

ردصم يأل ددعتملا ثبلا ىلع ةماع ةرظن (ASM) عمجمل ةيساسألا ةينبلا ةئيب يف SDA

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ةمدقملا

(RP) عيمجت ةطقن عم (ASM) ردصم يأل ددعتملا ثبلا ىلع ةماع ةرظن دنتسملا اذه فصوي (SD-Access) جماربللا قيرط نع ةفرعملا لوصوللا ةئيب يف ةدحاو.

ةيساسألا تابلطتلا

تابلطتلا

ددعتملا ثبلاو (LISP) عقوملا ددحم فرعم لصف لوكوتوربب ةفرعم كيدل نوكت نأب ىصوي.

ةمدختسملا تانوكملا

ةنعم ةيدام تانوكموجمارب تارادصلا ىلع دنتسملا اذه رصتقي ال.

ةصاخ ةيلمعم ةئيب يف ةدوجوملا ةزهجألا نم دنتسملا اذه يف ةدراولا تامولعملا عاشنالا مت gui.رمأ يأل لمحتملا ريثأتلل كمهف نم دكأتف، ةرشابم كتكبش تناك اذا

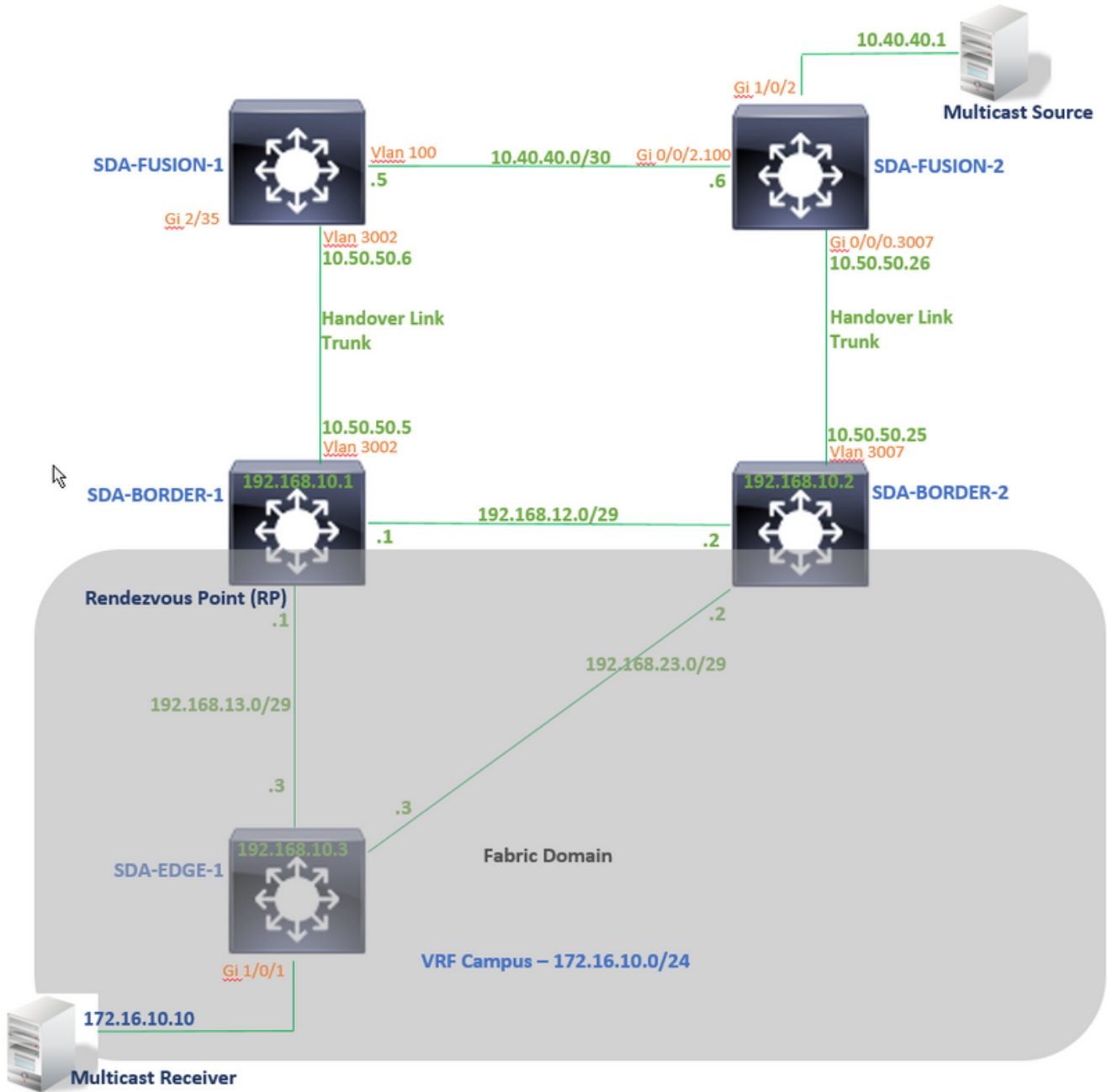
ةلاقملا هذهل ةمدختسملا ةزهجألا

1.2.1 رادصلا - (DNAC) ةيمقرلا ةكبشلا ةينب يف مكحتلا ةدحو

نيوكتلا

ةكبشلل يطيختلا مسرلا

اعم امه نيوكت مت ني دودح ني هجوم نم نوكتت ةلاقملا هذه يف ةمدختسملا ايجولوبطال RP، ك border-1 نيوكت متي. صاخ دودح هجوم لكب لاصتا عم راهصنالل ني هجومو، ةيجراخ دودحك Edge-1 ب ثبلا ددعتم لبقتسملا لصتيو Fusion-2 ب ددعتملا ثبلا رصم لصتيو.



تانيوكتلا

(SDA) جم اربلا ب فرعملا لوصولا ةئيب يف ةنيبنلا نيوكت تاوطخ ةلاقملا هذه يطيغت ال ةنيعم VN ةكبشلل ةنيبنلا لاجم يف ددعتملا ثبلا نيوكت تاوطخل حرشب ادبتو.


```
ip pim vrf Campus register-source Loopback4099
ip pim vrf Campus ssm default <<<<<<<<<< PIM SSM mode is enabled for vrf Campus for default
address range
```

```
SDA-Border1#sh run | s address-family ipv4 vrf Campus
address-family ipv4 vrf Campus
.....
network 192.168.50.1 mask 255.255.255.255 <<<<<<<<<< RP Address is injected into BGP Table
aggregate-address 192.168.50.0 255.255.255.0 summary-only <<<<<<<<<< Aggregate for Multicast
Pool is advertised
.....
```

ردروپ-هي | يد س |

```
interface Loopback4099
 vrf forwarding Campus
 ip address 192.168.50.3 255.255.255.255
 ip pim sparse-mode
end
```

```
interface LISP0.4099
 ip pim sparse-mode
end
```

```
SDA-Border2#sh run | in pim|multicast
```

```
ip multicast-routing
ip multicast-routing vrf Campus
```

```
ip pim ssm default
ip pim vrf Campus rp-address 192.168.50.1 <<<<<<<<<< BORDER-1 Loopback4099 is configured as
RP
ip pim vrf Campus register-source Loopback4099
ip pim vrf Campus ssm default
```

```
SDA-Border2#sh run | s address-family ipv4 vrf Campus
address-family ipv4 vrf Campus
.....
network 192.168.50.1 mask 255.255.255.255
aggregate-address 192.168.50.0 255.255.255.0 summary-only
.....
```

SDA-Edge-1

```
interface Vlan1021
description Configured from apic-em
mac-address 0000.0c9f.f45c
vrf forwarding Campus
ip address 172.16.10.1 255.255.255.0
ip helper-address 10.10.10.100
no ip redirects
ip local-proxy-arp
ip pim sparse-mode <<<<<<<<<< PIM is enabled on all SVI-s under Campus VN
ip route-cache same-interface
ip igmp version 3
no lisp mobility liveness test
lisp mobility 172_16_10_0-Campus
```

end

```
interface Loopback4099 vrf forwarding Campus ip address 192.168.50.2 255.255.255.255 ip pim
sparse-mode end interface LISP0.4099 ip pim sparse-mode end SDA-Edge1#sh run | in pim|multicast
ip multicast-routing ip multicast-routing vrf Campus ip pim ssm default ip pim vrf Campus rp-
address 192.168.50.1 <<<<<<<<<< BORDER-1 Loopback4099 is configued as RP ip pim vrf Campus
register-source Loopback4099 ip pim vrf Campus ssm default
```

مېلس تال طاب ترا ربع اي ودي PIM ني وكت : 3 ة وطلال

ثب لال قف دتل . لال م ل اذه ي ف Fusion-2 لى لى ن ب لال ج راخ ددعت م لال ثب لال ردص م لى صوت م تي
نوكت دق) ردص م لال لى لى لى بقت س م لال او ردص م لال لى لى RP م PIM راس م دوجو م ن دكأت ، ددعت م لال
ل! ة فل تخم تاراس م لال).

PIM Peering بېن SDA-border-1 و SDA-Fusion-1

SDA-BORDER-1

```
-----
interface Vlan3002 <<<<<<<<< Enable PIM on Handover link in Campus VN
description vrf interface to External router
vrf forwarding Campus
ip address 10.50.50.5 255.255.255.252
no ip redirects
ip pim sparse-mode
ip route-cache same-interface
end
```

SDA-FUSION-1

```
-----
ip multicast-routing
ip multicast-routing vrf Campus <<<<<<<<< Enable Multicast Routing in vrf Campus
ip pim vrf Campus rp-address 192.168.50.1 <<<<<<<<< Configure BORDER-1 Loopback4099 as RP
interface Vlan3002 <<<<<<<<< Enable PIM on Fusion Interface towards Border vrf forwarding Campus
ip address 10.50.50.6 255.255.255.252 ip pim sparse-mode
end
```

PIM Peering بېن SDA-border-2 و SDA-Fusion-2

SDA-BORDER-2

```
-----
interface Vlan3007
description vrf interface to External router
vrf forwarding Campus
ip address 10.50.50.25 255.255.255.252
no ip redirects
ip pim sparse-mode
ip route-cache same-interface
end
```

SDA-FUSION-2

```
-----
ip multicast-routing distributed
ip multicast-routing vrf Campus distributed

ip pim vrf Campus rp-address 192.168.50.1
```

```
interface GigabitEthernet0/0/0.3007
 encapsulation dot1Q 3007
 vrf forwarding Campus
 ip address 10.50.50.26 255.255.255.252
 ip pim sparse-mode
 no cdp enable
end
```

PIM Peering بين SDA-Fusion-1 و SDA-Fusion-2

SDA-FUSION-1

```
-----
interface Vlan100
 description Muticast_Campus
 vrf forwarding Campus
 ip address 10.40.40.5 255.255.255.252
 ip pim sparse-mode
end
```

SDA-FUSION-2

```
-----
interface GigabitEthernet0/0/2.100
 encapsulation dot1Q 100
 vrf forwarding Campus
 ip address 10.40.40.6 255.255.255.252
 ip pim sparse-mode
end
```

ردصم لابل ةلصت مالا ةهجاو لال عل PIM نل كمت

SDA-FUSION-2

```
-----
interface GigabitEthernet1/0/2
 vrf forwarding Campus
 ip address 10.40.40.2 255.255.255.252
 ip pim sparse-mode
 load-interval 30
 negotiation auto
end
```

مكحت لال ةوتسم ةلسمع

تنرتن إلال ةومجم ةرادل لوكوتورب مامضنا ددعت مالا ثبلا لابلقتسا زاها لسرل، ام ةطقن دنع ثبلا ردصم أدبىو، ةددجم ةومجم ل ثبلا لىقلتل (LHR) ةرلخال ةوطخال هجوم لىل (IGMP) انتللاح لىل (FHR). لىلوالا ةوطخال هجوم لىل ددعت مالا ثبلا لىلقت لاسرل لىل (مدخال) ددعت مالا لىل مكحت لال ةوتسم ةلسمع حرش متىو لىل SDA-Edge-1 هىل LHR و SDA-Fusion-2 هىل FHR نوكت هذهل قفدل لىل ردصم لال أدبىو الوأ قفدل لىل بقتسم لال هىل بلطى لىل ذل وىران لىل لىل لكذ دعب ةومجم لال.

LHR لىل IGMP لىل مامضن الال


```

*Aug 22 21:59:42.601: PIM(2): Check RP 192.168.50.1 into the (*, 239.1.1.1) entry
*Aug 22 21:59:42.601: MRT(2): (*,239.1.1.1), RPF change from /0.0.0.0 to
GigabitEthernet0/0/2.100/10.40.40.5 <<<<<<< RPF Interface is determined
*Aug 22 21:59:42.601: PIM(2): Building Triggered (*,G) Join / (S,G,RP-bit) Prune message for
239.1.1.1
*Aug 22 21:59:42.601: MRT(2): Create (*,239.1.1.1), RPF (GigabitEthernet0/0/2.100, 10.40.40.5,
1/0)
*Aug 22 21:59:42.602: MRT(2): (10.40.40.1,239.1.1.1), RPF install from /0.0.0.0 to
GigabitEthernet1/0/2/0.0.0.0
*Aug 22 21:59:42.602: PIM(2): Adding register encap tunnel (Tunnel0) as forwarding interface of
(10.40.40.1, 239.1.1.1). <<<<<<< Register Tunnel is created
*Aug 22 21:59:42.602: MRT(2): Set the F-flag for (*, 239.1.1.1)
*Aug 22 21:59:42.602: MRT(2): Set the F-flag for (10.40.40.1, 239.1.1.1)
<<<<<<< Register(F) flag is set
*Aug 22 21:59:42.602: MRT(2): Create (10.40.40.1,239.1.1.1), RPF (GigabitEthernet1/0/2, 0.0.0.0,
0/0) <<<<<<< (S,G) is created
*Aug 22 21:59:42.602: MRT(2): Set the T-flag for (10.40.40.1, 239.1.1.1)
<<<<<<< SPT (T) flag is set
*Aug 22 21:59:42.629: PIM(2): Received v2 Join/Prune on GigabitEthernet0/0/2.100 from
10.40.40.5, to us
*Aug 22 21:59:42.629: PIM(2): Join-list: (10.40.40.1/32, 239.1.1.1), S-bit set
<<<<<<< (S,G) join is received
*Aug 22 21:59:42.629: MRT(2): WAVL Insert interface: GigabitEthernet0/0/2.100 in
(10.40.40.1,239.1.1.1) Successful

*Aug 22 21:59:42.630: MRT(2): set min mtu for (10.40.40.1, 239.1.1.1) 18010->1500
*Aug 22 21:59:42.630: MRT(2): Add GigabitEthernet0/0/2.100/239.1.1.1 to the olist of
(10.40.40.1, 239.1.1.1), Forward state - MAC built
*Aug 22 21:59:42.630: PIM(2): Add GigabitEthernet0/0/2.100/10.40.40.5 to (10.40.40.1,
239.1.1.1), Forward state, by PIM SG Join
*Aug 22 21:59:42.630: MRT(2): Add GigabitEthernet0/0/2.100/239.1.1.1 to the olist of
(10.40.40.1, 239.1.1.1), Forward state - MAC built
*Aug 22 21:59:42.630: MRT(2): Set the PIM interest flag for (10.40.40.1, 239.1.1.1)

```

SDA-Fusion2#show ip mroute vrf Campus 239.1.1.1

IP Multicast Routing Table

```

(*, 239.1.1.1), 00:01:17/stopped, RP 192.168.50.1, flags: SPF
Incoming interface: GigabitEthernet0/0/2.100, RPF nbr 10.40.40.5
Outgoing interface list: Null

```

```

(10.40.40.1, 239.1.1.1), 00:01:17/00:02:14, flags: FT
Incoming interface: GigabitEthernet1/0/2, RPF nbr 0.0.0.0 <<<<<<<< RPF neighbor is
0.0.0.0 as the Source is directly connected

```

Outgoing interface list:

```

Gi0/0/0.3007, Forward/Sparse, 00:01:17/00:03:10

```

SDA-Fusion2# SDA-Fusion2#show interface tunnel 0

<<<<<<<< Register Tunnel is created

between FHR and RP

Tunnel0 is up, line protocol is up

Hardware is Tunnel

Description: **Pim Register Tunnel (Encap) for RP 192.168.50.1 on VRF Campus**

Interface is unnumbered. Using address of GigabitEthernet0/0/2.100 (10.40.40.6)

MTU 9972 bytes, BW 100 Kbit/sec, DLY 50000 usec,

reliability 255/255, txload 1/255, rxload 1/255

Encapsulation TUNNEL, loopback not set

Keepalive not set

Tunnel linestate evaluation up

Tunnel source 10.40.40.6 (GigabitEthernet0/0/2.100), destination 192.168.50.1

لإي دؤي ام وهو، ةيرشبل دراوملا ةرادإ نم لجسلا (BORDER-1) يملي لقالا جم انربلا ي قلتيو

ليجستل افقوت اضيأ ي قلت ي امك ،ةيرش بل دراوملا ةرادا وحن لسري (S,G) مامضنا عدب
RP. لعل عي ببط لكشب قفدتلا ي قلت مت يتم - ةيرش بل دراوملا ةرادا هاجت

```
SDA-Border1#debug ip mrouting vrf Campus 239.1.1.1
IP multicast routing debugging is on
```

```
*Aug 18 02:29:05.186: PIM(4): Received v2 Register on Vlan3002 from 10.40.40.6
<<<<<< PIM Register is received from FHR
*Aug 18 02:29:05.186:      for 10.40.40.1, group 239.1.1.1
*Aug 18 02:29:05.187: PIM(4): Adding register decap tunnel (Tunnell1) as accepting interface of
(10.40.40.1, 239.1.1.1). <<<<<< Register tunnel is created
*Aug 18 02:29:05.187: MRT(4): (10.40.40.1,239.1.1.1), RPF install from /0.0.0.0 to
Vlan3002/10.50.50.6
*Aug 18 02:29:05.188: MRT(4): Create (10.40.40.1,239.1.1.1), RPF (Vlan3002, 10.50.50.6, 20/0)
<<<<<< (S,G) is created and RPF is resolved
*Aug 18 02:29:05.188: MRT(4): WAVL Insert LISP interface: LISP0.4099 in (10.40.40.1,239.1.1.1)
Next-hop: 192.168.10.3 Outer-source: 0.0.0.0 Successful
*Aug 18 02:29:05.188: MRT(4): set min mtu for (10.40.40.1, 239.1.1.1) 18010->17892
*Aug 18 02:29:05.189: MRT(4): Add LISP0.4099/192.168.10.3 to the olist of (10.40.40.1,
239.1.1.1), Forward state - MAC not built <<<<<< LISP OIF is inherited from (*,G)
*Aug 18 02:29:05.189: PIM(4): Insert (10.40.40.1,239.1.1.1) join in nbr 10.50.50.6's queue
*Aug 18 02:29:05.189: PIM(4): Building Join/Prune packet for nbr 10.50.50.6
*Aug 18 02:29:05.189: PIM(4): Adding v2 (10.40.40.1/32, 239.1.1.1), S-bit Join
*Aug 18 02:29:05.189: PIM(4): Send v2 join/prune to 10.50.50.6 (Vlan3002)
<<<<<< (S,G) join is sent towards the Source
*Aug 18 02:29:05.272: PIM(4): J/P Transport Attribute, Transport Type: Unicast
*Aug 18 02:29:05.272: PIM(4): Join-list: (*, 239.1.1.1), RPT-bit set, WC-bit set, S-bit set
*Aug 18 02:29:05.272: PIM(4): Update LISP0.4099/192.168.10.3 to (*, 239.1.1.1), Forward state,
by PIM *G Join
*Aug 18 02:29:05.272: MRT(4): Update LISP0.4099/192.168.10.3 in the olist of (*, 239.1.1.1),
Forward state - MAC not built
*Aug 18 02:29:05.272: PIM(4): Prune-list: (10.40.40.1/32, 239.1.1.1) RPT-bit set
*Aug 18 02:29:05.273: PIM(4): Prune LISP0.4099/192.168.10.3 from (10.40.40.1/32, 239.1.1.1)
<<<<<< (S,G) Prune is received from Edg1
*Aug 18 02:29:05.273: MRT(4): Delete LISP0.4099/192.168.10.3 from the olist of (10.40.40.1,
239.1.1.1)
*Aug 18 02:29:05.273: PIM(4): Insert (10.40.40.1,239.1.1.1) prune in nbr 10.50.50.6's queue -
deleted

*Aug 18 02:29:05.273: PIM(4): Building Join/Prune packet for nbr 10.50.50.6
*Aug 18 02:29:05.273: PIM(4): Adding v2 (10.40.40.1/32, 239.1.1.1), S-bit Prune
*Aug 18 02:29:05.273: PIM(4): Send v2 join/prune to 10.50.50.6 (Vlan3002)
*Aug 18 02:29:05.439: PIM(4): J/P Transport Attribute, Transport Type: Unicast

*Aug 18 02:29:07.193: PIM(4): Received v2 Register on Vlan3002 from 10.40.40.6
*Aug 18 02:29:07.193:      for 10.40.40.1, group 239.1.1.1
*Aug 18 02:29:07.194: PIM(4): Send v2 Register-Stop to 10.40.40.6 for 10.40.40.1, group
239.1.1.1
<<<<<<< Register-Stop is sent towards FHR
```

```
SDA-Border1#show ip mroute vrf Campus 239.1.1.1
IP Multicast Routing Table
```

```
(*, 239.1.1.1), 00:51:28/00:02:44, RP 192.168.50.1, flags: S
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    LISP0.4099, 192.168.10.3, Forward/Sparse, 00:51:28/00:02:44

(10.40.40.1, 239.1.1.1), 00:09:37/00:01:24, flags: P
created but Pruned flag is set
  Incoming interface: Vlan3002, RPF nbr 10.50.50.6
interface and RPF neighbor
```



```
SDA-Edge1#show ip cef vrf Campus exact-route 192.168.50.2 10.40.40.1 <<<<<<<<<< CEF
hashing points towards Border-2
192.168.50.2 -> 10.40.40.1 =>IP adj out of GigabitEthernet1/0/11, addr 192.168.23.2
```

```
SDA-Edge1#show ip rpf vrf Campus 10.40.40.1
RPF information for ? (10.40.40.1)
RPF interface: LISP0.4099
RPF neighbor: ? (192.168.10.2) <<<<<<<<<< Hence
SPT Join is sent towards Border-2
RPF route/mask: 0.0.0.0/1
RPF type: unicast ()
Doing distance-preferred lookups across tables
RPF topology: ipv4 multicast base
SDA-Edge1#
```

Edge-1 يلى دېج PIM رواجم ت قىلخ، LISP ةه جاو ربع 2-دج ل وحن ط بر ل ل س ر ا (S,G) ن ا ام ب

```
SDA-Edge1#show ip pim vrf Campus neighbor
PIM Neighbor Table
```

Neighbor Address	Interface	Uptime/Expires	Ver	DR Prio/Mode
192.168.10.2	LISP0.4099	00:07:32/00:01:22	v2	0 / <<<<<<<< Neighbor
192.168.10.1	LISP0.4099	2w1d/00:01:58	v2	0 /

ن ا ب ق ع ت RLOC ح ي ر ص ت ز ن ا ر ط ض ي و ه ، ر ا ي ت multicast ل ل ر م م ت ا ن ا ي ب ل ا ي ف 2- border ن ا ام ب ط بر ل ل ن م ب ا و ج XTR-s ل Uicast ق ف د ت ن م RLOC ل ا ع ب ت ت ي .

```
SDA-Border2#show ip mroute vrf Campus 239.1.1.1
IP Multicast Routing Table
```

```
(* , 239.1.1.1), 00:23:00/stopped, RP 192.168.50.1, flags: SP
Incoming interface: LISP0.4099, RPF nbr 192.168.10.1
Outgoing interface list: Null

(10.40.40.1, 239.1.1.1), 00:12:35/00:02:52, flags: T <<<<<<< SPT flag is set
Incoming interface: Vlan3007, RPF nbr 10.50.50.26 <<<<<<< RPF neighbor is
based on RPF towards the Source - must be a PIM neighbor
Outgoing interface list:
LISP0.4099, 192.168.10.3, Forward/Sparse, 00:12:35/00:02:45 <<<<<<< OIL created from
(S,G) join received from LHR and containing LHR's RLOC info which has to be tracked
```

```
SDA-Border2#show ip mfib vrf Campus 239.1.1.1 10.40.40.1
```

```
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.
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: FS Pkt Count/PS Pkt Count

VRF Campus

(10.40.40.1,239.1.1.1) Flags: HW

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

HW Forwarding: 176/0/122/0, Other: 0/0/0

<<<<<<< Multicast stream is

forwarded in h/w

Vlan3007 Flags: A

LISP0.4099, 192.168.10.3 Flags: F NS

Pkts: 0/0

SDA-Border2#**sh ip mfib vrf Campus 239.1.1.1 10.40.40.1 count**

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

Other counts: Total/RPF failed/Other drops(OIF-null, rate-limit etc)

VRF Campus

6 routes, 2 (*,G)s, 3 (*,G/m)s

Group: 239.1.1.1

Source: 10.40.40.1,

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

HW Forwarding: 182/0/122/0, Other: 0/0/0

<<<<<<< Counter is

incrementing

Totals - Source count: 1, Packet count: 182

Groups: 1, 1.00 average sources per group

SDA-Border2#

ةمچرتل هذه لوج

ةللأل تاي نقتل نم ةومچم مادختساب دن تسمل اذہ Cisco تچرت
ملاعلاء انءمچي فني مدختسمل معدى وتحم مي دقتل ةيرشبل او
امك ةقيقد نوك تنل ةللأل ةمچرت لصف أن ةظحال مچري. ةصاخل مهتبل ب
Cisco يلخت. فرتحم مچرت مامدقي يتل ةيفارتحال ةمچرتل عم لالحل وه
ىل إأمئاد ةوچرلاب ي صؤت وتامچرتل هذه ةقدنع اهتيلوئسم Cisco
Systems (رفوتم طبارل) ي لصلأل يزي لچنل دن تسمل