

اهئاطخأ فاشكتساو mVPN تنارتسك| نيوكت Cisco IOS-XR ىلع اهجالصاو

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عمدقمل

Cisco IOS®XR في نيوكت ةلثمأ مدقويو Extranet mVPN ةكبش دنتسملا اذه فصبي

ةيساسألا تابلطتملا

تابلطتملا

دنتسملا اذهل ةصاخ تابلطتم دجوت ال

عمدختسملا تانوكملا

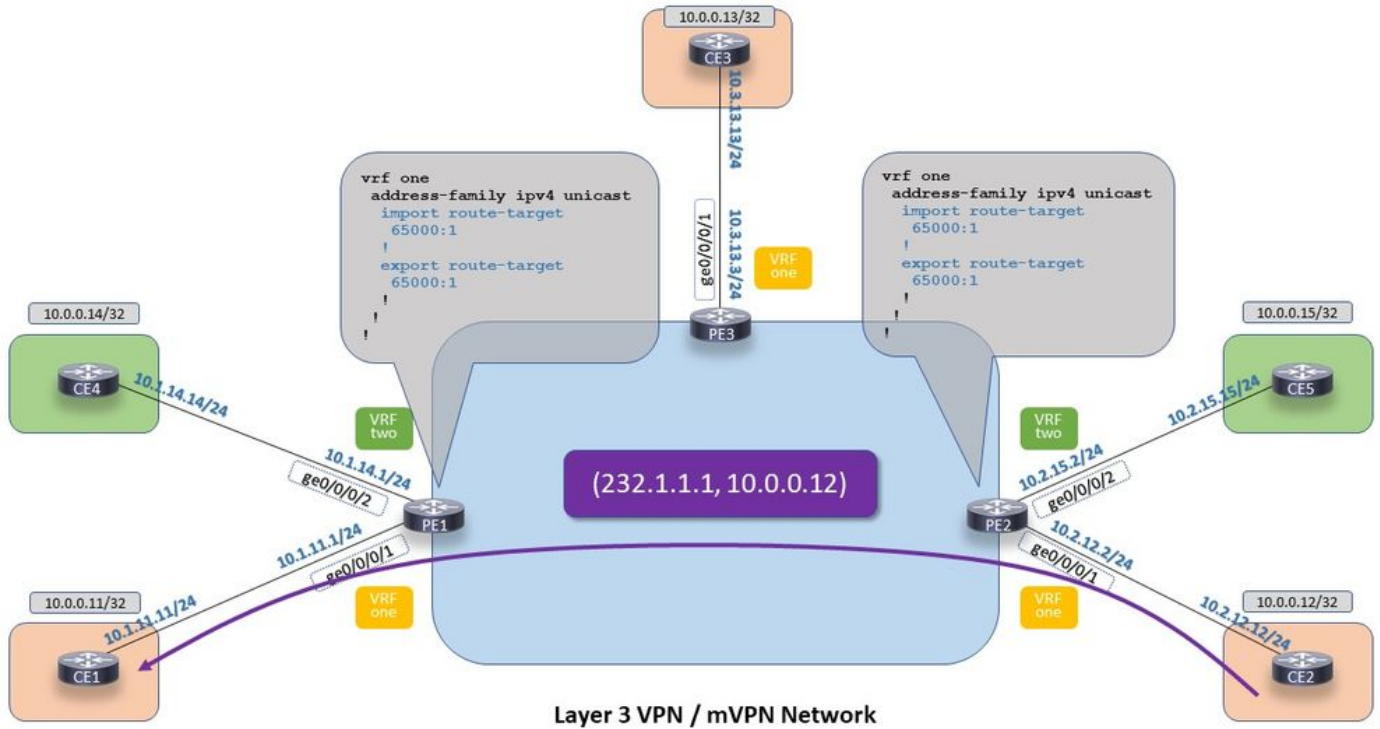
نعم زاهج وأ جم انرب رادصا ىلع رصتقي ال هنكلو، Cisco IOS XR ب صاخ دنتسملا اذه

ةصاخ ةي لمعم ةئيبي في ةدوجوملا ةزهجال نم دنتسملا اذه في ةدراولا تامولعمل عاشنإ مت تناك اذا. (يضارتفا) حوسمم نيوكتب دنتسملا اذه في عمدختسملا ةزهجال عيمج تادب رمأ يال لم تحملا ريثأتلل كمهف نم دكأتف، ليغشتلا ديقتك كبش

mVPN إلی ةمدقم

مدختسي (mVPN) ددتمال شبل نيكمت مت يتي VPN تاكيش يي ف ددتمال شبل معد متي VPN تاكيش اهم مدختست يتي (VRF) يرهظال هيجوتال ةداع او هيجوتال ميهافم سفن mVPN يي دخال شبلل 3 ةقبطلل.

(0 رادصال مادختساب) VRF تاكيش نيي ددتمال شبل هيجوت ةداع ةروصلال هذه ضرعت



Intranet MVRF ل ددتمال شبل ةمزح قفدت: IOS-XR لى VPN Extranet ةكبش

Intranet MVRF ل ددتمال شبل ةمزح قفدت 1. ةروصلال

VRF multicast لى اذه قبطي (RPF) يسكعل راسملا هيجوت ةداع لى ددتمال شبل دمعت نأ ةجاح كانه، VRF رخأ لى VRF دحاو نم multicast قفدت in order to نأ ينعي اذه. اضيأ رورم ةكح نوكي نأ بجي، كذلذ. VRF رخأ لى رورم ةكح multicast لى رصم لى VRF دحاو لى قلتى PE. هجوم لى لى بقتسم لى صاخ لى VRF هيجوت لودج لى لى احاتم ددتمال شبل رصم راسم هيجوت ةداع لى قاي س يي ف (RPF) يسكعل راسملا هيجوت ةداع لى حاجن نامضل ناتقيرط كانه (VRF) يسكعل راسملا.

1. رصم لى VRF دحاو نم قيرطل نأ ينعي اذه. لى (RIB) هيجوتال تامولعم ةداع دنست 1. مادختساب كلذ ققحتسي و. VRF لى بقتسم لى - VRF رخأ لى يي برس يي نأ احاتي VRF (RT) راسم لى ددتمال فاده لى ري دصت لى داريتسال ةفيظو.
2. يسكعل راسملا هيجوت ةداع لى حاجن ينعي اذه و. لى ةدنتسم لى (RPL) راسم لى جهن ةغل لى (RPF) يسكعل راسملا هيجوت ةداع لى بجت يتي لى راسم لى سايس لى صفب (RPF) (VRF) لى كلسال لى ددرت لى نم رخأ راطا يي ف) ةهجاو لى و (VRF) لى كلسال لى ددرت لى مادختسا.

ديعب PE هجوم نم VPN راسم PE هجوم لى قلت اذ. VPN راسم نع نال ةداع لى PE هجوم موقى ال اذ ام مهى ال. ايلحم 2 لى VRF 1 لى VRF نم VPN ةئداب ري دصت هنكمي الف، 1 لى VRF لى هدرتسا و PE هجوم لى لى حم 2 لى VRF 1 لى VRF نم راسم لى فده لى راسم نم داريتسا راسم كانه ناك. ثدحي ال 2 لى VRF لى داريتسال نإف، ال ما اذه.

هيجوت ةداع لى امئاد بقار (RPF) يسكعل راسملا هيجوت ةداع لى حاجن ددتمال شبل قلع تي

ةداعإ نوكت نأ بجي ،تنارتسكإ ةكبش ل ددعتم ل ثبلا لمعي يكل . (RPF) يسكعل راسم ل
 كذل . VRF رصم ل ل لبقتسم ل نم ،نخأ ل VRF فلم نم (RPF) يسكعل راسم ل هجوت
 VRF رصم ل ل VRF back to لبقتسم ل ي ف رصم ل ل قيرط unicast تنك يغبني كانه

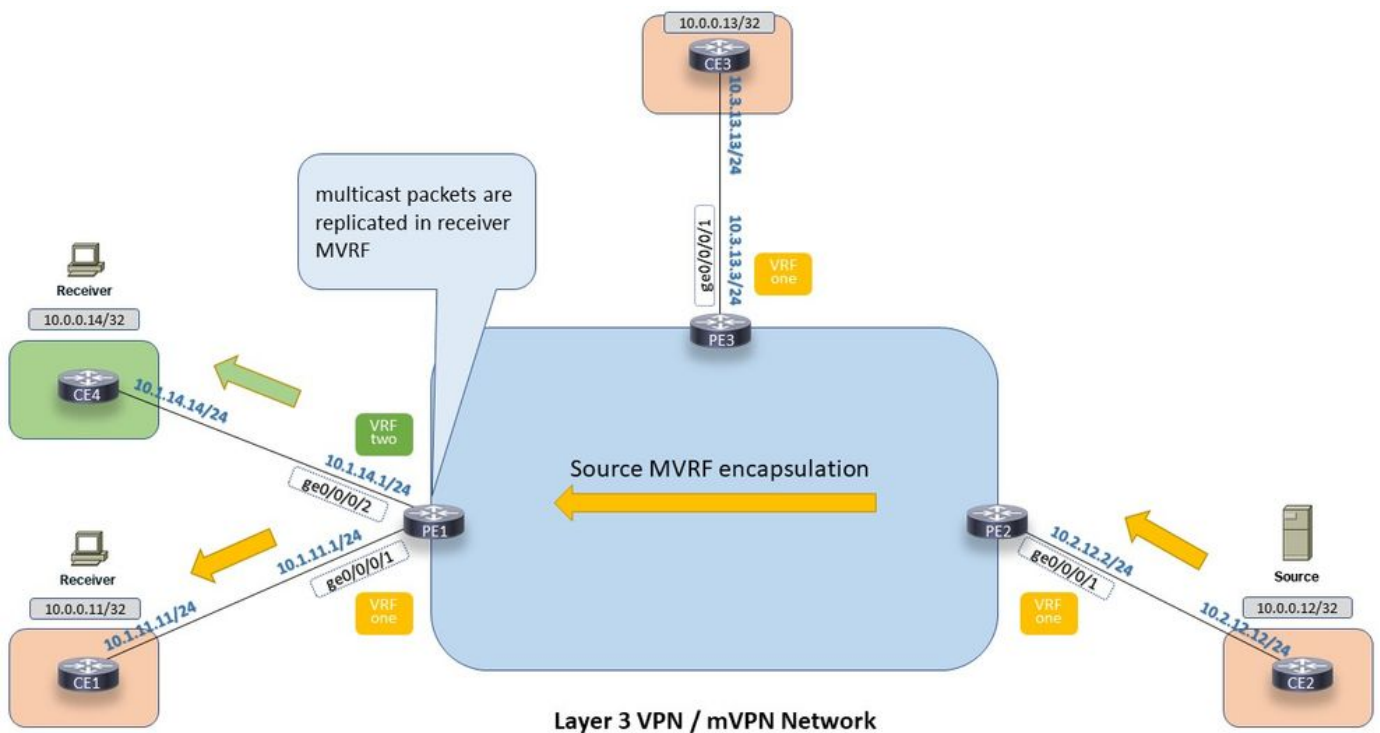
ةامسم ل ددعتم ل ثبلا عيزوت ةرئش : LMDT

طاطخ

قيرقحتل ني طاطخم (-XE) IOS مدق ،يضام ل ي ف . mVPN تنارتسكإ اضيأ Cisco IOS XE معدي
 س فنب تنارتسكإ IOS-XR معدي . 2 رايخل او 1 رايخل اب اه ل راشي و . mVPN ةجراخل ةكبش ل ل
 تاطاطخم ل .

زاهج ل ل رصم ل ل (MVRF) ددعتم ل ثبلا يرهاظ ل هجوت ل ةداعإ و هجوت ل رفوتي : 1 رايخل
 multicast ل ل ل دي دخت جاحسم PE لخدم ل ل (VRF رصم) ل ل نأ ينع ي اذه . MVRF ل لبقتسم ل ل
 دي دخت جاحسم بسانم ل ل عم دي دخت جاحسم PE جرخم ل ل تل كش اضيأ رورم ةكح

1. رايخل ل ددعتم ل ثبلا ةمزح قفدت ضرعي وه و . 2. ةروصل ل ل رظنا



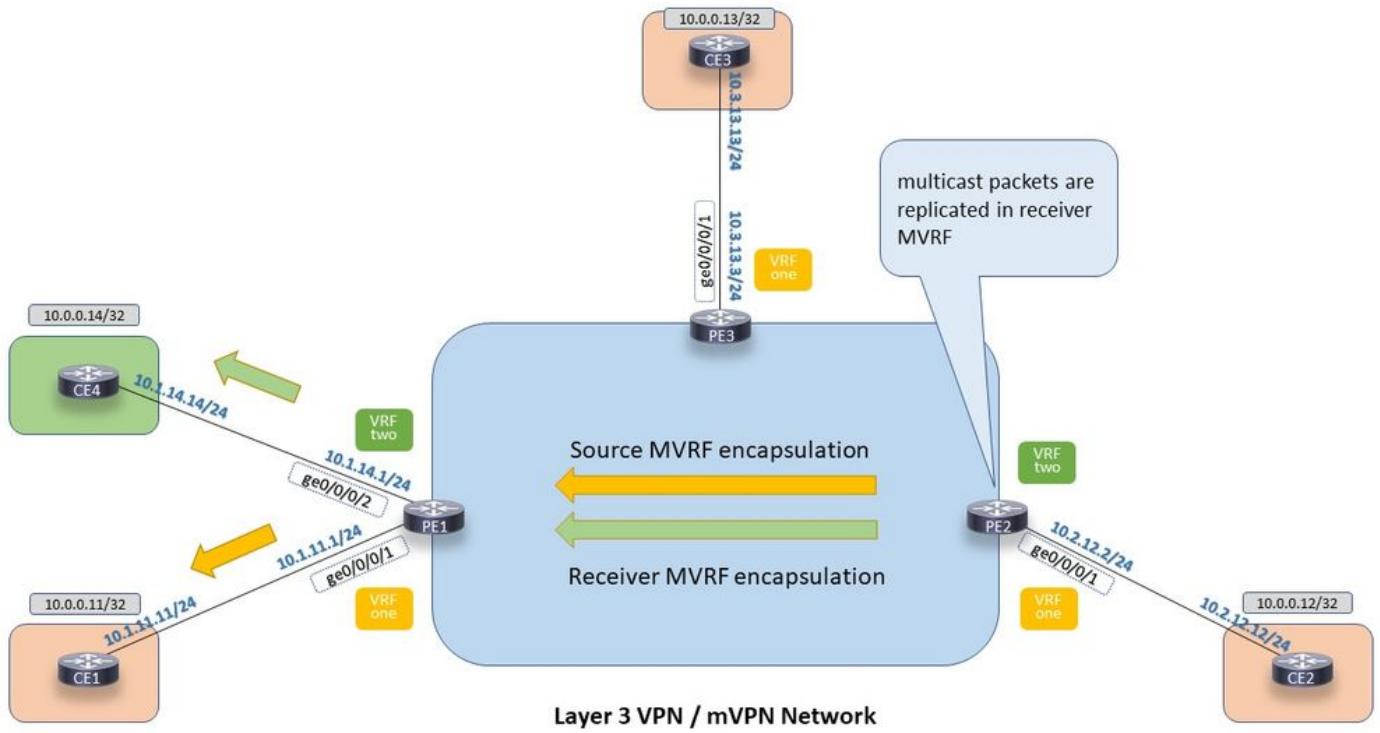
1 تنارتسكإ رايخل ددعتم ل ثبلا ةمزح قفدت : IOS-XR ل ل تنارتسكإ VPN ةكبش

1. Extranet رايخل ل ددعتم ل ثبلا ةمزح قفدت . 2. ةروصل ل

MVRF رصم ل ل سبب ةي لمع مدختست و ةيساسأل ةكبش ل ل ددعتم ل ثبلا رورم ةكح ربعت

(VRF لبقتسم) ل ل نأ ينع ي اذه . MVRF رصم ل ل ل VRF لبقتسم ل ل نوكي : 2 رايخل
 جاحسم PE لخدم ل ل تل كش اضيأ رورم ةكح multicast ل ل ل دي دخت جاحسم PE جرخم ل ل
 دي دخت جاحسم بسانم ل ل عم دي دخت

2. رايخل ل ددعتم ل ثبلا ةمزح قفدت ضرعي وه و . 3. ةروصل ل ل رظنا



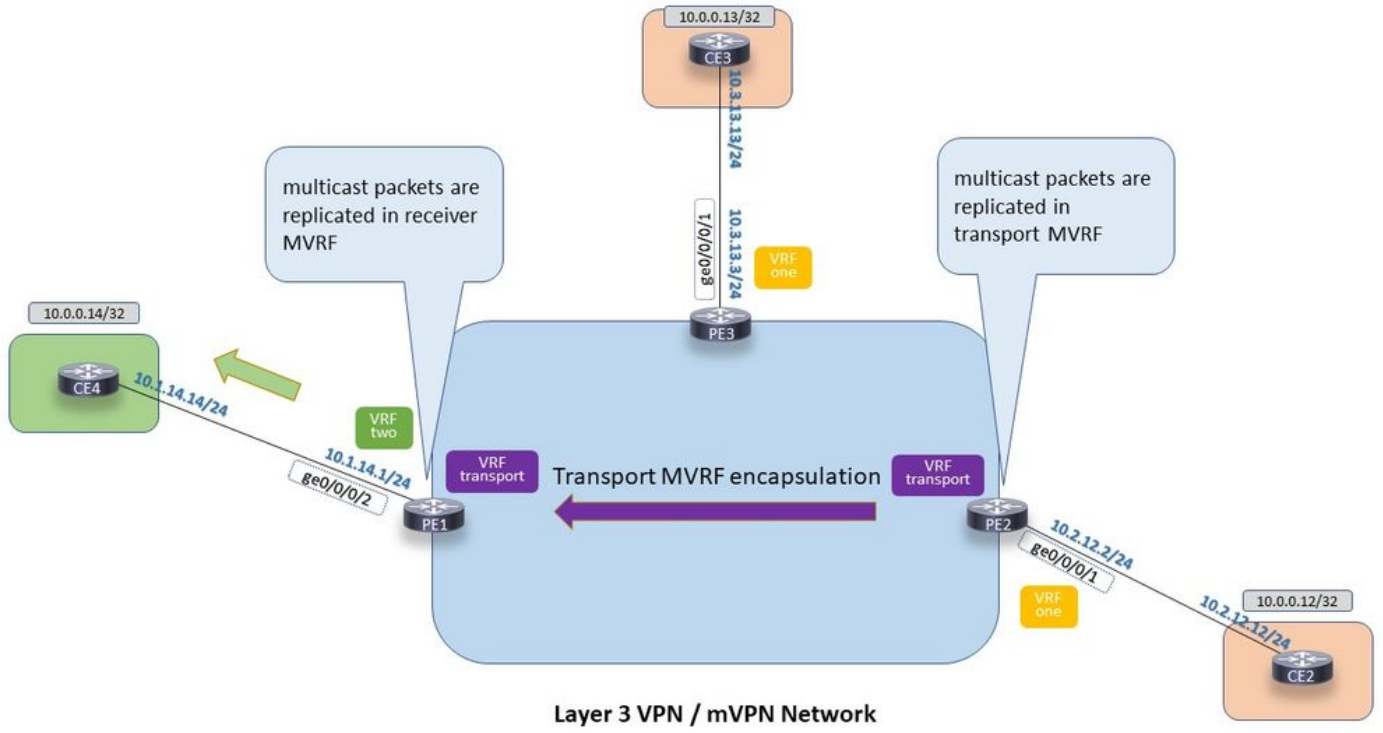
2 تنارتسك رايجل ددتمال شبلا ةمزح قفدت: IOS-XR ىل تنارتسك VPN ةكبش

Extranet 2. رايجلل ددتمال شبلا ةمزح قفدت. 3 ةروصلال

MVRF ردمال ةلسبك ةي لمع مدختست و ةساسأل ةكبشال ددتمال شبلا رورم ةكر ربعت قاطنلال ضرع ةيمك فعض مدختست ددتمال شبلا رورم ةكر نإف ، كذلذل MVRF ملتسمل او ةيزكرمال ةكبشلال يف.

2. راخو 1 راخ ني ب نيجه ل، ثلاث راخ كانه

ةكر multicast ل دي دخت جاحسم PE لخدمال جرختسي. ل قنلل MVRF مادختسإ متي: 3 راخلال شبلا رورم ةكر جاحتساب Egress PE هجوم موقوي. VRF ل قنلال ىل VRF ردمال نم رورم ةهجاو تاهجاو ىل MVRF ل قنلال اذ ه يوتحي ال. VRF لبقتسملال ىل VRF ل قنلال نم ددتمال هب ةنرتقمال ليملال



ثلاث VRF مداخلتساب Extranet ل ددتم ال ثبل اة مزح ق فدت : IOS-XR ل VPN Extranet ةكبش ،
 ل قنل ل VRF

VRF ل قنل ل ، ثلاث VRF لمعتسي تانارتسك ل ق فدت طبر multicast . 4 ةروصل

معدل اىل ةماع ةرظن

1 رايخال معد

RPL لىل مئاق معد لىل فىرعتل ا فلام ة فاك يوتحت

فلم) ددتم ال ثبل ل ة ساس ال ا ةرچش ل لوكوتورب مدختست ي تال فىرعتل ا فلام معدت
 RIB لىل مئاق ل ل mVPN تانارتسك ا طقف (0 و 3 و 11 فىرعتل ا

2 رايخال معد

ءانثتساب ، RIB لىل مئاق ل معدل او RPL لىل مئاق ل معدل ا فافى صوتل ا عىم معدت
 2 فافى صوت ل ا ثم ل لىل ع) BGP عم لىم ل ل ا رارش ل لاسر ا مدختست ي تال فافى صوتل ا
 اذ 2.2 ل ا ثم ل ل حضوي . ةصاخ ة قىرطب طقف 2 رايخال معدت ة رىخ ال ا هذه . (و 11 و

ل ل خاد mVPN فافى صوت نىوكت : ةفلتخ م ل ا فافى صوتل ل نىوكت و ةماع ةرظن نع انه شحبا
Cisco IOS-XR

ةلثم ال

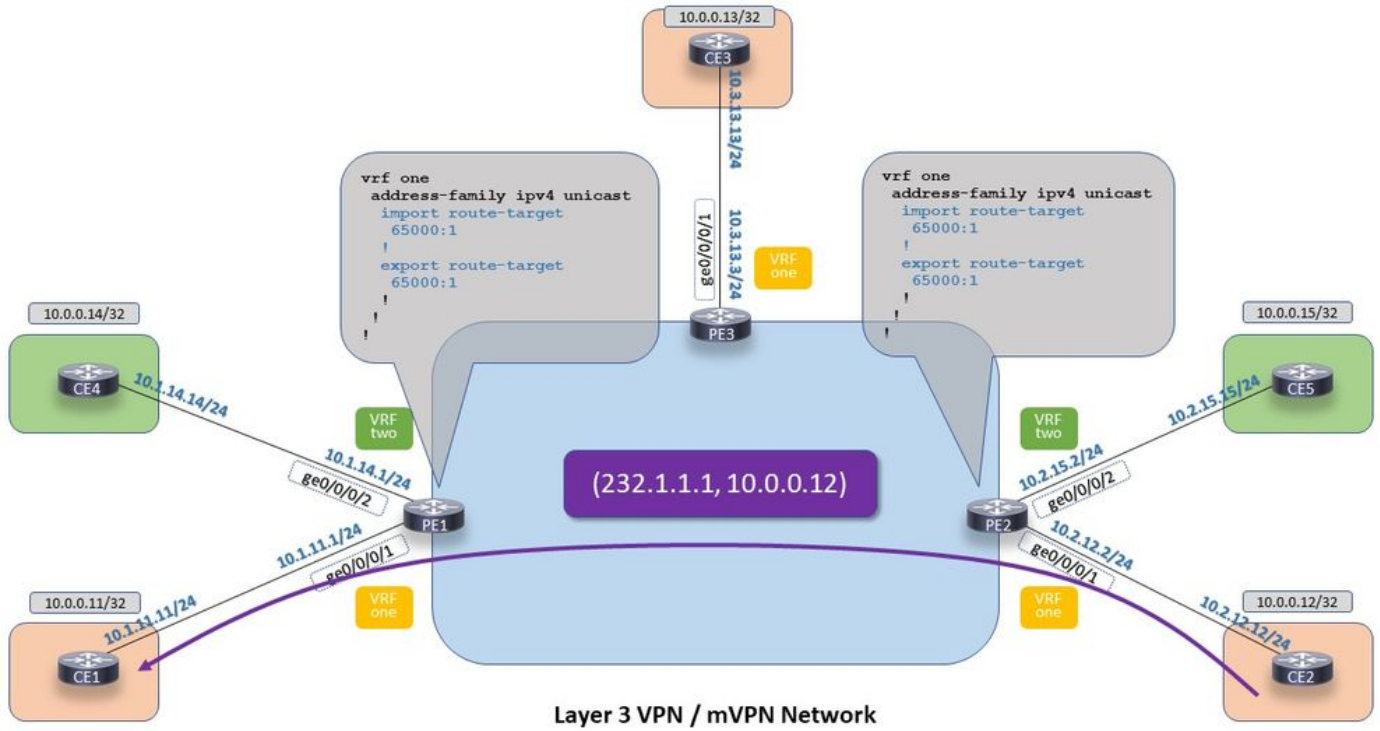
VRF ددرت ي ف رفوتت . (MRIB) ددتم ال ثبل ل RIB تال ا خ د لىل ع Extranet و EX تامال ع طحال
 اتاه اول لىل ع و ، ددتم ال ثبل ا تال ا خ د لىل ع و ، ل بقتسم ل او ر دصم ل ا

0 فىرعتل ا فلم

عزل الـ VRF في PIM لدعم الـ ثبلة تاراشا عم، ةضارفة الـ MDT ةزيم 0 في رعة الـ فلم مدخسة (VRF قايس) ةشغلة الـ ولس الـ

(3 يلة الـ و) 2 و 1 راي الـ في صولة الـ اذ معة

دحاو VRF الـ دحاو VRF نم، VRF تكة بش نيب ددعة الـ ثبلة رورم ةكح 5 ةروصلة صرعة



Intranet MVRF لدعم الـ ثبلة ةمزح قفدة - 0 في رعة الـ فلم IOS-XR على VPN Extranet ةكبة بش

MVRF تنرنة الـ ةكبة بش لدعم الـ ثبلة ةمزح قفدة - 0 ةروصلة في رعة الـ فلم

0. في رعة الـ فلم لـ لكشة

```
multicast-routing
vrf one
address-family ipv4
interface GigabitEthernet0/0/0/1
enable
!
mdt source Loopback0
mdt default ipv4 239.1.1.1
!
!
```

```
router pim
vrf one
address-family ipv4
ssm range SSM-range-vrf-one
!
!
```

هجة ةداع ططخم رمأ بلطتي الـ يذلة ديحولة في رعة الـ فلم وه 0 في رعة الـ فلم نأ طحال

يَسْكَعْ لَ رَاسْمَلَا (RPF).

فِي رِعْتَلَا فَلَ مَل (RPF) يَسْكَعْ لَ رَاسْمَلَا هِي جَوْتُ ةِدَاعِ طَطَخْمِ رَمَأُ نِي وَكْتُ كُنْ كَمِي، كَلْ ذُنْمِ الِ دَبْ 0.

```
router pim
vrf one
address-family ipv4
  rpf topology route-policy profile-0
  ssm range SSM-range-vrf-one
!
```

```
route-policy profile-0
set core-tree pim-default
end-policy
!
```

يَلِي امَك 1 PE جَرَحْمِ يَلِ ع MRIB لَخْدَا جَارِخَا وَدَبِي:

```
RP/0/0/CPU0:PE1#show mrib vrf one route 232.1.1.1 10.0.0.12
```

```
IP Multicast Routing Information Base
Entry flags: L - Domain-Local Source, E - External Source to the Domain,
C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN
Interface flags: F - Forward, A - Accept, IC - Internal Copy,
NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
LD - Local Disinterest, DI - Decapsulation Interface
EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface
```

```
(10.0.0.12,232.1.1.1) RPF nbr: 10.0.0.2 Flags: RPF
Up: 01:15:06
Incoming Interface List
  mdtone Flags: A MI, Up: 01:06:10
Outgoing Interface List
  GigabitEthernet0/0/0/1 Flags: F NS, Up: 01:15:06
```

دَدَعْتَمَلَا ثَبَلَا عِي زَوْتُ ةِرْجَشِ هُو، مِ دْتُونِ يَلِ (RPF) يَسْكَعْ لَ رَاسْمَلَا هِي جَوْتُ ةِدَاعِ رِي شَت (MDT) نَمِ دَحَاوَلِ VRF.

```
RP/0/0/CPU0:PE1#show pim vrf one rpf 10.0.0.12
Table: IPv4-Unicast-default
* 10.0.0.12/32 [200/0]
  via mdtone with rpf neighbor 10.0.0.2
  Connector: 65000:1002:10.0.0.2, Nexthop: 10.0.0.2
```

```
RP/0/0/CPU0:PE2#show mrib vrf one route 232.1.1.1 10.0.0.12
```

```
IP Multicast Routing Information Base
Entry flags: L - Domain-Local Source, E - External Source to the Domain,
```

C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
 IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
 MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
 CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
 MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
 MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN

Interface flags: F - Forward, A - Accept, IC - Internal Copy,
 NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
 II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
 LD - Local Disinterest, DI - Decapsulation Interface
 EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
 EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
 MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
 IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

```
(10.0.0.12,232.1.1.1) RPF nbr: 10.2.12.12 Flags: RPF
Up: 01:14:26
Incoming Interface List
  GigabitEthernet0/0/0/1 Flags: A, Up: 01:14:26
Outgoing Interface List
  mdtone Flags: F MI, Up: 01:06:51
```

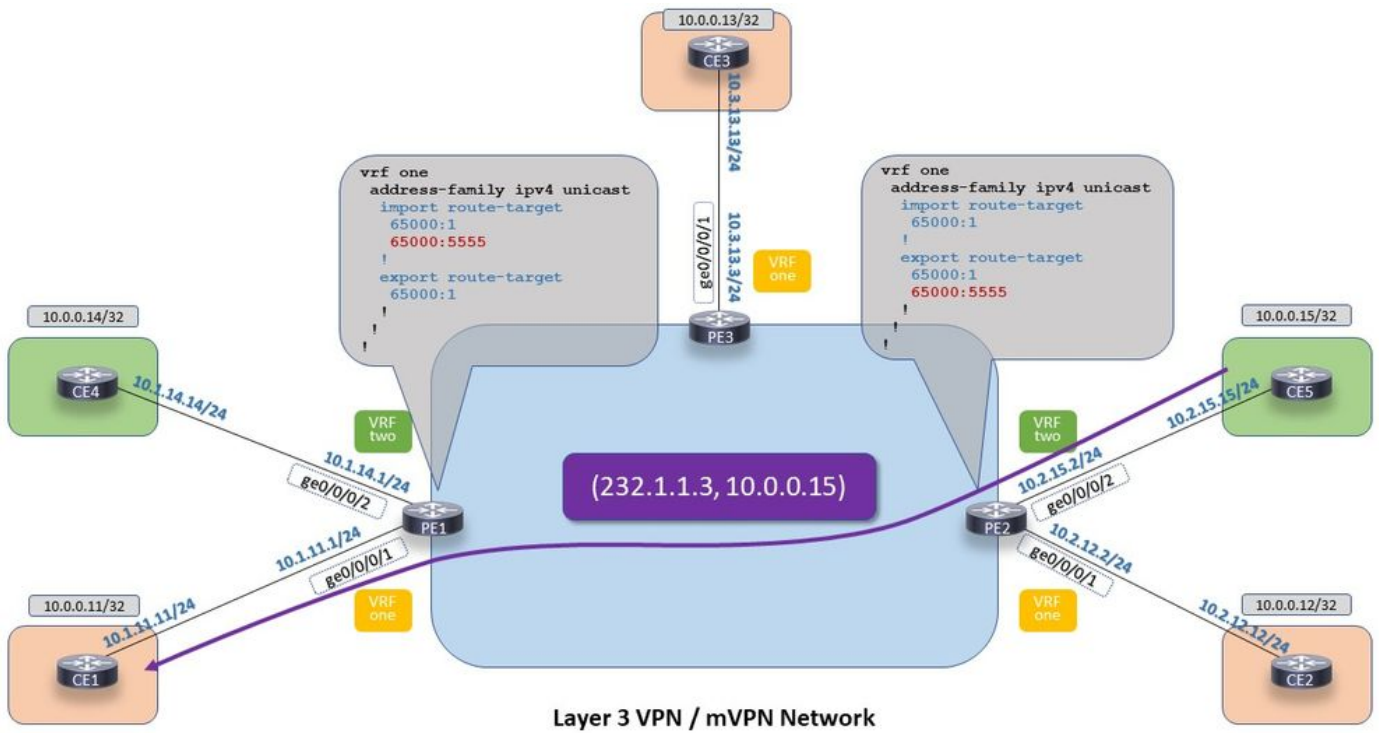
```
RP/0/0/CPU0:PE2#show pim vrf one rpf 10.0.0.12
```

Table: IPv4-Unicast-default

```
* 10.0.0.12/32 [20/0]
  via GigabitEthernet0/0/0/1 with rpf neighbor 10.2.12.12
```

MVRF لبققتسم ال اىل ع MVRF رصم ال 1. راىخ ال 1.1 لاثم

ي ف ادوجوم رصم ال اىل اىل راسم ال نو كى نأ ب جى. RIB لىل ع مئاق ال 1 راىخ ال 0 فى رعت ال فلم مع دى لبققتسم ال صاىخ ال VRF.



زاهج لىل ع MVRF رصم ال دجوى 1 راىخ ال - 0 فى رعت ال فلم: IOS-XR لىل ع VPN Extranet ةكبش MVRF لابققتسم ال

MVRF لبققتسم ال اىل ع MVRF رصم ال 1. راىخ - 0 فى صوت 6. ةروصل ال

ردصملا وهو، VRF 2 نم ردصملا راسم نع نلعي، لخدملا نم PE، PE2 هجوم نأ 6 ةروصلال حضوت اذه راسملا فده عم تاراسملا جرملا، PE1، PE هجوم دروتسي. route-target 65000:555 عم، VRF لبق تسملا، دحاو VRF ددرت لىل.

0. فيرعتلا فلم VRF 2 و VRF 1 نم لك مدختسي

```
multicast-routing
address-family ipv4
interface Loopback0
  enable
!
interface GigabitEthernet0/0/0/0
  enable
!
!
vrf one
address-family ipv4
interface GigabitEthernet0/0/0/1
  enable
!
mdt source Loopback0
mdt default ipv4 239.1.1.1
!
!
vrf two
address-family ipv4
interface GigabitEthernet0/0/0/2
  enable
!
mdt source Loopback0
mdt default ipv4 239.1.1.2
!

router pim
address-family ipv4
ssm range SSM-range
!
vrf one
address-family ipv4
ssm range SSM-range-vrf-one
!
!
vrf two
address-family ipv4
ssm range SSM-range-vrf-two
!
!
!
```

Egress PE Router، PE1، اذه route-target 6500:555 عم راسملا اذه، Ingress PE Router، PE2، عم route-target 65000:555 ردي

```
RP/0/0/CPU0:PE1#show mrib vrf one route 232.1.1.3 10.0.0.15
```

```
IP Multicast Routing Information Base
Entry flags: L - Domain-Local Source, E - External Source to the Domain,
C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
```

MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN
Interface flags: F - Forward, A - Accept, IC - Internal Copy,
NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
LD - Local Disinterest, DI - Decapsulation Interface
EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

(10.0.0.15,232.1.1.3) RPF TID: 0xe0000011 Flags: RPF EX

Up: 01:36:16

Outgoing Interface List

GigabitEthernet0/0/0/1 Flags: F NS, Up: 01:36:16

RP/0/0/CPU0:PE1#show pim vrf one rpf 10.0.0.15

Table: IPv4-Unicast-default

* 10.0.0.15/32 [200/0]

via VRF:two with rpf neighbor 10.0.0.2

Connector: 65000:2002:10.0.0.2, Nexthop: 10.0.0.2

نم نينثا في ف ثحت نأ بجي (RPF) ي سكال راسم ال هي جوت ةداعا نأ، PE1، PE، ه جوم فرعي فيك VRF؟

اذه لثم دحاو VRF في BGP VPN4 ل داحال األ ثبل راسم ودبي:

RP/0/0/CPU0:PE1#show bgp vpnv4 unicast vrf one 10.0.0.15/32

BGP routing table entry for 10.0.0.15/32, Route Distinguisher: 65000:1001

Versions:

Process	bRIB/RIB	SendTblVer
---------	----------	------------

Speaker	65	65
---------	----	----

Last Modified: Nov 21 19:09:22.469 for 00:14:33

Paths: (1 available, best #1)

Not advertised to any peer

Path #1: Received by speaker 0

Not advertised to any peer

65005

10.0.0.2 (metric 3) from 10.0.0.4 (10.0.0.2)

Received Label 24006

Origin IGP, metric 0, localpref 100, valid, internal, best, group-best, import-candidate, imported

Received Path ID 0, Local Path ID 1, version 65

Extended community: RT:65000:2 RT:65000:5555

Originator: 10.0.0.2, Cluster list: 10.0.0.4

Connector: type: 1, Value:65000:2002:10.0.0.2

Source AFI: VPNv4 Unicast, Source VRF: default, Source Route Distinguisher: 65000:2002

ثبل الة عومجم ناو نع لىل PE1 فرعتي VRF. ي كلسال ددرت ب راسم ال اذه زي مم طبر متي BGP Address-family لودج في RD نع ثحب لال خ نم اذه (راسم ال زي مت) ل RD ل مدخت س م ال ددعت م ال family IPv4 MDT.

RP/0/0/CPU0:PE1#show bgp ipv4 mdt rd 65000:2002 10.0.0.2

BGP routing table entry for 10.0.0.2/96, Route Distinguisher: 65000:2002

Versions:

Process	bRIB/RIB	SendTblVer
---------	----------	------------

Speaker	6	6
---------	---	---

Last Modified: Nov 21 17:26:11.469 for 01:58:30

Paths: (1 available, best #1)

Not advertised to any peer

Path #1: Received by speaker 0

Not advertised to any peer

Local

10.0.0.2 (metric 3) from 10.0.0.4 (10.0.0.2)

Origin IGP, localpref 100, valid, internal, best, group-best

Received Path ID 0, Local Path ID 1, version 6

Originator: 10.0.0.2, Cluster list: 10.0.0.4

MDT group address: 239.1.1.2

لك يوتحي. ناناثا VRF لبق نم مدختسم الة وعومجم ال ناونع وه 239.1.1.2 اذه وعومجم ال ناونع
ة وعومجم ناونعك اهنويوكت مت يت الة وعومجم ال هذه يلع، PE1 هوجوم ال اذه نمضتتي يذلو او، PE هوجوم
MDT ل يضا رتفال VRF 2.

RP/0/0/CPU0:PE1#show mrib vrf two route 232.1.1.3 10.0.0.15

IP Multicast Routing Information Base

Entry flags: L - Domain-Local Source, E - External Source to the Domain,

C - Directly-Connected Check, S - Signal, IA - Inherit Accept,

IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,

MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle

CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet

MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary

MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN

Interface flags: F - Forward, A - Accept, IC - Internal Copy,

NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,

II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,

LD - Local Disinterest, DI - Decapsulation Interface

EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,

EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,

MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface

IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

(10.0.0.15,232.1.1.3) RPF nbr: 10.0.0.2 Flags: RPF EX

Up: 00:05:11

Incoming Interface List

mdttwo Flags: A MI, Up: 00:05:11

Outgoing Interface List

GigabitEthernet0/0/0/1 Flags: F NS EX, Up 00:05:11

RP/0/0/CPU0:PE1#show pim vrf two rpf 10.0.0.15

Table: IPv4-Unicast-default

* 10.0.0.15/32 [200/0]

via mdttwo with rpf neighbor 10.0.0.2

Connector: 65000:2002:10.0.0.2, Nexthop: 10.0.0.2

زكرم ال زاتحي ناناثا VRF نم MDT تاي طعم دحاو وأ ريصقت ال رورم ة كرح لمعتسي multicast ال
ة كپش.

RP/0/0/CPU0:PE2#show mrib vrf two route 232.1.1.3 10.0.0.15

IP Multicast Routing Information Base

Entry flags: L - Domain-Local Source, E - External Source to the Domain,

C - Directly-Connected Check, S - Signal, IA - Inherit Accept,

IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,

MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle

CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet

MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary

MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN

Interface flags: F - Forward, A - Accept, IC - Internal Copy,

NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,

II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,

LD - Local Disinterest, DI - Decapsulation Interface

EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,

EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
 MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
 IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

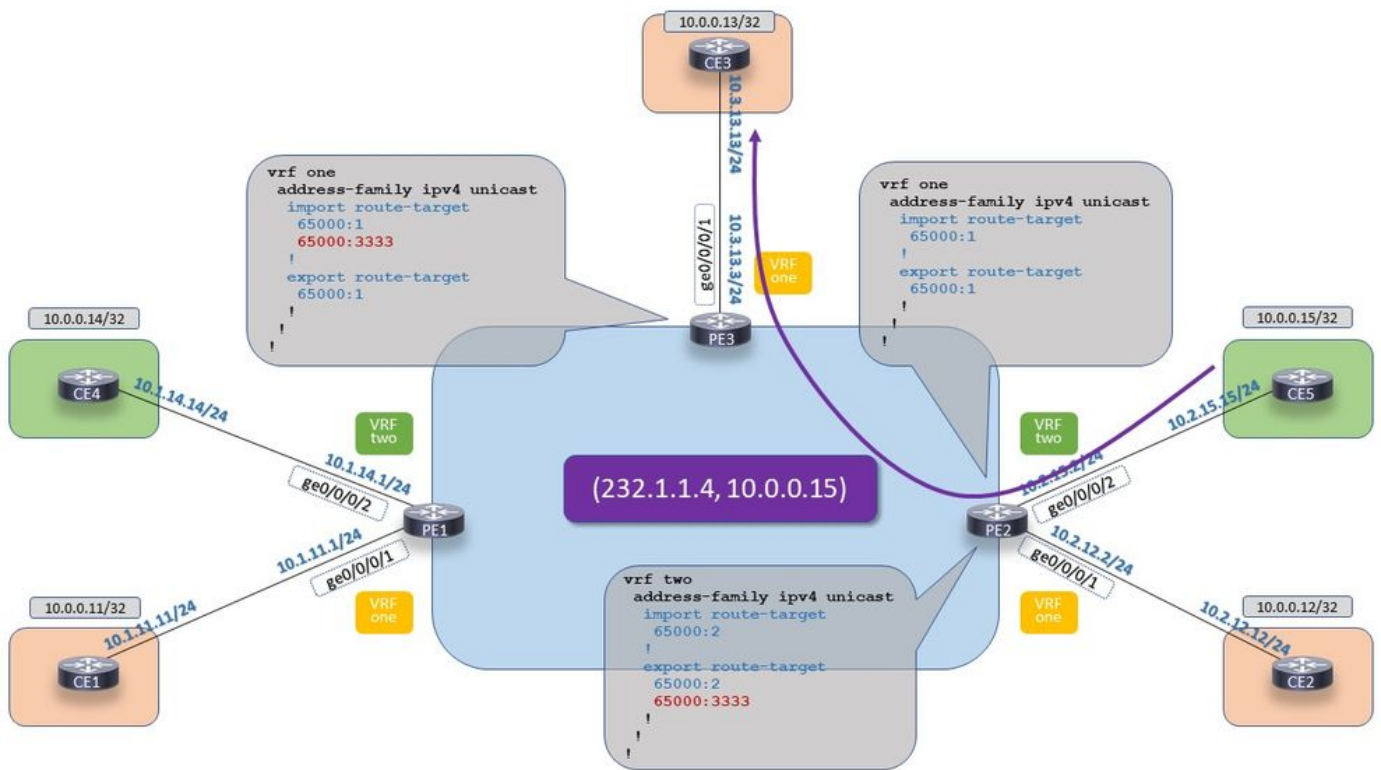
```
(10.0.0.15,232.1.1.3) RPF nbr: 10.2.15.15 Flags: RPF
Up: 00:02:49
Incoming Interface List
  GigabitEthernet0/0/0/2 Flags: A, Up: 00:02:49
Outgoing Interface List
  mdttwo Flags: F MI, Up: 00:02:49
```

ادجوم VRF One ناك اذ ص VRF One، PE، PE2، ل خدم ص (10.0.0.15، 232.1.1.3) ل ة لاج دجوت ال
 لخدم ال PE، PE2 ل هوم ص ل ع ص ح .

RPL ل ة دنت س ص ال ة ق رط ال ه RIB ل ة دنت س ص ال ة ق رط ال ة ل د ب ال ة ق رط ال
 ل ا ث م ل 2.1 ل ا ث م ل ع جار . (RPF) ل ع ك ع ال راس م ال ه ل جوت ة دا ع ر ل ر ل ة س ال ة س ا ل س ا
 ل ع ال راس م ال ه ل جوت ة دا ع ر ل ر ل ة س ال ة س ا ل س ل ع ال ه .

MVRF ر د ص م ال ل ع MVRF ل ب ق ت س م ال 2 ر ا ل خ ال 1.2 ل ا ث م

ة ن و ن ا ق ل ال ة ل و و س م ال ل ع م ئ ا ق ل ا ج ه ن ل و ه ا ذ ه .



MVRF ر د ص م ال ل ع MVRF ل ب ق ت س م ال 2 ر ا ل خ ال - 0 ل ع ر ل ل ا ف ل م ل ل ة ص ا ل ع VPN Extranet

MVRF ر د ص م ال ل ع MVRF ل ب ق ت س م ال 2 ر ا ل خ - 0 ص ص ل ص ل ف ل م 7 ة ر و ص

د ر ت ل ال ل ا (VRF) ل ك ل س ال ل د ر ت ل ل م ن ل ر ا س م ا ر ل ت س ال ف د ه ل - ر ا س م ال م ا د خ ت س ا م ت ل
 PE، PE3، ل ب ق ت س م ال ل ع د ح ا و (VRF) ل ك ل س ال ل

ل ال ر ل ش ل (VRF ل ب ق ت س م) د ح ا و VRF ل ف ل ك ل ت ا ت س ا ل ن ك ا س ق ر ط ، PE2، PE، ل د م ال ج ا ت ح ل
 PE2، ل د د خ ت ج ا ح س م PE ل د م ال ل ع RPF ل ا ج ج ن ل ص ت ح (VRF ر د ص م) ن ا ن ا ل VRF

PE3: ز ا ر ط م د ا خ ل

```
vrf one
address-family ipv4 unicast
import route-target
65000:1
65000:3333
!
export route-target
65000:1
!
```

PE2 زارط مداخل

```
vrf one
address-family ipv4 unicast
import route-target
65000:1
!
export route-target
65000:1
!
```

```
vrf two
address-family ipv4 unicast
import route-target
65000:2
!
export route-target
65000:2
65000:3333
```

```
router static
vrf one
address-family ipv4 unicast
10.0.0.15/32 vrf two GigabitEthernet0/0/0/2 10.2.15.15
!
```

ردصم ل، VRF 2 يف راسم ل اذه نلعي . BGP لى ل تباث ل راسم ل اذه ع يزوت ةداع ل ةجاح دجوت ال يف ، PE1، PE، هجوم ةطساوب هنع نالعال م تي هنأل راسم ل اذه ، PE3، PE، هجوم لبق تسي . VRF راسم ل مزلي . PE3 لى ل دحاو VRF لى ل هداري تسي م تي يذلا 65000:3333 هجوم هجوم عم VRF 2 لخدم ل دنع دوجوم ل PE، PE2 هجوم لى ل (RPF) يسي كعل راسم ل هيجوت ةداع ل حان ل تباث ل .

ةيساس ال ةكبش ل روبعل دحاو VRF نم MDT ددعت م ل ثبل رورم ةكرح مدختست .

```
RP/0/0/CPU0:PE3#show mrib vrf one route 232.1.1.4 10.0.0.15
```

```
IP Multicast Routing Information Base
Entry flags: L - Domain-Local Source, E - External Source to the Domain,
C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN
Interface flags: F - Forward, A - Accept, IC - Internal Copy,
NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
LD - Local Disinterest, DI - Decapsulation Interface
EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
```

IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

(10.0.0.15,232.1.1.4) RPF nbr: 10.0.0.2 Flags: RPF
Up: 14:54:08

Incoming Interface List

mdtone Flags: A MI, Up: 00:16:47

Outgoing Interface List

GigabitEthernet0/0/0/1 Flags: F NS, Up: 14:54:08

RP/0/0/CPU0:PE3#show route vrf one 10.0.0.15/32

Routing entry for 10.0.0.15/32

Known via "bgp 65000", distance 200, metric 0, type internal

Installed Nov 22 08:02:19.808 for 00:25:24

Routing Descriptor Blocks

10.0.0.2, from 10.0.0.4

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

No advertising protos.

RP/0/0/CPU0:PE3#show bgp vpnv4 unicast vrf one 10.0.0.15/32

BGP routing table entry for 10.0.0.15/32, Route Distinguisher: 65000:1003

Versions:

Process	bRIB/RIB	SendTblVer
---------	----------	------------

Speaker	51	51
---------	----	----

Last Modified: Nov 22 09:24:32.318 for 00:02:38

Paths: (1 available, best #1)

Not advertised to any peer

Path #1: Received by speaker 0

Not advertised to any peer

65005

10.0.0.2 (metric 3) from 10.0.0.4 (10.0.0.2)

Received Label 24006

Origin IGP, metric 0, localpref 100, valid, internal, best, group-best, import-candidate, imported

Received Path ID 0, Local Path ID 1, version 51

Extended community: RT:65000:2 RT:65000:3333

Originator: 10.0.0.2, Cluster list: 10.0.0.4

Connector: type: 1, Value:65000:2002:10.0.0.2

Source AFI: VPNv4 Unicast, Source VRF: default, Source Route Distinguisher: 65000:2002

RP/0/0/CPU0:PE3#show pim vrf one rpf 10.0.0.15

Table: IPv4-Unicast-default

* 10.0.0.15/32 [200/0]

via mdtone with rpf neighbor 10.0.0.2

Connector: 65000:1002:10.0.0.2, Nexthop: 10.0.0.2

VRF One بة صاخلا MDT ةهجاوو، MRIB لاج داإل VRF One يف ةرداص ةهجاو لىلع PE2 يوتحي

RP/0/0/CPU0:PE2#show mrib vrf one route 232.1.1.4 10.0.0.15

IP Multicast Routing Information Base

Entry flags: L - Domain-Local Source, E - External Source to the Domain,

C - Directly-Connected Check, S - Signal, IA - Inherit Accept,

IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,

MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle

CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet

MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary

MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN

Interface flags: F - Forward, A - Accept, IC - Internal Copy,

NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,

II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,

LD - Local Disinterest, DI - Decapsulation Interface

EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

(10.0.0.15,232.1.1.4) RPF TID: 0xe0000011 Flags: RPF EX
Up: 00:21:58

Incoming Interface List

GigabitEthernet0/0/0/2 Flags: A EX, Up: 00:21:58

Outgoing Interface List

mdtone Flags: F MI, Up: 00:21:58

VRF One. بة صاخلا MDT هجاوو، MRIB لادلال VRF 2 يف اضيا ةرداص هجاو لىل PE2 يوتحي

RP/0/0/CPU0:PE2#show mrib vrf two route 232.1.1.4 10.0.0.15

IP Multicast Routing Information Base

Entry flags: L - Domain-Local Source, E - External Source to the Domain,
C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN

Interface flags: F - Forward, A - Accept, IC - Internal Copy,

NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
LD - Local Disinterest, DI - Decapsulation Interface
EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

(10.0.0.15,232.1.1.4) RPF nbr: 10.2.15.15 Flags: RPF EX
Up: 00:18:39

Incoming Interface List

GigabitEthernet0/0/0/2 Flags: A, Up: 00:18:39

Outgoing Interface List

mdtone Flags: F MI EX, Up: 00:18:39

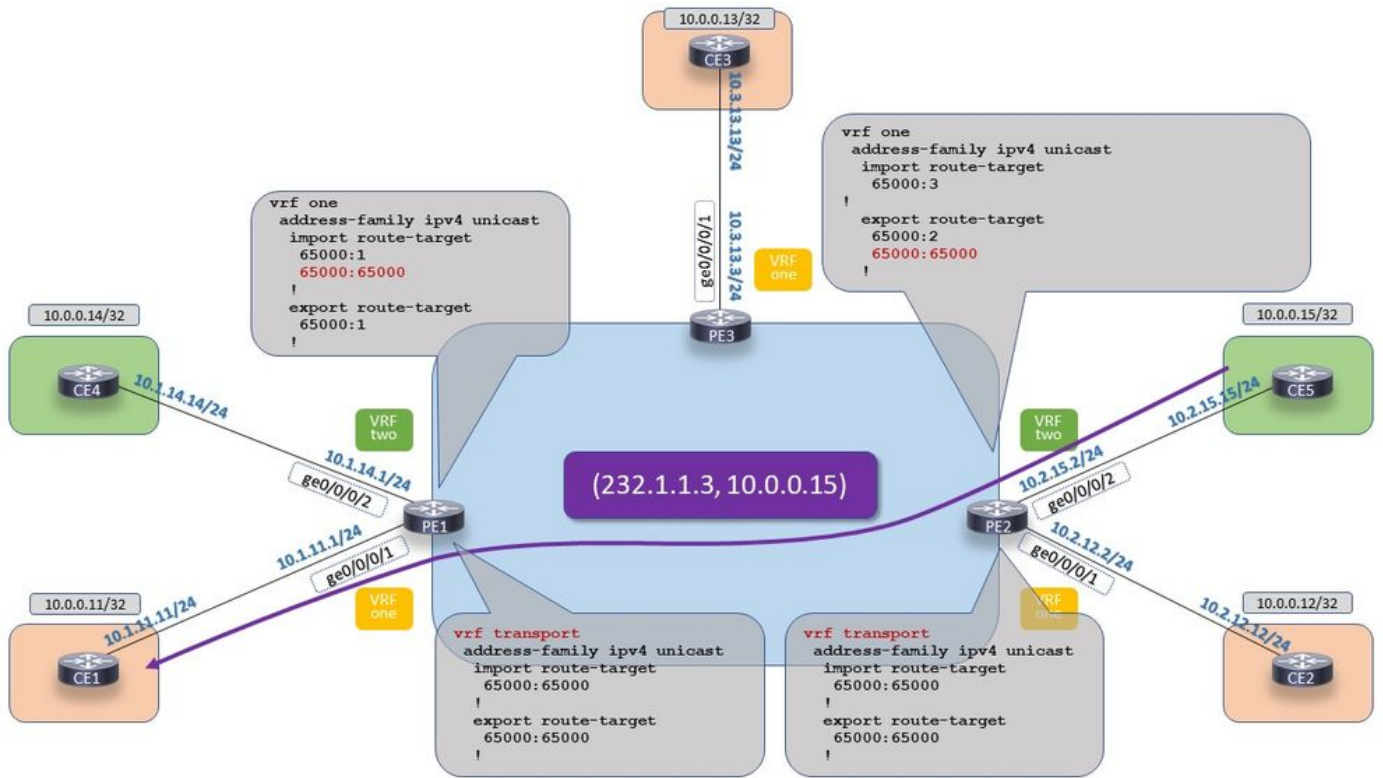
RP/0/0/CPU0:PE2#show pim vrf one rpf 10.0.0.15

Table: IPv4-Unicast-default

* 10.0.0.15/32 [1/0]

via VRF:two,GigabitEthernet0/0/0/2 with rpf neighbor 10.2.15.15

لقنلل MVRF مادختسا متي 3. رايخلا 1.3. لاثم



MVRF لقنلا مادختسا متي 3 راخي ال - 0 فيرعت ال فلم IOS-XR لىل تارنتسك VPN كيش

8 ةروصل MVRF A Transport 3 راخي ال مادختسا متي - 0 فيرعت ال فلم .

VRF نيوكت :كانه رخا عيش لك نوكي نأ مزلي ،كلذ عمو .تاهجاو يا لىل MVRF لقنلا جاتحي ال ،هجوم لل PIM نيوكتو ،ددعت ال ثبل الهجوت نيوكتو ، و BGP نيوكتو .

PE، PE2 لخدم لىل 2 راخي نم نيوكتال او PE1، PE لخدم لىل 1 راخي نم ليكشال .

PE1 زارط مداخل:

```
vrf one
address-family ipv4 unicast
import route-target
65000:1
65000:65000
!
export route-target
65000:1
!
```

```
vrf transport
address-family ipv4 unicast
import route-target
65000:65000
!
export route-target
65000:65000
!
```

```
router bgp 65000
...
vrf one
rd 65000:1001
bgp unsafe-ebgp-policy
```



```

address-family ipv4 unicast
  redistribute connected
!
address-family ipv4 mvpn
!
neighbor 10.1.11.11
  remote-as 65001
  address-family ipv4 unicast
    route-policy pass-all in
    route-policy pass-all out
!
!
!
vrf transport
rd 65000:123
address-family ipv4 unicast
  redistribute static
!
address-family ipv4 mvpn
!

multicast-routing
vrf one
address-family ipv4
  interface GigabitEthernet0/0/0/1
    enable
!
  mdt source Loopback0
  mdt default ipv4 239.1.1.1
!
!
!

multicast-routing
vrf transport
address-family ipv4
  mdt source Loopback0
  mdt default ipv4 239.1.1.3
!
!

router pim
vrf one
address-family ipv4
  ssm range SSM-range-vrf-one
!
!
!

router pim
vrf transport
address-family ipv4
  ssm range SSM-range-vrf-transport
!

```

PE2: زارط مداخل

```

vrf two
address-family ipv4 unicast
import route-target
  65000:2
!
export route-target

```

```

65000:2
65000:65000
!

vrf transport
address-family ipv4 unicast
import route-target
65000:65000
!
export route-target
65000:65000
!

router bgp 65000
...
!
vrf two
rd 65000:2002
bgp unsafe-ebgp-policy
address-family ipv4 unicast
redistribute connected
!
address-family ipv4 mvpn
!
neighbor 10.2.15.15
remote-as 65005
address-family ipv4 unicast
route-policy pass-all in
route-policy pass-all out
!
!
!

router static
!
vrf transport
address-family ipv4 unicast
10.0.0.15/32 vrf two GigabitEthernet0/0/0/2 10.2.15.15
!

vrf transport
rd 65000:123
address-family ipv4 unicast
redistribute static
!
address-family ipv4 mvpn
!

multicast-routing
vrf two
address-family ipv4
interface GigabitEthernet0/0/0/2
enable
!
mdt source Loopback0
mdt default ipv4 239.1.1.2
!
!
!

multicast-routing
vrf transport
address-family ipv4
mdt source Loopback0

```

```
mdt default ipv4 239.1.1.3
!
```

```
RP/0/0/CPU0:PE1#show mrib vrf one route 232.1.1.3 10.0.0.15
```

```
IP Multicast Routing Information Base
```

```
Entry flags: L - Domain-Local Source, E - External Source to the Domain,
C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN
Interface flags: F - Forward, A - Accept, IC - Internal Copy,
NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
LD - Local Disinterest, DI - Decapsulation Interface
EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface
```

```
(10.0.0.15,232.1.1.3) RPF TID: 0xe0000012 Flags: RPF EX
```

```
Up: 16:41:11
```

```
Outgoing Interface List
```

```
GigabitEthernet0/0/0/1 Flags: F NS, Up: 16:41:11
```

```
RP/0/0/CPU0:PE1#show pim vrf one rpf 10.0.0.15
```

```
Table: IPv4-Unicast-default
```

```
* 10.0.0.15/32 [200/0]
```

```
via VRF:transport with rpf neighbor 10.0.0.2
```

```
Connector: 65000:123:10.0.0.2, Nexthop: 10.0.0.2
```

```
RP/0/0/CPU0:PE1#show mrib vrf transport route 232.1.1.3 10.0.0.15
```

```
IP Multicast Routing Information Base
```

```
Entry flags: L - Domain-Local Source, E - External Source to the Domain,
C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN
Interface flags: F - Forward, A - Accept, IC - Internal Copy,
NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
LD - Local Disinterest, DI - Decapsulation Interface
EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface
```

```
(10.0.0.15,232.1.1.3) RPF nbr: 10.0.0.2 Flags: RPF EX
```

```
Up: 00:08:14
```

```
Incoming Interface List
```

```
mdttransport Flags: A MI, Up: 00:08:14
```

```
Outgoing Interface List
```

```
GigabitEthernet0/0/0/1 Flags: F NS EX, Up: 00:00:14
```

```
RP/0/0/CPU0:PE1#show pim vrf transport rpf 10.0.0.15
```

```
Table: IPv4-Unicast-default
```

```
* 10.0.0.15/32 [200/0]
```

```
via mdttransport with rpf neighbor 10.0.0.2
```

Connector: 65000:123:10.0.0.2, Nexthop: 10.0.0.2

Egress PE. VRF ل ق ن ي ف افور عم ر د ص م ل ا ر ا س م نو ك ي ن ا ب ج ي

RP/0/0/CPU0:PE1#show route vrf transport 10.0.0.15/32

Routing entry for 10.0.0.15/32

Known via "bgp 65000", distance 200, metric 0, type internal

Installed Nov 22 09:57:13.255 for 00:15:30

Routing Descriptor Blocks

10.0.0.2, from 10.0.0.4

Nexthop in Vrf: "default", Table: "default", IPv4 Unicast, Table Id: 0xe0000000

Route metric is 0

No advertising protos.

Ingress PE, PE2:

RP/0/0/CPU0:PE2#show mrib vrf two route 232.1.1.3 10.0.0.15

IP Multicast Routing Information Base

Entry flags: L - Domain-Local Source, E - External Source to the Domain,

C - Directly-Connected Check, S - Signal, IA - Inherit Accept,

IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,

MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle

CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet

MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary

MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN

Interface flags: F - Forward, A - Accept, IC - Internal Copy,

NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,

II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,

LD - Local Disinterest, DI - Decapsulation Interface

EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,

EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,

MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface

IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

(10.0.0.15,232.1.1.3) RPF nbr: 10.2.15.15 Flags: RPF EX

Up: 00:10:37

Incoming Interface List

GigabitEthernet0/0/0/2 Flags: A, Up: 00:10:37

Outgoing Interface List

mdttransport Flags: F NS MI EX, Up: 00:10:37

RP/0/0/CPU0:PE2#show pim vrf two rpf 10.0.0.15

Table: IPv4-Unicast-default

* 10.0.0.15/32 [20/0]

via GigabitEthernet0/0/0/2 with rpf neighbor 10.2.15.15

RP/0/0/CPU0:PE2#show mrib vrf transport route 232.1.1.3 10.0.0.15

IP Multicast Routing Information Base

Entry flags: L - Domain-Local Source, E - External Source to the Domain,

C - Directly-Connected Check, S - Signal, IA - Inherit Accept,

IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,

MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle

CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet

MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary

MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN

Interface flags: F - Forward, A - Accept, IC - Internal Copy,

NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,

II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,

LD - Local Disinterest, DI - Decapsulation Interface

EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,

EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
 MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
 IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

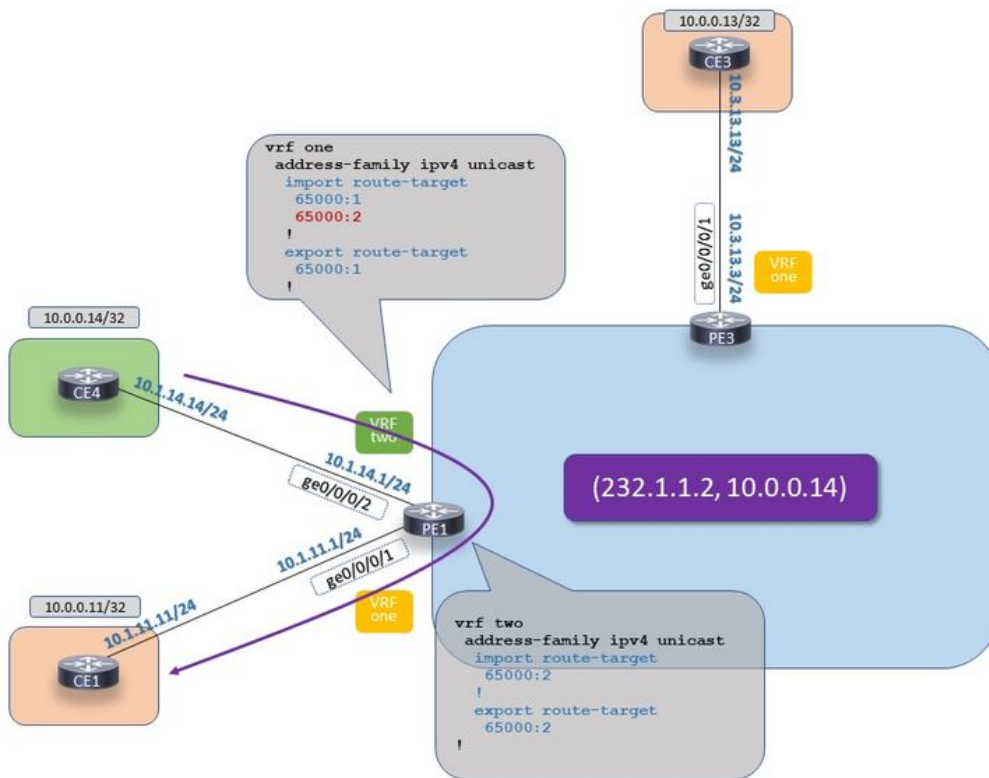
```
(10.0.0.15,232.1.1.3) RPF TID: 0xe0000011 Flags: RPF EX
Up: 00:11:44
Incoming Interface List
  GigabitEthernet0/0/0/2 Flags: A EX, Up: 00:11:44
Outgoing Interface List
  mdtransport Flags: F NS MI, Up: 00:11:44
```

```
RP/0/0/CPU0:PE2#show pim vrf transport rpf 10.0.0.15
Table: IPv4-Unicast-default
* 10.0.0.15/32 [1/0]
  via VRF:two,GigabitEthernet0/0/0/2 with rpf neighbor 10.2.15.15
```

يلحم تنارتسك | 1.4 للاثم

يكلساللا ددرتلا ي ف لبقتسملا ىلا ةدوعلل راسم دوجو نإ . طروت م طقف دحاو PE هجوم كانه
 يكلساللا ددرتلا ىلع مئاقلا لجال انه ديحوللا بلطتملا وه ردصملا ب صاخلا (VRF)

لبقتسم) نانثا VRF نم ديدخت جاحسملا دروتسي (VRF ردصم) دحاو VRF ىقلتي نأ ل ح دحاو
 فده-قيرط بسانملا مادختسا قيرط نع (VRF)



ةيلحم تنارتسك ةكبش - 0 فيرعتلا فلم IOS-XR ىلع mVPN ةكبش ل ةيجراخلا ةكبشلا

يلحم تنارتسك | - 0 فيرعتلا فلم 9 ةروصللا

PE1 زارط مداخللا

```
vrf one
address-family ipv4 unicast
import route-target
65000:1
65000:2
```

```
!  
export route-target  
65000:1 !  
!  
!
```

```
vrf two  
address-family ipv4 unicast  
import route-target  
65000:2  
!  
export route-target  
65000:2  
!
```

```
RP/0/0/CPU0:PE1#show mrib vrf one route 232.1.1.2 10.0.0.14
```

```
IP Multicast Routing Information Base
```

```
Entry flags: L - Domain-Local Source, E - External Source to the Domain,  
C - Directly-Connected Check, S - Signal, IA - Inherit Accept,  
IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,  
MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle  
CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet  
MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary  
MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN  
Interface flags: F - Forward, A - Accept, IC - Internal Copy,  
NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,  
II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,  
LD - Local Disinterest, DI - Decapsulation Interface  
EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,  
EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,  
MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface  
IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface
```

```
(10.0.0.14,232.1.1.2) RPF TID: 0xe0000011 Flags: RPF EX
```

```
Up: 17:02:25
```

```
Incoming Interface List
```

```
GigabitEthernet0/0/0/2 Flags: A EX, Up: 00:02:32
```

```
Outgoing Interface List
```

```
GigabitEthernet0/0/0/1 Flags: F NS, Up: 1702:25
```

```
RP/0/0/CPU0:PE1#show route vrf one 10.0.0.14/32
```

```
Routing entry for 10.0.0.14/32
```

```
Known via "bgp 65000", distance 20, metric 0
```

```
Tag 65004, type external
```

```
Installed Nov 22 10:24:52.002 for 00:01:10
```

```
Routing Descriptor Blocks
```

```
10.1.14.14, from 10.1.14.14, BGP external
```

```
Nexthop in Vrf: "two", Table: "default", IPv4 Unicast, Table Id: 0xe0000011
```

```
Route metric is 0
```

```
No advertising protos.
```

```
RP/0/0/CPU0:PE1#show pim vrf one rpf 10.0.0.14
```

```
Table: IPv4-Unicast-default
```

```
* 10.0.0.14/32 [20/0]
```

```
via VRF:two with rpf neighbor 10.1.14.14
```

```
RP/0/0/CPU0:PE1#show mrib vrf two route 232.1.1.2 10.0.0.14
```

```
IP Multicast Routing Information Base
```

```
Entry flags: L - Domain-Local Source, E - External Source to the Domain,  
C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
```

IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
 MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
 CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
 MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
 MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN

Interface flags: F - Forward, A - Accept, IC - Internal Copy,
 NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
 II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
 LD - Local Disinterest, DI - Decapsulation Interface
 EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
 EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
 MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
 IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

```
(10.0.0.14,232.1.1.2) RPF nbr: 10.1.14.14 Flags: RPF EX
Up: 00:03:06
Incoming Interface List
  GigabitEthernet0/0/0/2 Flags: A, Up: 00:03:06
Outgoing Interface List
  GigabitEthernet0/0/0/1 Flags: F NS EX, Up: 00:03:06
```

```
RP/0/0/CPU0:PE1#show pim vrf two rpf 10.0.0.14
Table: IPv4-Unicast-default
* 10.0.0.14/32 [20/0]
  via GigabitEthernet0/0/0/2 with rpf neighbor 10.1.14.14
```

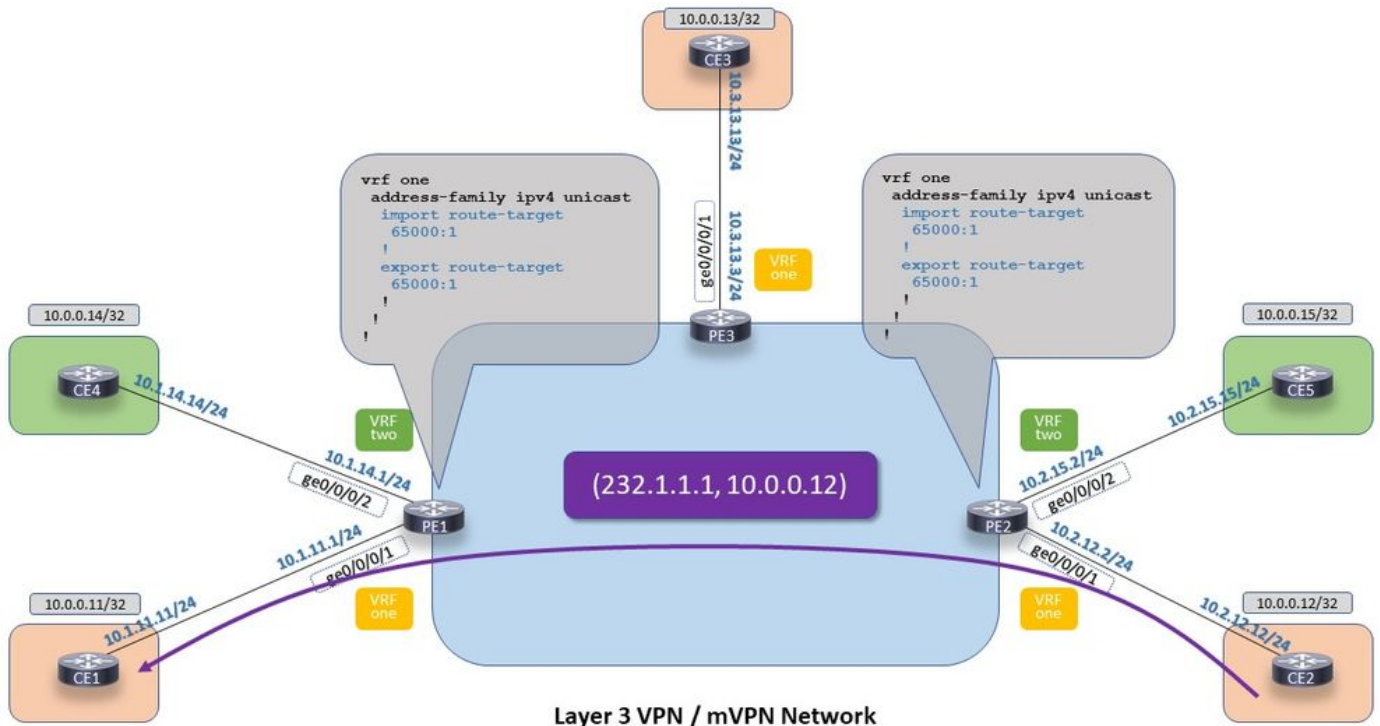
14 فيرنتال فلم

لاسراو ساسألأ في mLDP ل ددعتالم ثبل تاراشا عم، مسقم ال Profile 14 MDT مدختسي (VRF قاي س) ةيشغتلأ في (ل م عم ال) BGP تاراشا

1. رايل في صوت ال اذ م عدي

هيجوت ة دخب الم عيل 3 و 2 رايل ل عج نكمي

دحاو VRF ل دحاو VRF نم، VRF تاكبش ني ب ددعتالم ثبل رورم ة كرح 10 ةروصلأ ضرعت



تاكبش ني ب ددعتم ل ثب ل رورم ة كرح - 14 فيرعت ل ل ف ل م : IOS-XR ل ل ع VPN Extranet ة ك ب ش VRF

VRF تاكبش ني ب ددعتم ل ل ثب ل رورم ة كرح - 14 Profile 10 ة روص ل ل

ي ل ي ام ك 1 PE ج ر م ل ع MRIB ل ل ا خ د ا ج ا ر خ ا و د ب ي :

```
RP/0/0/CPU0:PE1#show mrib vrf one route 232.1.1.1 10.0.0.12
```

```
IP Multicast Routing Information Base
Entry flags: L - Domain-Local Source, E - External Source to the Domain,
  C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
  IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
  MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
  CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
  MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
  MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN
Interface flags: F - Forward, A - Accept, IC - Internal Copy,
  NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
  II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
  LD - Local Disinterest, DI - Decapsulation Interface
  EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
  EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
  MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
  IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface
```

```
(10.0.0.12,232.1.1.1) RPF nbr: 10.0.0.2 Flags: RPF
Up: 02:06:44
Incoming Interface List
  Lmdtone Flags: A LMI, Up: 02:05:18
Outgoing Interface List
  GigabitEthernet0/0/0/1 Flags: F NS, Up: 02:06:44
```

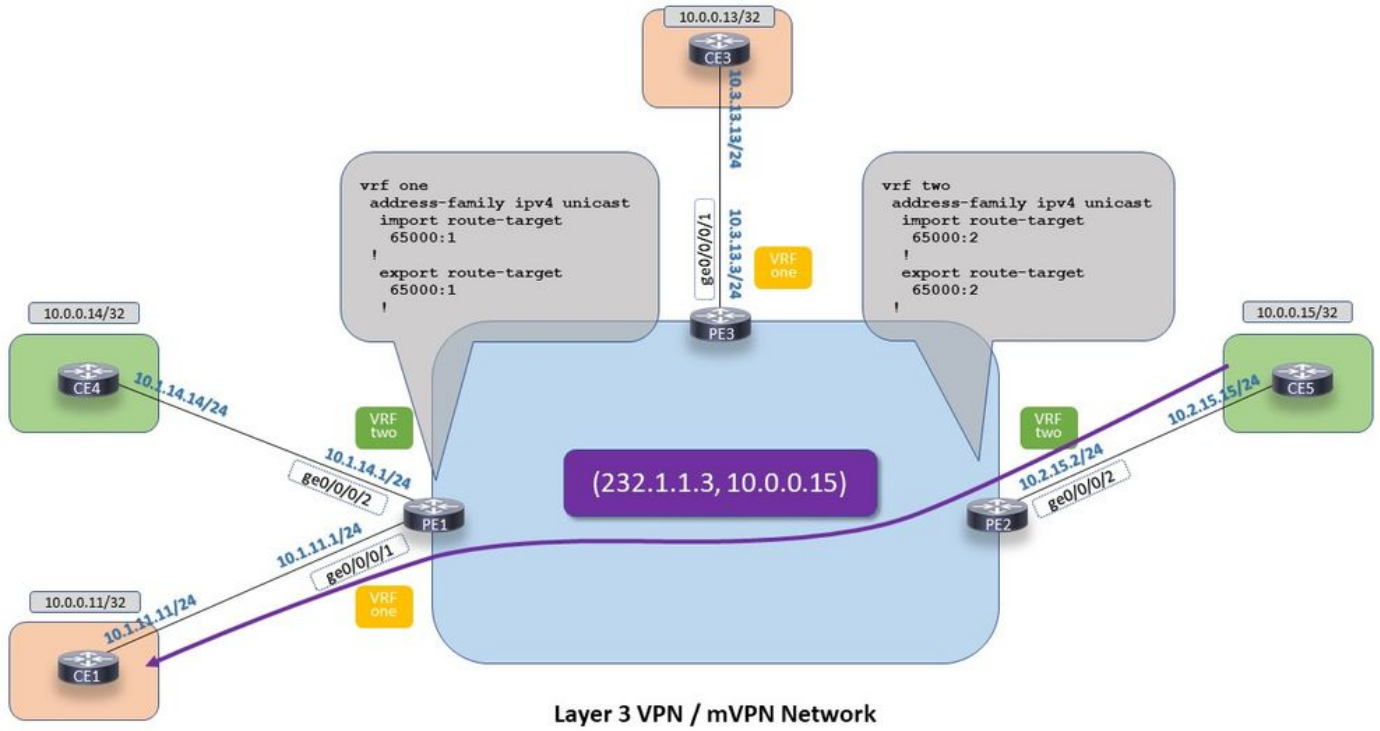
```
RP/0/0/CPU0:PE1#show pim vrf one rpf 10.0.0.12
```

```
Table: IPv4-Unicast-default
* 10.0.0.12/32 [200/0]
  via Lmdtone with rpf neighbor 10.0.0.2
  Connector: 65000:1002:10.0.0.2, Nexthop: 10.0.0.2
```

```
router pim
vrf one
address-family ipv4
  rpf topology route-policy profile-14
  mdt c-multicast-routing bgp
  !
  ssm range SSM-range-vrf-one
  !
  !
```

```
route-policy profile-14
  set core-tree mldp-partitioned-p2mp
end-policy
!
```

MVRF ل ب ق ت س م ل ل ع MVRF ر د ص م ل ل 1. ر ا ي خ ل ل 2.1. ل ل ا ث م



زاهج يلى مVRMF ردصم ال 1 راخي ل- 14 في رعت ال فلم: IOS-XR يلى تنا رتسك | VPN ةكبش
MVRMF لابق تسال ال

MVRMF لبق تسم ال يلى مVRMF ردصم ال 1 راخي - 14 صي صخت فلم 11 ةروصل

PE لبق تسم ال في VRF لبق تسم ال يلى (RPF) يسك ال راسم ال هي جوت ةداع | ري يغت ب جي

ت ادرت ال نم ني نث | مقرو دحاو مقرر لة بس ن لا ب يه امك ري دصت ل او داري تسال ال تانا ي ب لازت ال و
ةي ضار ت فال ال

```
router pim
vrf one
address-family ipv4
rpf topology route-policy profile-14-extranet
mtd c-multicast-routing bgp
!
ssm range SSM-range-vrf-one
!
!
!
router pim
vrf two
address-family ipv4
rpf topology route-policy profile-14
mtd c-multicast-routing bgp
!
ssm range SSM-range-vrf-two
!
!
!
route-policy profile-14
set core-tree mldp-partitioned-p2mp
end-policy
!
```

```
route-policy profile-14-extranet
  if destination in (232.1.1.3/32) then
    set rpf-topology vrf two
  else
    set core-tree mldp-partitioned-p2mp
  endif
end-policy
!
```

على 232.1.1.3 ددعت الما ثبلا ةومجم ل VRF One في (RPF) يسكعلا راسملا هي جوت ةداع| ريشت VRF Two.

```
RP/0/0/CPU0:PE1#show mrib vrf one route 232.1.1.3 10.0.0.15
```

```
IP Multicast Routing Information Base
Entry flags: L - Domain-Local Source, E - External Source to the Domain,
  C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
  IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
  MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
  CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
  MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
  MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN
Interface flags: F - Forward, A - Accept, IC - Internal Copy,
  NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
  II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
  LD - Local Disinterest, DI - Decapsulation Interface
  EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
  EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
  MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
  IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface
```

```
(10.0.0.15,232.1.1.3) RPF TID: 0xe0000011 Flags: EX
Up: 03:37:29
Outgoing Interface List
GigabitEthernet0/0/0/1 Flags: F NS, Up: 03:37:29
```

ةكرح هي جوت ةداع| لعل اذه رثؤي ال. دحاو VRF في MRIB ل اخل ةدراو ةه او دجوت ال: ةظحال م. تان ايبلا رورم.

```
RP/0/0/CPU0:PE1#show pim vrf one rpf 10.0.0.15
Table: IPv4-Unicast-default
* 10.0.0.15/32 [4294967295/4294967295]
  via Null with rpf neighbor 0.0.0.0
```

يسكعلا يسكعلا هي جوت ال في (RPF) يسكعلا راسملا هي جوت ةداع| لشل في: ةظحال م. ةكرح هي جوت ةداع| لعل اذه رثؤي ال. جورخل لل (PE) يسكعلا يسكعلا هي جوت ال في (VRF) تان ايبلا رورم.

```
RP/0/0/CPU0:PE1#show mrib vrf two route 232.1.1.3 10.0.0.15
```

```
IP Multicast Routing Information Base
Entry flags: L - Domain-Local Source, E - External Source to the Domain,
  C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
  IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
  MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
  CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
  MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
  MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN
Interface flags: F - Forward, A - Accept, IC - Internal Copy,
```

NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
 II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
 LD - Local Disinterest, DI - Decapsulation Interface
 EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
 EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
 MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
 IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

```
(10.0.0.15,232.1.1.3) RPF nbr: 10.0.0.2 Flags: RPF EX
Up: 00:05:58
Incoming Interface List
  Lmdttwo Flags: A LMI, Up: 00:05:58
Outgoing Interface List
  GigabitEthernet0/0/0/1 Flags: F NS EX, Up: 00:05:58
```

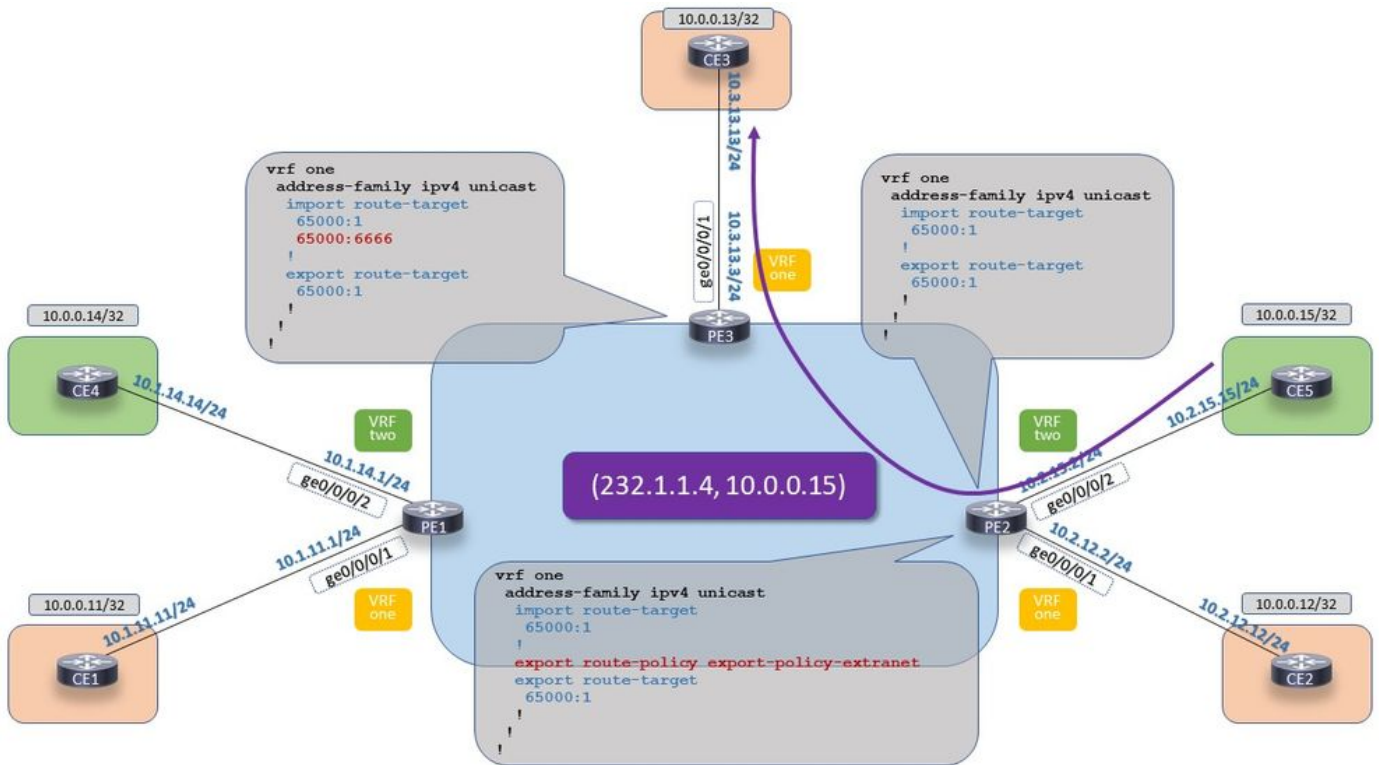
دحاو VRF في ge0/0/0/1 هه جاولا نا طحال.

MVRF ردصملا ىلع MVRF لبققتسملا 2. راىخا. 2.2 لاثم

وا راسملا فادهال ري دصتلاو داريتسالا تانايبب بعالتلا لالخنم لمعلال لجال اذهل نكمي ال (RPF) يسكعلال راسملا هي جوت عداع لبق نم عم دختسملا راسملا سايس ريغت لالخنم طقف.

صاخال PE هجوم ىلع (RPF) يسكعلال راسملا هي جوت عداع لصال ىلع دعاست عده كانه ىل هونيو VRF لبققتسملا في كيتاتاسا نكاس قيرط فيضي نا عده لال. لخدملا ب ديدخت جاحسم PE لخدملا ىلع VRF ردصملا.

تباثل راسملا اذه زييمت متي VRF لبققتسملا في ردصملا ناو نع تباثل راسملا نلعي نلعمل راسملا سفنم راسملا اذه زييمت نكمي ىتح BGP في ديرف ديدج هجوم مادختساب لخدملا ىلع VRF لبققتسملا نم تباثل راسملا داريتسا يدافت اذهو. VRF ردصملا في هنع هي جوت رادصا في ببستت يتلا ىلخال PE تاهجوم ب صاخال VRF لبققتسملا ىل PE.



MVRF ردصملا ىلع MVRF يقىلتملا 2 راىخا - 14 فيرعتلا فلم IOS-XR ىلع VPN Extranet

MVRF ردصملا ىلع MVRF يقىلتملا 2 راىخ - 14 صيصخت فلم 12 روصلا

PE2 زارط مداخل

```
router static
  vrf one
  address-family ipv4 unicast
    10.0.0.15/32 vrf two GigabitEthernet0/0/0/2 10.2.15.15
  !
  !
  !
```

```
router bgp 65000
  vrf one
  rd 65000:1002
  address-family ipv4 unicast
    redistribute connected
  redistribute static
  !
```

```
route-policy export-policy-extranet
  if destination in (10.0.0.15/32) then
    set extcommunity rt rt-set-static-extranet
  else
    pass
  endif
end-policy
!
```

```
extcommunity-set rt rt-set-static-extranet
  65000:6666
end-set
!
```

```
RP/0/0/CPU0:PE2#show route vrf one 10.0.0.15/32
Routing entry for 10.0.0.15/32
  Known via "static", distance 1, metric 0
  Installed Nov 20 13:48:25.525 for 04:50:15
  Routing Descriptor Blocks
    10.2.15.15, via GigabitEthernet0/0/0/2
      Nexthop in Vrf: "two", Table: "default", IPv4 Unicast, Table Id: 0xe0000011
      Route metric is 0, Wt is 1
  No advertising protos.
```

```
RP/0/0/CPU0:PE2#show pim vrf one rpf 10.0.0.15
Table: IPv4-Unicast-default
* 10.0.0.15/32 [1/0]
  via VRF:two,GigabitEthernet0/0/0/2 with rpf neighbor 10.2.15.15
```

PE لخدم لى ع فده لى راس م لى نى عى ع م BGP راس م Egress PE لى

```
RP/0/0/CPU0:PE3#show bgp vrf one 10.0.0.15/32
BGP routing table entry for 10.0.0.15/32, Route Distinguisher: 65000:1003
Versions:
  Process          bRIB/RIB  SendTblVer
  Speaker          8         8
Last Modified: Nov 20 13:49:49.569 for 04:51:19
Paths: (1 available, best #1)
  Advertised to CE peers (in unique update groups):
    10.3.13.13
  Path #1: Received by speaker 0
  Advertised to CE peers (in unique update groups):
    10.3.13.13
```

Local

10.0.0.2 (metric 3) from 10.0.0.4 (10.0.0.2)

Received Label 24003

Origin incomplete, metric 0, localpref 100, valid, internal, best, group-best, import-candidate, imported

Received Path ID 0, Local Path ID 1, version 8

Extended community: VRF Route Import:10.0.0.2:16 Source AS:65000:0 RT:65000:6666

Originator: 10.0.0.2, Cluster list: 10.0.0.4

Connector: type: 1, Value:65000:1002:10.0.0.2

Source AFI: VPNv4 Unicast, Source VRF: default, Source Route Distinguisher: 65000:1002

دحاو VRF، VRF ردصم الي في pe لخدمل الي RPF حي حص لخدمل الي pe جخدمل الي قتلتي

RP/0/0/CPU0:PE3#show pim vrf one rpf 10.0.0.15

Table: IPv4-Unicast-default

* 10.0.0.15/32 [200/0]

via Lmdtone with rpf neighbor 10.0.0.2

Connector: 65000:1002:10.0.0.2, Nexthop: 10.0.0.2

RP/0/0/CPU0:PE3#show mrib vrf one route 232.1.1.4 10.0.0.15

IP Multicast Routing Information Base

Entry flags: L - Domain-Local Source, E - External Source to the Domain,

C - Directly-Connected Check, S - Signal, IA - Inherit Accept,

IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,

MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle

CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet

MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary

MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN

Interface flags: F - Forward, A - Accept, IC - Internal Copy,

NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,

II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,

LD - Local Disinterest, DI - Decapsulation Interface

EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,

EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,

MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface

IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

(10.0.0.15,232.1.1.4) RPF nbr: 10.0.0.2 Flags: RPF

Up: 04:54:24

Incoming Interface List

Lmdtone Flags: A LMI, Up: 00:05:48

Outgoing Interface List

GigabitEthernet0/0/0/1 Flags: F NS, Up: 04:54:24

VRF ردصم. VRF ملتسم ل او ردصم ل اوس دح يلع في extranet اتال خدمل الي قتلتي

RP/0/0/CPU0:PE2#show mrib vrf two route 232.1.1.4 10.0.0.15

IP Multicast Routing Information Base

Entry flags: L - Domain-Local Source, E - External Source to the Domain,

C - Directly-Connected Check, S - Signal, IA - Inherit Accept,

IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,

MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle

CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet

MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary

MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN

Interface flags: F - Forward, A - Accept, IC - Internal Copy,

NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,

II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,

LD - Local Disinterest, DI - Decapsulation Interface

EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,

EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

(10.0.0.15,232.1.1.4) RPF nbr: 10.2.15.15 Flags: RPF EX
Up: 00:06:36

Incoming Interface List

GigabitEthernet0/0/0/2 Flags: A, Up: 00:06:36

Outgoing Interface List

Lmdtone Flags: F LMI EX TR, Up: 00:06:36

لابق تسال زاھج VRF:

RP/0/0/CPU0:PE2#show mrib vrf one route 232.1.1.4 10.0.0.15

IP Multicast Routing Information Base

Entry flags: L - Domain-Local Source, E - External Source to the Domain,
C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN

Interface flags: F - Forward, A - Accept, IC - Internal Copy,

NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
LD - Local Disinterest, DI - Decapsulation Interface
EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

(10.0.0.15,232.1.1.4) RPF TID: 0xe0000011 Flags: RPF EX
Up: 00:06:28

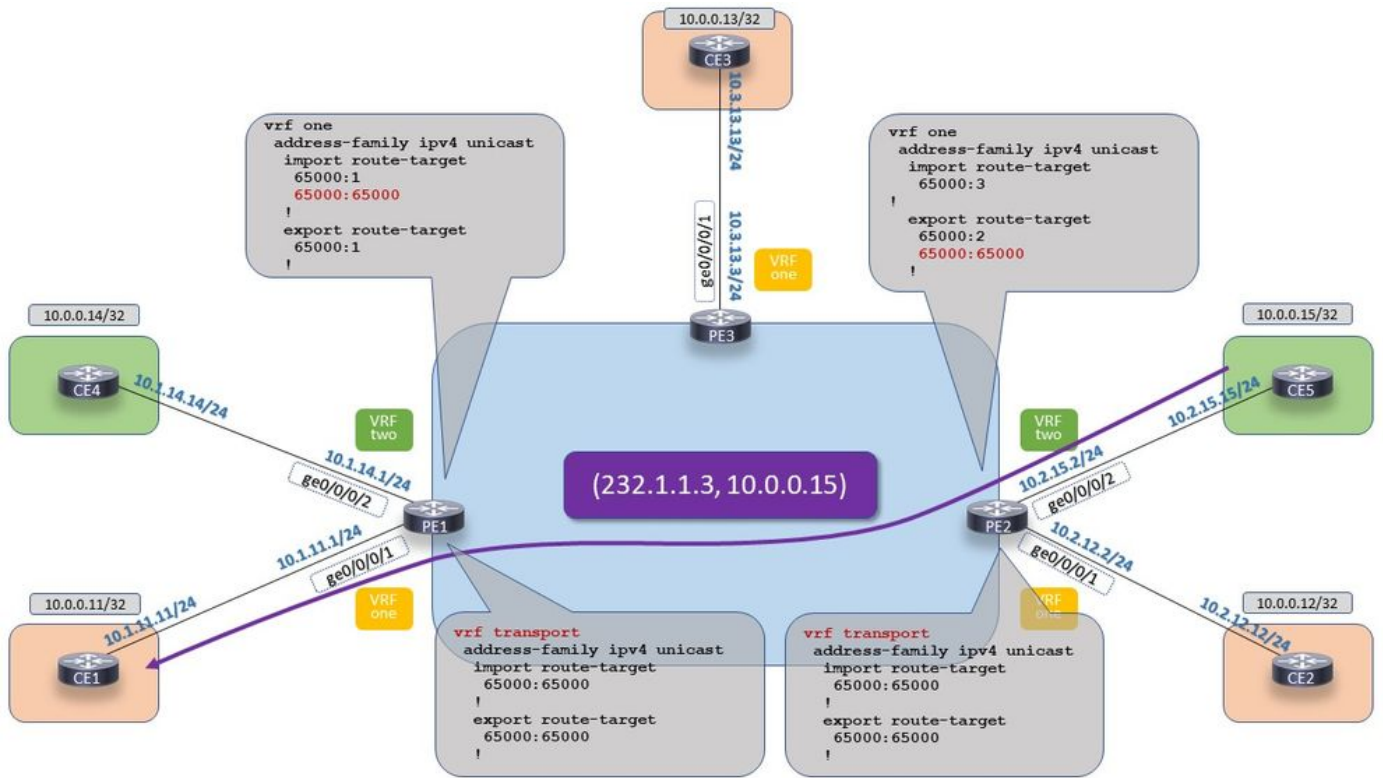
Incoming Interface List

GigabitEthernet0/0/0/2 Flags: A EX, Up: 00:06:28

Outgoing Interface List

Lmdtone Flags: F LMI TR, Up: 00:06:28

لقنلل MVRF مادختسا متي 3 رايخالا 2.3 لاثم



MVRF مداخلتسا متي 3 رايجال - 14 فيرعتال فلم IOS-XR لىل تارستسك VPN كىبش لقنلل

لقنلل MVRF مداخلتسا متي 3 رايجال - Profile 14 ةروصلال

VRF نيوكت: كانه رخآ عيش لك نوكتي نأ مزلي، كلكذ عمو. تاهجاو يأل VRF لقنلال جاتحي ال هجوملل PIM نيوكتو، ددعتمال ثبلال هيچوت نيوكتو، BGP نيوكتو.

زارط مداخلال PE، PE2 لخدم لىل ع 2 رايج نم نيوكتالو PE1، PE1 لخدم لىل ع 1 رايج نم لىل كشتال PE1:

```
vrf transport
address-family ipv4 unicast
import route-target
65000:65000
!
export route-target
65000:65000
!

router bgp 65000
...
!
vrf transport
rd 65000:123
address-family ipv4 unicast
redistribute static
!
address-family ipv4 mvpn
!

multicast-routing
vrf one
address-family ipv4
interface GigabitEthernet0/0/0/1
enable
```

```

!
mdt source Loopback0
bgp auto-discovery mldp
!
mdt partitioned mldp ipv4 p2mp
!
!
!
vrf transport
address-family ipv4
  mdt source Loopback0
  bgp auto-discovery mldp
  !
  mdt partitioned mldp ipv4 p2mp
!

router pim
vrf one
address-family ipv4
  rpf topology route-policy profile-14
  mdt c-multicast-routing bgp
  !
  ssm range SSM-range-vrf-one
  !
  !
vrf transport
address-family ipv4
  rpf topology route-policy profile-14
  mdt c-multicast-routing bgp
  !
  ssm range SSM-range-vrf-transport
  !

```

PE2: زارط مداخل

```

vrf transport
address-family ipv4 unicast
import route-target
  65000:65000
!
export route-target
  65000:65000
!
!

route-policy vrf-one-profile-14
set core-tree mldp-partitioned-p2mp
end-policy

!

route-policy export-policy-extranet
if destination in (10.0.0.15/32) then
  set extcommunity rt rt-set-static-extranet
else
  pass
endif
end-policy

!

router static
!
vrf transport

```



```
address-family ipv4 unicast
 10.0.0.15/32 vrf two GigabitEthernet0/0/0/2 10.2.15.15
!
!
```

```
router bgp 65000
```

```
...
```

```
vrf transport
address-family ipv4
 mdt source Loopback0
 interface all enable
 bgp auto-discovery mldp
!
 mdt partitioned mldp ipv4 p2mp
!
```

```
router pim
```

```
address-family ipv4
 ssm range SSM-range
```

```
!
```

```
!
```

```
vrf two
address-family ipv4
 rpf topology route-policy profile-14
 mdt c-multicast-routing bgp
!
 ssm range SSM-range-vrf-two
```

```
!
```

```
!
```

```
vrf transport
address-family ipv4
 rpf topology route-policy profile-14
 mdt c-multicast-routing bgp
!
 ssm range SSM-range-vrf-transport
```

```
!
```

```
multicast-routing
```

```
!
```

```
vrf two
address-family ipv4
 interface GigabitEthernet0/0/0/2
  enable
```

```
!
```

```
 mdt source Loopback0
 bgp auto-discovery mldp
```

```
!
```

```
 mdt partitioned mldp ipv4 p2mp
```

```
!
```

```
!
```

```
vrf transport
address-family ipv4
 mdt source Loopback0
 bgp auto-discovery mldp
!
 mdt partitioned mldp ipv4 p2mp
```

```
!
```

```
RP/0/0/CPU0:PE1#show mrib vrf one route 232.1.1.3 10.0.0.15
```

```
IP Multicast Routing Information Base
```

```
Entry flags: L - Domain-Local Source, E - External Source to the Domain,
```

C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN
Interface flags: F - Forward, A - Accept, IC - Internal Copy,
NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
LD - Local Disinterest, DI - Decapsulation Interface
EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

(10.0.0.15,232.1.1.3) RPF TID: 0xe0000012 Flags: RPF EX

Up: 1d03h

Outgoing Interface List

GigabitEthernet0/0/0/1 Flags: F NS, Up: 1d03h

**ةكرح هي جوت ةداعإ ىلع اذه رثؤي ال .دحاو VRF في MRIB لادخال ةدراو ةهجاو دجوت ال :ةظحال م
ت.انايبل رورم**

RP/0/0/CPU0:PE1#show pim vrf one rpf 10.0.0.15

Table: IPv4-Unicast-default

* 10.0.0.15/32 [4294967295/4294967295]

via Null with rpf neighbor 0.0.0.0

**يسكعلال يسكعلال هي جوتال في (RPF) يسكعلال راسملا هي جوت ةداعإ ل ش في :ةظحال م
ةكرح هي جوت ةداعإ ىلع اذه رثؤي ال .جورخلل (PE) يسكعلال يسكعلال هي جوتال في (VRF)
ت.انايبل رورم**

RP/0/0/CPU0:PE1#show pim vrf transport rpf 10.0.0.15

Table: IPv4-Unicast-default

* 10.0.0.15/32 [200/0]

via Lmdttransport with rpf neighbor 10.0.0.2

Connector: 65000:456:10.0.0.2, Nexthop: 10.0.0.2

RP/0/0/CPU0:PE1#show mrib vrf transport route 232.1.1.3 10.0.0.15

IP Multicast Routing Information Base

Entry flags: L - Domain-Local Source, E - External Source to the Domain,

C - Directly-Connected Check, S - Signal, IA - Inherit Accept,

IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,

MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle

CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet

MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary

MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN

Interface flags: F - Forward, A - Accept, IC - Internal Copy,

NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,

II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,

LD - Local Disinterest, DI - Decapsulation Interface

EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,

EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,

MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface

IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

(10.0.0.15,232.1.1.3) RPF nbr: 10.0.0.2 Flags: RPF EX

Up: 00:48:15

Incoming Interface List

Lmdttransport Flags: A LMI, Up: 00:22:51
Outgoing Interface List
GigabitEthernet0/0/0/1 Flags: F NS EX, Up: 00:48:15

RP/0/0/CPU0:PE1#show route vrf transport

Codes: C - connected, S - static, R - RIP, B - BGP, (>) - Diversion path
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - ISIS, L1 - IS-IS level-1, L2 - IS-IS level-2
ia - IS-IS inter area, su - IS-IS summary null, * - candidate default
U - per-user static route, o - ODR, L - local, G - DAGR, l - LISP
A - access/subscriber, a - Application route
M - mobile route, r - RPL, t - Traffic Engineering, (!) - FRR Backup path

Gateway of last resort is not set

B 10.0.0.15/32 [200/0] via 10.0.0.2 (nexthop in vrf default), 00:40:06

RP/0/0/CPU0:PE2#show mrib vrf transport route 232.1.1.3 10.0.0.15

IP Multicast Routing Information Base

Entry flags: L - Domain-Local Source, E - External Source to the Domain,
C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN
Interface flags: F - Forward, A - Accept, IC - Internal Copy,
NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
LD - Local Disinterest, DI - Decapsulation Interface
EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

(10.0.0.15,232.1.1.3) RPF TID: 0xe0000011 Flags: RPF EX
Up: 00:25:25

Incoming Interface List
GigabitEthernet0/0/0/2 Flags: A EX, Up: 00:25:25
Outgoing Interface List
Lmdttransport Flags: F LMI TR, Up: 00:25:25

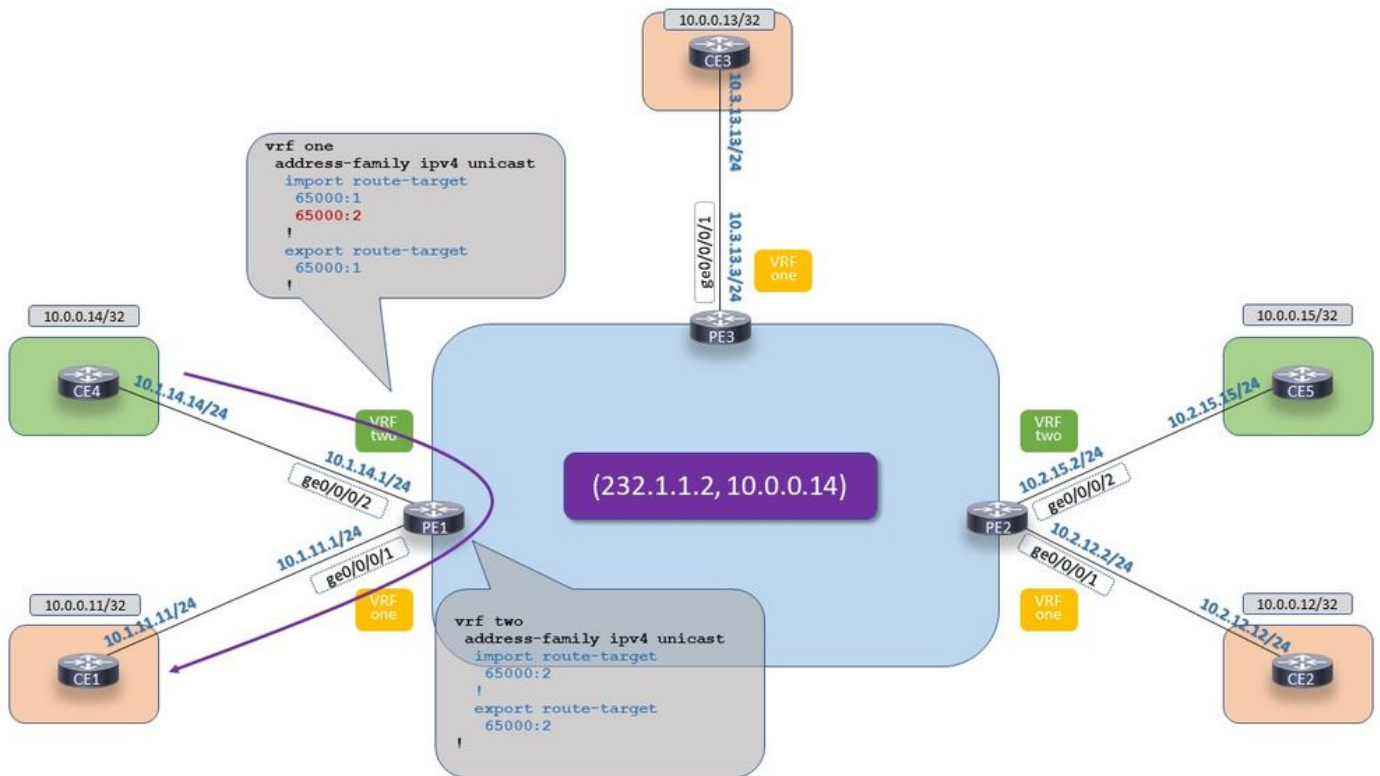
RP/0/0/CPU0:PE2#show mrib vrf two route 232.1.1.3 10.0.0.15

IP Multicast Routing Information Base

Entry flags: L - Domain-Local Source, E - External Source to the Domain,
C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle
CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet
MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary
MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN
Interface flags: F - Forward, A - Accept, IC - Internal Copy,
NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,
II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,
LD - Local Disinterest, DI - Decapsulation Interface
EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,
EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,
MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface
IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

```
(10.0.0.15,232.1.1.3) RPF nbr: 10.2.15.15 Flags: RPF EX
Up: 00:25:55
Incoming Interface List
  GigabitEthernet0/0/0/2 Flags: A, Up: 00:25:55
Outgoing Interface List
  Lmdttransport Flags: F LMI EX TR, Up: 00:25:55
```

يلحم تنارتسك | 2.4 لاثم



ةيخراللةكبشلا - 14 فيرعتلا فلم: IOS-XR لىع mVPN ةكبشلةيخراللةكبشلا ةيلحملا

يلحم تنارتسك | - Profile 14 ةروصوللا

لبقتسملا VRF لىل رصملا VRF نم رصملا راسم داريتس! بجي.

```
vrf one
address-family ipv4 unicast
import route-target
  65000:1
  65000:2
!
export route-target
  65000:1
!
```

```
vrf two
address-family ipv4 unicast
import route-target
  65000:2
!
export route-target
  65000:2
!
```

RP/0/0/CPU0:PE1#show route vrf one 10.0.0.14/32

Routing entry for 10.0.0.14/32

Known via "bgp 65000", distance 20, metric 0

Tag 65004, type external

Installed Nov 22 10:52:10.451 for 00:01:22

Routing Descriptor Blocks

10.1.14.14, from 10.1.14.14, BGP external

Nexthop in Vrf: "two", Table: "default", IPv4 Unicast, Table Id: 0xe0000011

Route metric is 0

No advertising protos.

RP/0/0/CPU0:PE1#show mrib vrf one route 232.1.1.2 10.0.0.14

IP Multicast Routing Information Base

Entry flags: L - Domain-Local Source, E - External Source to the Domain,

C - Directly-Connected Check, S - Signal, IA - Inherit Accept,

IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,

MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle

CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet

MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary

MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN

Interface flags: F - Forward, A - Accept, IC - Internal Copy,

NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,

II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,

LD - Local Disinterest, DI - Decapsulation Interface

EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,

EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,

MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface

IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

(10.0.0.14,232.1.1.2) RPF TID: 0xe0000011 Flags: RPF EX

Up: 1d21h

Incoming Interface List

GigabitEthernet0/0/0/2 Flags: A EX, Up: 00:02:07

Outgoing Interface List

GigabitEthernet0/0/0/1 Flags: F NS, Up: 1d21h

RP/0/0/CPU0:PE1#show pim vrf one rpf 10.0.0.14

Table: IPv4-Unicast-default

* 10.0.0.14/32 [20/0]

via VRF:two with rpf neighbor 10.0.0.1

RP/0/0/CPU0:PE1#show mrib vrf two route 232.1.1.2 10.0.0.14

IP Multicast Routing Information Base

Entry flags: L - Domain-Local Source, E - External Source to the Domain,

C - Directly-Connected Check, S - Signal, IA - Inherit Accept,

IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,

MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface handle

CD - Conditional Decap, MPLS - MPLS Decap, EX - Extranet

MoFE - MoFRR Enabled, MoFS - MoFRR State, MoFP - MoFRR Primary

MoFB - MoFRR Backup, RPFID - RPF ID Set, X - VXLAN

Interface flags: F - Forward, A - Accept, IC - Internal Copy,

NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,

II - Internal Interest, ID - Internal Disinterest, LI - Local Interest,

LD - Local Disinterest, DI - Decapsulation Interface

EI - Encapsulation Interface, MI - MDT Interface, LVIF - MPLS Encap,

EX - Extranet, A2 - Secondary Accept, MT - MDT Threshold Crossed,

MA - Data MDT Assigned, LMI - mLDP MDT Interface, TMI - P2MP-TE MDT Interface

IRMI - IR MDT Interface, TRMI - TREE SID MDT Interface

(10.0.0.14,232.1.1.2) RPF nbr: 10.1.14.14 Flags: RPF EX

Up: 00:02:47

Incoming Interface List

GigabitEthernet0/0/0/2 Flags: A, Up: 00:02:47

Outgoing Interface List

GigabitEthernet0/0/0/1 Flags: F NS EX, Up: 00:02:47

ةمچرتل هذه لوج

ةللأل تاي نقتل نم ةومچم مادختساب دن تسمل اذه Cisco تچرت
ملاعلاء انءمچ يف نيمدختسمل معدى وتحم مي دقتل ةيرشبل او
امك ةقيد نوك تنل ةللأل ةمچرت لصف أن ةظحال مچرئ. ةصاغل مه تلبل
Cisco يلخت. فرتحم مچرت مامدقي يتل ةيفارتهال ةمچرتل عم لاعل وه
ىل إامءاد ةوچرلاب يصوت وتامچرتل هذه ةقد نع اهتيلوئسم Cisco
Systems (رفوتم طبارل) يلصلأل يزىلچنل دن تسمل