnel flag, l - LISP decap ref count contributor

Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join

t - LISP transit group

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

(* , 239.0.0.5), 1w3d/stopped, RP 10.47.6.1, flags: SPF1
Incoming interface: LISPO.4100, RPF nbr 10.47.1.10
Outgoing interface list: Null

```
(  
10.47.7.3  
,  
239.0.0.5  
) , 1w3d/00:01:23, flags: FT  
<-- Multicast source, true multicast group
```

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

```
10.47.1.13  
,  
232.0.2.245  
) , Forward/Sparse, 19:12:56/stopped, flags:  
<-- FHR RLOC, underlay group IP
```

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

Nella schermata "Underlay", usare "show ip route <underlay group address>"

```
<#root>
```

```
Edge-2#
```

```
show ip mroute 232.0.2.245
```

IP Multicast Routing Table

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

Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
t - LISP transit group
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

```
(  
10.47.1.13  
,  
232.0.2.245  
) , 1w3d/00:03:01, flags: sT  
<-- RLOC of the FHR, Underlay multicast group  
  
Incoming interface: Null0, RPF nbr 0.0.0.0 <-- Indicates encapsulation
```

Outgoing interface list:

```
GigabitEthernet1/0/1  
, Forward/Sparse, 00:01:42/00:03:01, flags:  
<-- Where the multicast traffic is forwarded
```

LHR riceve il traffico multicast lungo la struttura condivisa

Dopo aver ricevuto il traffico multicast incapsulato dall'RP lungo la struttura condivisa, LHR decapsula il traffico multicast come se il valore di OIL nella struttura sottostante (S,G) fosse Null0, quindi crea una voce (S,G) nella struttura sovrapposta. È possibile usare il comando "show ip mroute <indirizzo del gruppo sottostante>" e "show ip mroute vrf <nome VN> <indirizzo del gruppo overlay"

<#root>

Edge-1#

```
show ip mroute 232.0.2.245
```

IP Multicast Routing Table

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

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

```
(  
10.47.1.10  
,  
232.0.2.245  
) , 2d03h/00:00:36, flags: sT  
<-- RLOC of the RP, Underlay group  
  
Incoming interface:  
GigabitEthernet1/0/1, RPF nbr 10.47.1.0 <-- RPF interface towards the RP
```

```
Outgoing interface list:  
Null0, Forward/Dense, 2d03h/stopped, flags: <-- Indicates Decapsulation
```

Nell'overlay "show ip route vrf <nome VN> <indirizzo gruppo overlay>"

<#root>

Edge-1#

```
show ip mroute vrf blue_vn 239.0.0.5
```

IP Multicast Routing Table

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

```
(* , 239.0.0.5), 1w3d/stopped, RP 10.47.6.1, flags: SJC1  
Incoming interface: LISP0.4100, RPF nbr 10.47.1.10  
Outgoing interface list:  
Vlan1025, Forward/Sparse-Dense, 1w3d/00:02:03, flags:
```

```
(
10.47.7.3, 239.0.0.5
), 00:01:21/00:01:38, flags: JT1
<-- Multicast Source, Overlay Group

Incoming interface: LISP0.4100, RPF nbr 10.47.1.13, LISP:
[
10.47.1.13, 232.0.2.245
]
<-- RLOC of the FHR, Underlay Group
```

Outgoing interface list:

```
Vlan1025
, Forward/Sparse-Dense, 00:01:21/00:02:03, flags:
<-- Multicast traffic is forwarded into VLAN 1025
```

A questo punto, LHR si unisce all'albero del percorso più breve (SPT, Shortest Path Tree) ed elimina l'albero condiviso, tramite i join PIM (S,G) nella sovrapposizione e nella sovrapposizione. Dopo che l'LHR ha eliminato l'albero condiviso, l'OLIO RP per l'albero (S,G) non include più l'LHR. Andare all'RP e usare il comando "show ip mroute vrf <nome VN> <indirizzo del gruppo di overlay>"

```
<#root>
```

```
Border-1#
```

```
show ip mroute vrf blue_vn 239.0.0.5
```

IP Multicast Routing Table

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



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

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

```
Outgoing interface list: Null
```

Poiché la struttura (S,G) non dispone più di una mappatura di underlay, anche se il traffico a 239.0.0.5 viene ricevuto tramite Underlay, l'RP non la riincapsula a nessun LHR, che elimina la shared-tree. Tuttavia, la struttura (S,G) sia per l'albero di origine che per l'albero condiviso esiste ancora. Andare all'RP e controllare il gruppo Underlay con il comando "show ip route <indirizzo gruppo underlay>"

```
<#root>
```

```
Border-1#
```

```
show ip mroute 232.0.2.245
```

```
IP Multicast Routing Table
```

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

```
Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join
```

```
t - LISP transit group
```

```
Timers: Uptime/Expires
```

```
Interface state: Interface, Next-Hop or VCD, State/Mode
```

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

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

Se l'RP ha rimosso tutti i suoi OLI, si elimina anche dall'OLIO FHR, e l'OLIO FHR include solo l'LHR. Andare all'FHR e usare il comando "show ip route vrf <nome VN> <indirizzo del gruppo di

sovrapposizione>"

<#root>

Edge-2#

```
show ip mroute vrf blue_vn 239.0.0.5
```

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,

L - Local, P - Pruned, R - RP-bit set, F - Register flag,

T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,

X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,

U - URD, I - Received Source Specific Host Report,

Z - Multicast Tunnel, z - MDT-data group sender,

Y - Joined MDT-data group, y - Sending to MDT-data group,

G - Received BGP C-Mroute, g - Sent BGP C-Mroute,

N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,

Q - Received BGP S-A Route, q - Sent BGP S-A Route,

V - RD & Vector, v - Vector, p - PIM Joins on route,

x - VxLAN group, c - PFP-SA cache created entry,

* - determined by Assert, # - iif-starg configured on rpf intf,

e - encap-helper tunnel flag, l - LISP decap ref count contributor

Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join

t - LISP transit group

Timers: Uptime/Expires

Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.0.0.5), 1w4d/stopped, RP 10.47.6.1, flags: SPF1

Incoming interface: LISPO.4100, RPF nbr 10.47.1.10

Outgoing interface list: Null

(

10.47.7.3

,

239.0.0.5

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

<-- Multicast Source, Overlay Group

Incoming interface: Vlan1025, RPF nbr 0.0.0.0

Outgoing interface list:

LISPO.4100, (

10.47.1.13, 232.0.2.245

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

<-- RLOC of the LHR, Underlay Group

Verifica del piano dati (indipendente dalla piattaforma)

È possibile che si verifichino diversi problemi che impediscono alla sorgente multicast o al

ricevitore multicast di inviare/ricevere il traffico. In questa sezione vengono illustrati i problemi di convalida che possono influire sia sull'origine multicast che sul ricevitore multicast, con particolare attenzione ai problemi non correlati alla programmazione hardware.

Creazione FHR (S,G)

Affinché FHR possa creare (S,G), verificare che SISF, LISP, CEF e RPF siano tutti validi e corretti, usare il comando "show device-tracking database address <indirizzo IPv4>"

```
<#root>
```

```
Edge-2#
```

```
show device-tracking database address 10.47.7.3
```

```
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol, DH4 - IPv4 DHCP  
Preflevel flags (prlvl):
```

```
0001:MAC and LLA match 0002:Orig trunk 0004:Orig access
```

```
0008:Orig trusted trunk 0010:Orig trusted access 0020:DHCP assigned
```

```
0040:Cga authenticated 0080:Cert authenticated 0100:Statically assigned
```

```
Network Layer Address Link Layer Address Interface vlan prlvl age state Time left  
DH4 10.47.7.3 5254.0012.521d Gi1/0/4 1025 0024 16s REACHABLE 232 s try 0(84662 s)
```

Il protocollo SISF viene utilizzato da LISP. Utilizzare il comando "show lisp instance-id <L3 LISP Instance ID> database ipv4 <IP/32>"

```
<#root>
```

```
Edge-2#
```

```
show lisp instance-id 4100 ipv4 database 10.47.7.3/32
```

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

```
10.47.7.3/32
```

```
, dynamic-eid blue-IPV4, inherited from default locator-set rloc_691b1fe4-5264-44c2-bb1b-0903b3eb2c51
```

```
Uptime: 5w0d, Last-change: 5w0d
```

```
Domain-ID: local
```

```
Service-Insertion: N/A
```

```
Locator Pri/Wgt Source State
```

```
10.47.1.13 10/10 cfg-intf site-self, reachable
```

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

```
10.47.1.10 2d04h Yes 0
```

```
10.47.1.11 2d15h Yes 0
```

```
Edge-2#
```

```
show ip lisp instance-id 4100 forwarding eid local 10.47.7.3
```

```
Prefix
```

```
10.47.7.3/32
```

programmi LISP CEF, usare il comando "show ip cef vrf <nome VN> <indirizzo ip>" e verificare che sia un hop successivo nella VLAN, non puntato verso LISP.

```
<#root>
```

```
Edge-2#
```

```
show ip cef vrf blue_vn 10.47.7.3
```

```
10.47.7.3/32
```

```
nexthop 10.47.7.3 Vlan1025
```

Infine, accertarsi che RPF punti correttamente e dica connesso direttamente.

```
<#root>
```

```
Edge-2#
```

```
show ip rpf vrf blue_vn 10.47.7.3
```

```
RPF information for (10.47.7.3)
```

```
RPF interface: Vlan1025
```

```
RPF neighbor: ?
```

```
(10.47.7.3) - directly connected
```

```
RPF route/mask: 10.47.7.3/32
```

```
RPF type: unicast (lisp)
```

```
Doing distance-preferred lookups across tables
```

```
Multicast Multipath enabled.
```

```
RPF topology: ipv4 multicast base, originated from ipv4 unicast base
```

Se non esiste una voce valida in SISF/IPDT, non viene creata alcuna mappatura del database LISP sull'FHR, il che fa sì che CEF e RPF puntino al/ai bordo/i. Se la fonte multicast invia traffico, RPF punta all'interfaccia errata, che genera un errore RPF (S,G) e non viene formato.

```
<#root>
```

```
Edge-2#
```

```
show device-tracking database address 10.47.7.3
```

```
Codes: L - Local, S - Static, ND - Neighbor Discovery, ARP - Address Resolution Protocol, DH4 - IPv4 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 vln prlvl age state Time left
```

Edge-2#

```
show lisp instance-id 4100 ipv4 database 10.47.7.3/32
```

% No database-mapping entry for 10.47.7.3/32.

Edge-2#

```
show ip cef vrf blue_vn 10.47.7.3
```

10.47.7.0/24

nexthop 10.47.1.10

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

nexthop 10.47.1.11

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

Edge-2#

```
show ip rpf vrf blue_vn 10.47.7.3
```

RPF information for (10.47.7.3)

RPF interface:

LISP0.4100

RPF neighbor: ? (

10.47.1.11

)

RPF route/mask: 10.47.7.3/32

RPF type: unicast ()

Doing distance-preferred lookups across tables

Multicast Multipath enabled.

RPF topology: ipv4 multicast base

Per evitare questo problema, trattare la sorgente multicast come un host silenzioso, dove i binding IP Directed Broadcast, Flooding, Static SISF/IPDT possono risolvere il problema.

Registrazione origine

La registrazione PIM è un flusso di pacchetto unicast, che utilizza LISP/VXLAN come qualsiasi altro pacchetto unicast. Per verificare che l'FHR sia in grado di registrare correttamente l'origine multicast nell'RP di Anycast, vengono eseguiti diversi controlli dei requisiti.

Innanzitutto, verificare che l'Anycast RP sia configurato correttamente per GDA.

<#root>

Edge-2#

```
show ip pim vrf blue_vn rp 239.0.0.5
```

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

Verificare che il tunnel del registro PIM sia formato.

<#root>

Edge-2#

```
show ip pim vrf blue_vn tunnel
```

Tunnel1

Type : PIM Encap

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

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

State : UP

Last event : Created (1w4d)

Accertarsi che vi sia raggiungibilità IP all'Anycast RP

<#root>

Edge-2#

```
show ip cef vrf blue_vn 10.47.6.1
```

10.47.6.1/32

nexthop

10.47.1.10

LISPO.4100

<-- RLOC of Border-1

nexthop

10.47.1.11

LISPO.4100

<-- RLOC of Border-2

Edge-2#

```
ping vrf blue_vn 10.47.6.1 source lo4100
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.47.6.1, timeout is 2 seconds:

Packet sent with a source address of 10.47.6.3

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/3 ms

Verifica lato ricevitore

- Verificare che il ricevitore multicast stia inviando un messaggio IGMP MR.
- Verificare che lo snooping IGMP sia abilitato. Solo le VN L2 sono l'unico tipo di VN per cui non è abilitato lo snooping IGMP
- Accertarsi che non vi siano ACL della porta, ACL della VLAN e ACL della porta di routing configurati in grado di eliminare il file MR IGMP.
- Convalidare la versione di IGMP MR; per impostazione predefinita, IGMPv2, se il ricevitore multicast è IGMPv3, richiede "ip igmp versione 3"
- Verificare che "ip option drop" non sia configurato

Verifica LHR PIM (*,G)

- Assicurarsi che LHR sia il DR PIM per la subnet/segmento del ricevitore
- Verificare che non sia configurato alcun "ip multicast group-range"
- Accertarsi che non vi siano ACL della porta, ACL della VLAN e ACL della porta di routing configurati in grado di eliminare il file MR IGMP.
- Accertarsi che non vi sia un CPU elevato o che il Control-Plane Policing (CoPP) non scarti il MR IGMP.

Verifica albero condiviso PIM LHR

Verificare che sia configurato un RP per il gruppo

```
<#root>
```

```
Edge-1#
```

```
show ip mroute vrf blue_vn 239.0.0.5
```

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,

L - Local, P - Pruned, R - RP-bit set, F - Register flag,

T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,

X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,

U - URD, I - Received Source Specific Host Report,

Z - Multicast Tunnel, z - MDT-data group sender,

Y - Joined MDT-data group, y - Sending to MDT-data group,

G - Received BGP C-Mroute, g - Sent BGP C-Mroute,

N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,

Q - Received BGP S-A Route, q - Sent BGP S-A Route,

V - RD & Vector, v - Vector, p - PIM Joins on route,

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

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

10.47.6.1

, flags: SJC1

<-- Anycast RP address

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

Accertarsi che la RPF all'Anycast RP sia corretta

<#root>

Edge-1#

show ip cef vrf blue_vn 10.47.6.1

10.47.6.1/32

nexthop 10.47.1.10 LISP0.4100

nexthop 10.47.1.11 LISP0.4100

Edge-1#

show ip rpf vrf blue_vn 10.47.6.1

RPF information for (10.47.6.1)

RPF interface: LISP0.4100

RPF neighbor: ? (10.47.1.10)

RPF route/mask: 10.47.6.1/32

RPF type: unicast ()

Doing distance-preferred lookups across tables

Multicast Multipath enabled.

RPF topology: ipv4 multicast base

Inoltro MFIB - Verifica lato origine multicast nativo (sovrapposizione)

Per ulteriori informazioni sull'inoltro dei pacchetti, usare il comando "show ip mfib vrf <nome VN>
<indirizzo del gruppo di overlay> <origine unicast> verbose".

<#root>

Edge-2#

```
show ip mfib vrf blue_vn 239.0.0.5 10.47.7.3 verbose
```

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

10.47.1.13

,

232.0.2.245

) Flags: RF F NS

<-- RLOC of FHR, Underlay Group IP address

CEF: Adjacency with MAC:

4500000000004000001184BC0A2F010DE80002F5000012B500000000084000000100400BA25CDF4AD38BA25CDF4AD380000

Pkts: 0/0/0 Rate: 0 pps

Inoltro MFIB - Verifica lato origine multicast nativo (underlay)

Utilizzare "show ip route <indirizzo gruppo sottostante> <RLOC of FHR>" per visualizzare il gruppo sottostante

<#root>

Edge-2#

```
show ip mroute 232.0.2.245 10.47.1.13
```

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,

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

(

10.47.1.13

,

232.0.2.245

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

<-- RLOC of the FHR, Underlay Group

Incoming interface:

Null0

, RPF nbr 0.0.0.0

<-- Indicates Encapsulation

Outgoing interface list:

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

Edge-2#

show ip mfib 232.0.2.245 10.47.1.13 verbo

se

Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,

ET - Data Rate Exceeds Threshold, K - Keepalive

DDE - Data Driven Event, HW - Hardware Installed

ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB

MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary

MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,

e - Encap helper tunnel flag.

I/O Item Flags: IC - Internal Copy, NP - Not platform switched,

NS - Negate Signalling, SP - Signal Present,

A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,

MA - MFIB Accept, A2 - Accept backup,

RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second

Other counts: Total/RPF failed/Other drops

I/O Item Counts: HW Pkt Count/FS Pkt Count/PS Pkt Count Egress Rate in pps

Default

(

10.47.1.13,232.0.2.245

) Flags: K HW

0x348 OIF-IC count: 0, OIF-A count: 1

SW Forwarding: 0/0/0/0, Other: 0/0/0

HW Forwarding:

5268151634814304256

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

Null0

Flags: RA A MA

GigabitEthernet1/0/1 Flags: RF F NS

CEF: Adjacency with MAC: 01005E0002F552540017FE730800

Pkts: 0/0/0 Rate: 0 pps

Inoltro MFIB - Multicast nativo (post-decapsulamento)

Quando il traffico multicast arriva all'LHR incapsulato con un indirizzo IP di origine pari a 10.47.1.13 e un indirizzo di destinazione pari a 232.0.2.245, viene instradato all'interfaccia in uscita Null0. Questa azione attiva la decapsulazione del pacchetto.

<#root>

Edge-1#

show ip mroute 232.0.2.245 10.47.1.13

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,

L - Local, P - Pruned, R - RP-bit set, F - Register flag,

T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,

X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,

U - URD, I - Received Source Specific Host Report,

Z - Multicast Tunnel, z - MDT-data group sender,

Y - Joined MDT-data group, y - Sending to MDT-data group,

G - Received BGP C-Mroute, g - Sent BGP C-Mroute,

N - Received BGP Shared-Tree Prune, n - BGP C-Mroute suppressed,

Q - Received BGP S-A Route, q - Sent BGP S-A Route,

V - RD & Vector, v - Vector, p - PIM Joins on route,

x - VxLAN group, c - PFP-SA cache created entry,

* - determined by Assert, # - iif-starg configured on rpf intf,

e - encap-helper tunnel flag, l - LISP decap ref count contributor

Outgoing interface flags: H - Hardware switched, A - Assert winner, p - PIM Join

t - LISP transit group

Timers: Uptime/Expires

Interface state: Interface, Next-Hop or VCD, State/Mode

(

10.47.1.13

,

232.0.2.245

), 00:38:22/00:00:37, flags: sT

Incoming interface: GigabitEthernet1/0/2, RPF nbr 10.47.1.4

Outgoing interface list:

Null0

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

Edge-1#

show ip mfib 232.0.2.245 10.47.1.13 verbose

Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,

ET - Data Rate Exceeds Threshold, K - Keepalive

DDE - Data Driven Event, HW - Hardware Installed

ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB

MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary

MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,

e - Encap helper tunnel flag.

I/O Item Flags: IC - Internal Copy, NP - Not platform switched,

NS - Negate Signalling, SP - Signal Present,

A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,

MA - MFIB Accept, A2 - Accept backup,

RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second

Other counts: Total/RPF failed/Other drops

I/O Item Counts: HW Pkt Count/FS Pkt Count/PS Pkt Count Egress Rate in pps

Default

(

10.47.1.13,232.0.2.245

) Flags: K HW

0x77 OIF-IC count: 0, OIF-A count: 1

SW Forwarding: 0/0/0/0, Other: 0/0/0

HW Forwarding: 0/0/0/0, Other: 0/0/0

GigabitEthernet1/0/2

Flags: RA A MA

Null0, LISPv4 Decap Flags: RF F NS

CEF: OCE (lisp decap)

Pkts: 0/0/0 Rate: 0 pps

Dopo la decapsulazione, l'LHR identifica che l'indirizzo IP di destinazione reale è 239.0.0.5 all'interno del VNI 4100, e che l'indirizzo IP di origine è 10.47.7.3

<#root>

Edge-1#

show ip mroute vrf blue_vn 239.0.0.5

IP Multicast Routing Table

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

(*, 239.0.0.5), 1w3d/stopped, RP 10.47.6.1, flags: SJC1
Incoming interface: LISPO.4100, RPF nbr 10.47.1.10
Outgoing interface list:
Vlan1025, Forward/Sparse-Dense, 1w3d/00:02:01, flags:

(

10.47.7.3

,

239.0.0.5

), 00:01:29/00:01:30, flags: JT1
Incoming interface: LISPO.4100, RPF nbr 10.47.1.13
Outgoing interface list:

Vlan1025

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

Edge-1#

show ip mfib vrf blue_vn 239.0.0.5 10.47.7.3

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

```
10.47.7.3,239.0.0.5
```

```
) Flags: HW
```

```
<-- Unicast Source and Overlay Group
```

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

```
HW Forwarding: 0/0/0/0, Other: 0/0/0
```

```
LISP0.4100 Flags: A <-- Incoming Interface
```

```
Vlan1025 Flags: F NS <-- Outgoing Interface
```

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

Utilizzare il comando "show ip igmp snooping groups vlan <VLAN>" per verificare quali porte riceveranno il traffico multicast.

```
<#root>
```

```
Edge-1#
```

```
show ip igmp snooping groups vlan 1025
```

```
Vlan Group      Type Version Port List
```

```
-----  
1025 239.0.0.5 igmp v2      Gi1/0/5
```

Verifica del piano dati (dipendente dalla piattaforma)

Mroute Programmazione hardware - IOS mroute

La programmazione hardware utilizza questa catena: IOS, quindi FMAN RP, a FMAN FP e quindi FED. Verificare prima IOS, con il comando "show ip mroute vrf <nome VN> <indirizzo gruppo di overlay> verbose" e "show ip mroute <indirizzo gruppo di overlay> verbose"

```
<#root>
```

```
Edge-1#
```

```
show ip mroute vrf blue_vn 239.0.0.5 verbose
```

```
IP Multicast Routing Table
```

```
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
```

```
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
```

```
T - SPT-bit set, J - Join SPT, M - MSDP created entry, E - Extranet,
```

```
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
```

```
U - URD, I - Received Source Specific Host Report,
```

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

(

*, 239.0.0.5

), 1w3d/stopped, RP 10.47.6.1, flags: SJC1
Incoming interface: LISP0.4100, RPF nbr 10.47.1.10, LISP: [10.47.1.10, 232.0.2.245]
Outgoing interface list:
Vlan1025, Forward/Sparse-Dense, 1w3d/00:02:58, Pkts:0, flags:

(

10.47.7.3, 239.0.0.5

), 00:02:19/00:00:40, flags: JT1
Incoming interface: LISP0.4100, RPF nbr 10.47.1.13, LISP: [10.47.1.13, 232.0.2.245]
Outgoing interface list:
Vlan1025, Forward/Sparse-Dense, 00:02:19/00:02:58, Pkts:0, flags:

Nel sottofondo

<#root>

Edge-1#

show ip mroute 232.0.2.245 verbose

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

(

10.47.1.13, 232.0.2.245

), 01:18:55/00:02:04, flags: sT

Incoming interface: GigabitEthernet1/0/2, RPF nbr 10.47.1.4

LISP EID ref count: 1, Underlay ref timer: 00:05:13

Outgoing interface list:

Null0, Forward/Dense, 00:01:46/stopped, Pkts:0, flags:

(

10.47.1.10, 232.0.2.245

), 2d06h/00:02:59, flags: sT

Incoming interface: GigabitEthernet1/0/1, RPF nbr 10.47.1.0

LISP EID ref count: 1, Underlay ref timer: 00:05:12

Outgoing interface list:

Null0, Forward/Dense, 2d06h/stopped, Pkts:0, flags:

Programmazione hardware Mroute - MFIB IOS

Verificare i valori MFIB overlay e underlay con il comando "show ip mfib vrf <nome VN> <indirizzo gruppo overlay> verbose" e "show ip mroute <indirizzo gruppo underlay> verbose"

Nella sovrapposizione

<#root>

Edge-1#

```
show ip mfib vrf blue_vn 239.0.0.5 verbose
```

Entry Flags: C - Directly Connected, S - Signal, IA - Inherit A flag,

ET - Data Rate Exceeds Threshold, K - Keepalive

DDE - Data Driven Event, HW - Hardware Installed

ME - MoFRR ECMP entry, MNE - MoFRR Non-ECMP entry, MP - MFIB

MoFRR Primary, RP - MRIB MoFRR Primary, P - MoFRR Primary

MS - MoFRR Entry in Sync, MC - MoFRR entry in MoFRR Client,

e - Encap helper tunnel flag.

I/O Item Flags: IC - Internal Copy, NP - Not platform switched,

NS - Negate Signalling, SP - Signal Present,

A - Accept, F - Forward, RA - MRIB Accept, RF - MRIB Forward,

MA - MFIB Accept, A2 - Accept backup,

RA2 - MRIB Accept backup, MA2 - MFIB Accept backup

Forwarding Counts: Pkt Count/Pkts per second/Avg Pkt Size/Kbits per second

Other counts: Total/RPF failed/Other drops

I/O Item Counts: HW Pkt Count/FS Pkt Count/PS Pkt Count Egress Rate in pps

VRF blue_vn

(

*,239.0.0.5

) Flags: C K HW

0x6D OIF-IC count: 0, OIF-A count: 1

SW Forwarding: 0/0/0/0, Other: 0/0/0

HW Forwarding: 16218869633044709376/0/0/0, Other: 0/0/0

LISP0.4100 Flags: RA A MA NS


```
Vlan1025 Flags: RF F NS
CEF: Adjacency with MAC: 01005E00000500000C9FFB870800
Pkts: 0/0/0 Rate: 0 pps
(
```

```
10.47.7.3,239.0.0.5
```

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

Nel sottofondo

```
<#root>
```

```
Edge-1#
```

```
show ip mfib 232.0.2.245 verbose
```

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

```
10.47.1.10,232.0.2.245
```

```
) Flags: K HW
0x18 OIF-IC count: 0, OIF-A count: 1
SW Forwarding: 0/0/0/0, Other: 0/0/0
HW Forwarding: 8384858081233731584/0/0/0, Other: 0/0/0
GigabitEthernet1/0/1 Flags: RA A MA
Null0, LISPV4 Decap Flags: RF F NS
CEF: OCE (lisp decap)
Pkts: 0/0/0 Rate: 0 pps
(
```

```
10.47.1.13,232.0.2.245
```

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

```
HW Forwarding: 0/0/0/0, Other: 0/0/0
GigabitEthernet1/0/2 Flags: RA A MA
Null0, LISPv4 Decap Flags: RF F NS
CEF: OCE (lisp decap)
Pkts: 0/0/0 Rate: 0 pps
```

Programmazione hardware Mroute - FMAN RP

Per convalidare FMAN RP, acquisire prima l'ID VRF.

```
<#root>
```

```
Edge-1#
```

```
show vrf detail blue_vn | include Id
```

```
VRF blue_vn (
```

```
VRF Id = 2
```

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

Quindi, utilizzare il valore di indice VRF per i comandi successivi. Per convalidare la sovrapposizione (*,G) usare il comando "show platform software ip switch active r0 mfib vrf index <VRF Index> group <overlay group address>/32"

```
<#root>
```

```
Edge-1#
```

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

```
Route flags:
```

```
S - Signal; C - Directly connected;
```

```
IA - Inherit A Flag; L - Local;
```

```
BR - Bidir route
```

```
*, 239.0.0.5/32 --> OBJ_INTF_LIST (0x6d)
```

```
Obj id: 0x6d, Flags: C
```

```
OM handle: 0x348030b738
```

Per convalidare l'overlay (S,G), usare il comando "show platform software ip switch active r0 mfib vrf index 2 group address <overlay group address> <unicast source>"

```
<#root>
```

```
Edge-1#
```

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

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

Per convalidare l'overlay (S,G) per l'overlay (*,G), usare il comando "show platform software ip switch active r0 mfib group address <indirizzo gruppo underlay> <indirizzo RP>"

<#root>

Edge-1#

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

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

Per convalidare l'overlay (S,G) per l'overlay (S,G), usare il comando "show platform software ip switch active r0 mfib group address <underlay group address> <RLOC of FHR>"

<#root>

Edge-1#

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

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

Programmazione hardware Mroute - FP FMAN

Per convalidare l'overlay (*,G), usare il comando "show platform software ip switch active f0 mfib vrf index <ID VRF> group <indirizzo gruppo overlay>"

<#root>

Edge-1#

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

Route flags:

S - Signal; C - Directly connected;

IA - Inherit A Flag; L - Local;

BR - Bidir route

*, 239.0.0.5/32 --> OBJ_INTF_LIST (0x6d)

Obj id: 0x6d, Flags: C

aom id:

100880

, HW handle: (nil) (created)

Per convalidare l'overlay (S,G), usare il comando "show platform software ip switch active f0 mfib vrf index <VRF ID> group address <overlay group address> <unicast source>"

<#root>

Edge-1#

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

Route flags:

S - Signal; C - Directly connected;

IA - Inherit A Flag; L - Local;

BR - Bidir route

239.0.0.5, 10.47.7.3/64 --> OBJ_INTF_LIST (0x8f)

Obj id: 0x8f, Flags: unknown

aom id:

161855

, HW handle: (nil) (created)

Per convalidare l'overlay (S,G) per l'overlay (*,G), usare il comando "show platform software ip switch active f0 mfib group address <indirizzo gruppo underlay> <indirizzo RP>"

<#root>

Edge-1#

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

Route flags:

S - Signal; C - Directly connected;

IA - Inherit A Flag; L - Local;

BR - Bidir route

232.0.2.245, 10.47.1.10/64 --> OBJ_INTF_LIST (0x18)

Obj id: 0x18, Flags: unknown

aom id:

138716

, HW handle: (nil) (created)

Per convalidare l'overlay (S,G) per l'overlay (S,G), usare il comando "show platform software ip switch active f0 mfib group address <underlay group address> <RLOC of FHR>"

<#root>

Edge-1#

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

Route flags:

S - Signal; C - Directly connected;

IA - Inherit A Flag; L - Local;

BR - Bidir route

232.0.2.245, 10.47.1.13/64 --> OBJ_INTF_LIST (0x5)

Obj id: 0x5, Flags: unknown

aom id:

161559

, HW handle: (nil) (created)

Programmazione hardware Mroute - Database FP FMAN

Per convalidare l'oggetto FP FMAN, usare il comando "show platform software object-manager switch active f0 object <ID oggetto> parent"

Ad esempio, per convalidare la sovrapposizione (*,G)

<#root>

Edge-1#

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

Object identifier: 100605

Description: ipv4_mcast table 2 (

blue_vn

), vrf id 2

Status: Done

Object identifier: 100878

Description:

mlist 109

Status: Done

Per convalidare la sovrapposizione (S,G)

```
<#root>
```

```
Edge-1#
```

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

```
Object identifier: 100605
```

```
Description: ipv4_mcast table 2 (blue_vn), vrf id 2
```

```
Status: Done
```

```
Object identifier: 161854
```

```
Description:
```

```
m1ist 143
```

```
Status: Done
```

L'elenco mlist è una combinazione dell'interfaccia in ingresso (IIF) e dell'elenco delle interfacce in uscita (OIL) separate dalla route in un oggetto diverso. Per convalidare mlist, usare il comando "show platform software mlist switch active f0 index <index>"

```
<#root>
```

```
Edge-1#
```

```
show platform software mlist switch active f0 index 109
```

```
Multicast List entries
```

```
OCE Flags:
```

```
NS - Negate Signalling; IC - Internal copy;
```

```
A - Accept; F - Forward;
```

```
OCE Type OCE Flags Interface
```

```
-----  
0xf8000171 OBJ_ADJACENCY NS, A LISPO.4100
```

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

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

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

```
<#root>
```

```
Edge-1#
```

```
show platform software mlist switch active f0 index 143
```

```
Multicast List entries
```

```
OCE Flags:
```

NS - Negate Signalling; IC - Internal copy;
A - Accept; F - Forward;
OCE Type OCE Flags Interface

0xf8000171 OBJ_ADJACENCY A LISP0.4100

<-- Outgoing Interface for (S,G)

0xf80001f1 OBJ_ADJACENCY NS, F Vlan1025

<-- Incoming Interface for (S,G)

Programmazione hardware Mroute - FED

Per convalidare l'overlay (S,G), usare il comando "show platform software fed switch active ip mfib vrf <VN Name> <overlay group address> <Unicast Source>"

<#root>

Edge-1#

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

Multicast (S,G) Information

VRF : 2

Source Address : 10.47.7.3

HTM Handler : 0x7f0efe53a638

SI Handler : 0x7f0efe50ec68

DI Handler :

0x7f0efe530768

REP RI handler : 0x7f0efe5387e8

Flags :

Packet count : 0

State : 4

RPF :

LISP0.4100 A

OIF :

Vlan1025 F NS

LISP0.4100 A

(Adj: 0xf8000171)

Per convalidare l'underlay (S,G), usare il comando "show platform software fed switch active ip mfib <underlay group address> <RLOC of FHR>"

<#root>

Edge-1#

```
show platform software fed switch active ip mfib 232.0.2.245 10.47.1.13
```


ctiLo0 = 0
ctiLo1 = 0
ctiLo2 = 0
cpuQNum0 = 0
cpuQNum1 = 0
cpuQNum2 = 0
npuIndex = 0
stripSeg = 0
copySeg = 0

=====

Informazioni su questa traduzione

Cisco ha tradotto questo documento utilizzando una combinazione di tecnologie automatiche e umane per offrire ai nostri utenti in tutto il mondo contenuti di supporto nella propria lingua. Si noti che anche la migliore traduzione automatica non sarà mai accurata come quella fornita da un traduttore professionista. Cisco Systems, Inc. non si assume alcuna responsabilità per l'accuratezza di queste traduzioni e consiglia di consultare sempre il documento originale in inglese (disponibile al link fornito).