

# Configurar e solucionar problemas da Extranet mVPN no Cisco IOS-XR

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## Introduction

Este documento descreve a Extranet mVPN e fornece exemplos de configuração no Cisco IOS®XR.

## Prerequisites

## Requirements

Não existem requisitos específicos para este documento.

## Componentes Utilizados

Este documento é específico do Cisco IOS XR, mas não está restrito a uma versão de software ou hardware específicos.

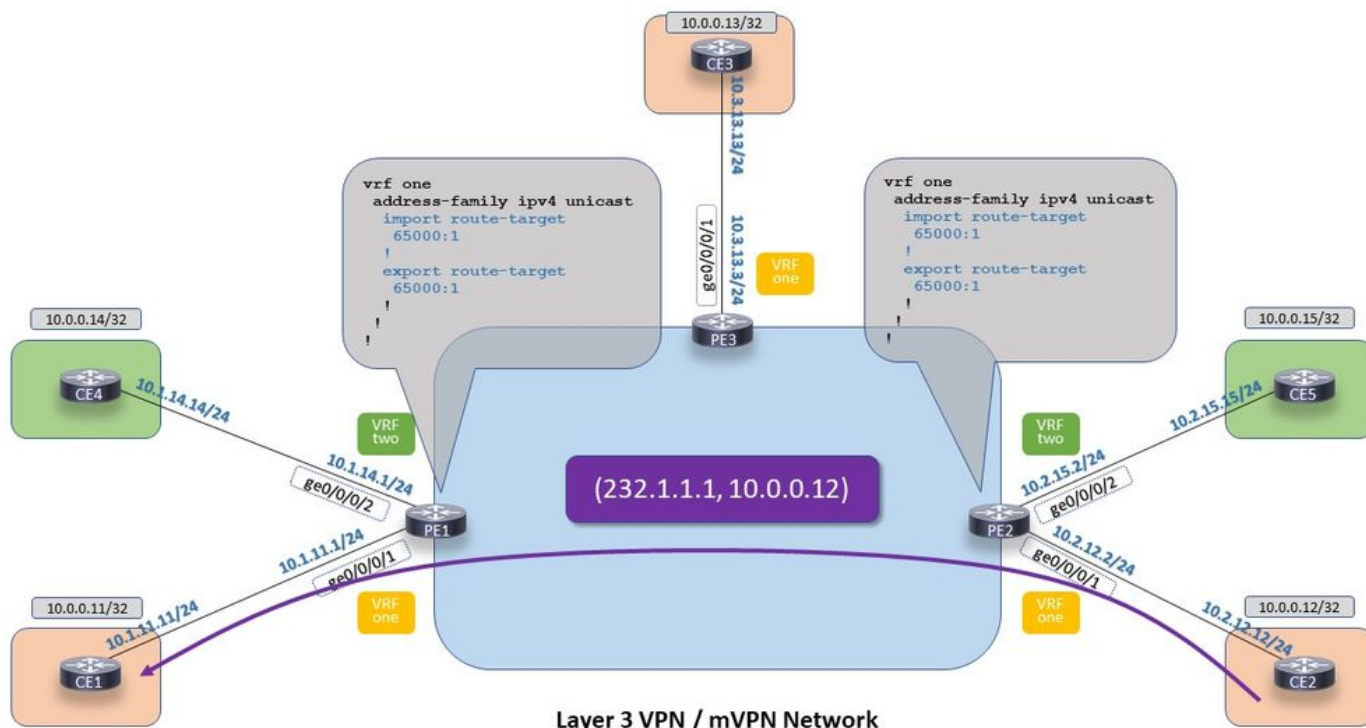
The information in this document was created from the devices in a specific lab environment. All of

the devices used in this document started with a cleared (default) configuration. Se a rede estiver ativa, certifique-se de que você entenda o impacto potencial de qualquer comando.

## Introdução ao mVPN

O multicast é suportado em VPNs habilitadas para multicast (mVPN). O mVPN usa os mesmos conceitos de Virtual Routing and Forwarding (VRF) que as redes VPN de Camada 3 unicast usam.

Esta imagem mostra o encaminhamento multicast intra-VRF (usando o perfil 0).



Extranet mVPN no IOS-XR: Fluxo de pacote multicast para MVRF intranet

Imagem 1. Fluxo de pacote multicast para MVRF intranet

O multicast depende do RPF (Reverse Path Forwarding). Isso também se aplica ao tráfego multicast entre VRF. Isso significa que, para que o multicast flua de um VRF para outro VRF, é necessário ter um VRF para RPF para a origem do tráfego multicast para outro VRF. Portanto, a rota para a origem multicast precisa estar disponível na tabela de roteamento VRF do receptor no roteador PE. Há duas maneiras de garantir o sucesso do RPF no contexto do VRF.

1. Baseado em Routing Information Base (RIB). Isso significa que a rota de um VRF - o VRF de origem - precisa ser vazada no outro VRF - o VRF do receptor. Isso será obtido com o uso da função de importação e exportação para RT (Route-Targets).
2. Baseado em RPL (Route Policy Language). Isso significa que o RPF é bem-sucedido graças a uma política de rota forçando o RPF para um VRF e/ou interface (em outro VRF).

Um roteador PE não anuncia novamente uma rota VPN. Se um roteador PE recebeu uma rota VPN de um roteador PE remoto e a importou para o VRF 1, ele não poderá exportar esse prefixo de VPN do VRF 1 para o VRF 2 localmente. Não importa se há uma rota de importação de destino de rota do VRF 1 para o VRF 2 localmente neste roteador PE ou não, a importação para o VRF 2 não ocorre.

O multicast tem tudo a ver com o sucesso do RPF. Fique sempre de olho no RPF. Para que o multicast extranet funcione, o RPF deve ser de um VRF a outro, do receptor ao VRF de origem. Portanto, deve haver uma rota unicast para a origem no VRF receptor de volta para o VRF de origem.

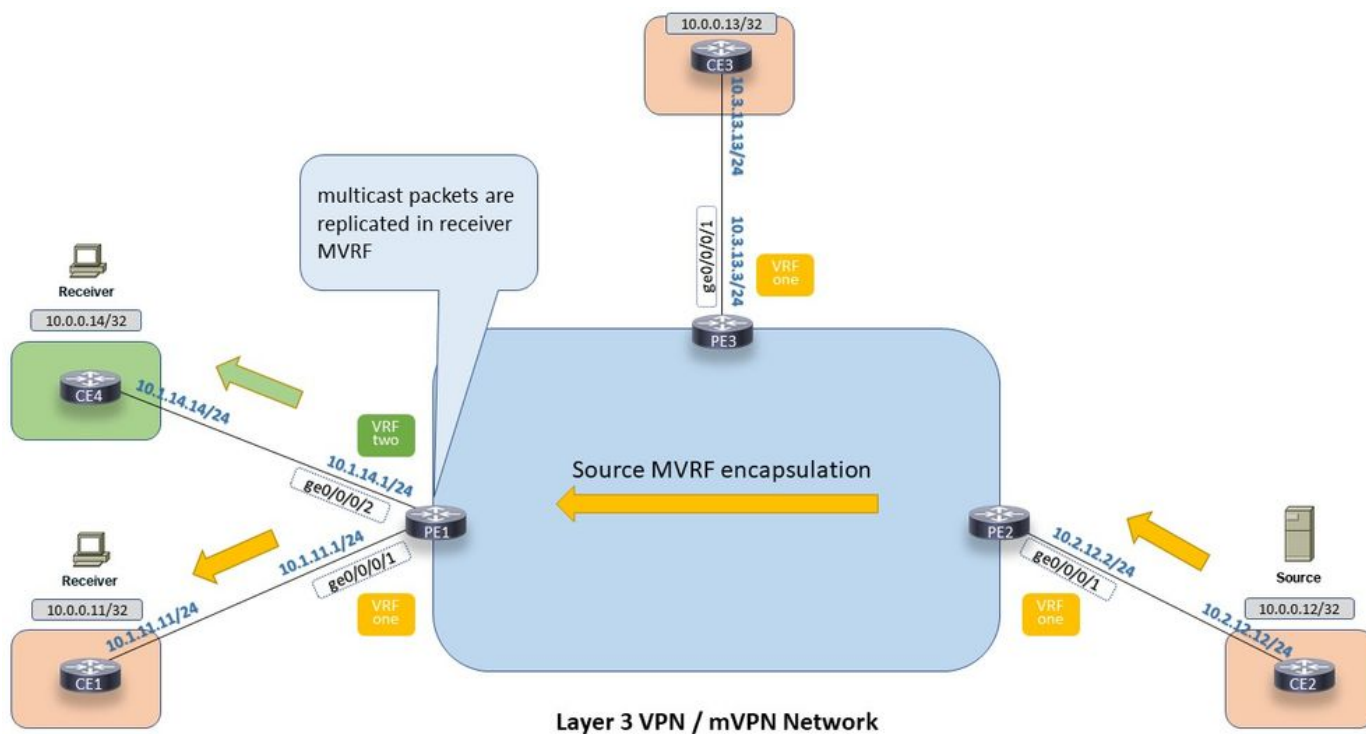
Lmdt: Árvore de distribuição multicast rotulada

## Esquemas

O Cisco IOS XE também suporta mVPN extranet. No passado, o IOS (-XE) introduziu dois esquemas para alcançar o mVPN extranet. São referidas como opção 1 e opção 2. O IOS-XR suporta extranet com os mesmos esquemas.

Opção 1: O Multicast Virtual Routing and Forwarding (MVRF) de origem está no MVRF receptor. Isso significa que o VRF (VRF de origem) no roteador PE de entrada para o tráfego multicast também é configurado no roteador PE de saída com os destinos de rota apropriados.

Veja a Imagem 2. Mostra o fluxo de pacotes multicast para a Opção 1.



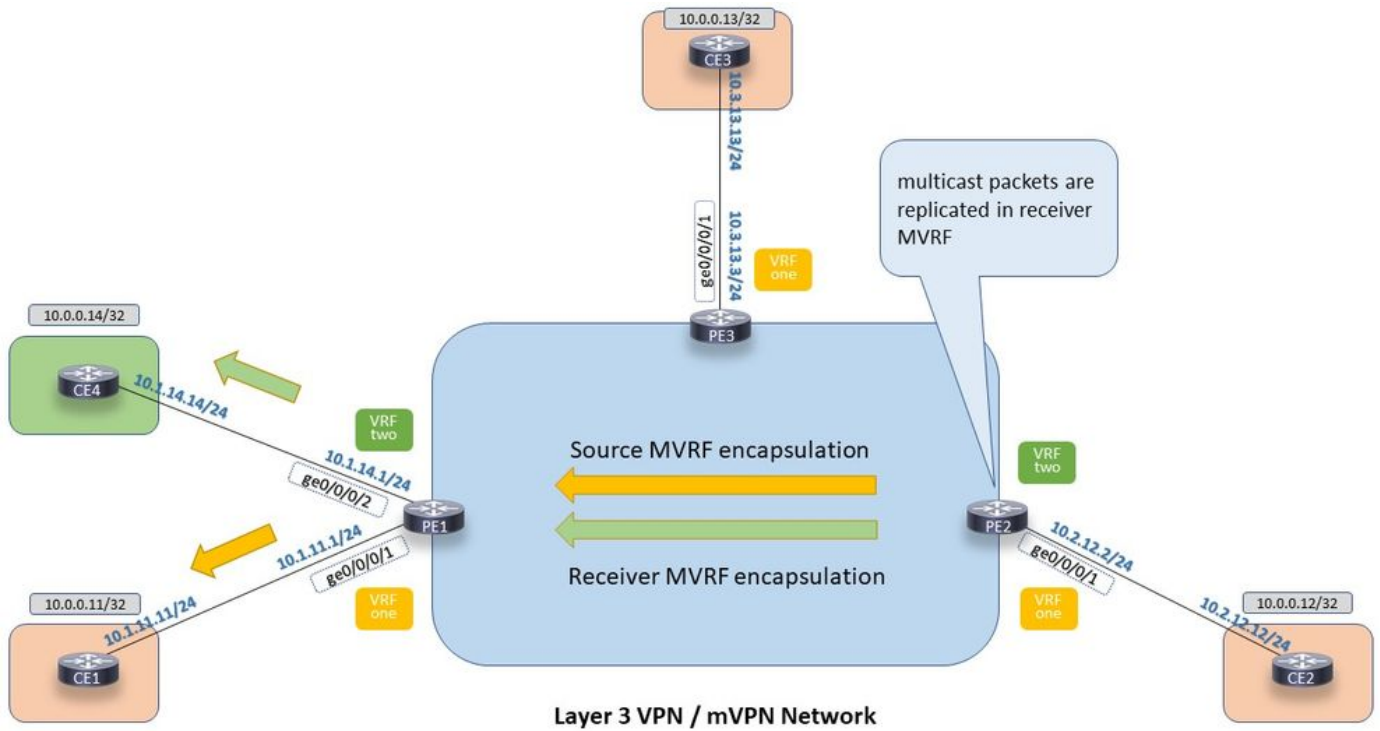
Extranet mVPN no IOS-XR: Fluxo de pacote multicast para a opção de extranet 1

Imagem 2. Fluxo de pacote multicast para a Opção de extranet 1.

O tráfego multicast atravessa a rede central e usa o encapsulamento do MVRF de origem.

Opção 2: O receptor MVRF está no MVRF de origem. Isso significa que o VRF (receptor VRF) no roteador PE de saída para o tráfego multicast também é configurado no roteador PE de entrada com os destinos de rota apropriados.

Veja a Imagem 3. Mostra o fluxo de pacotes multicast para a Opção 2.



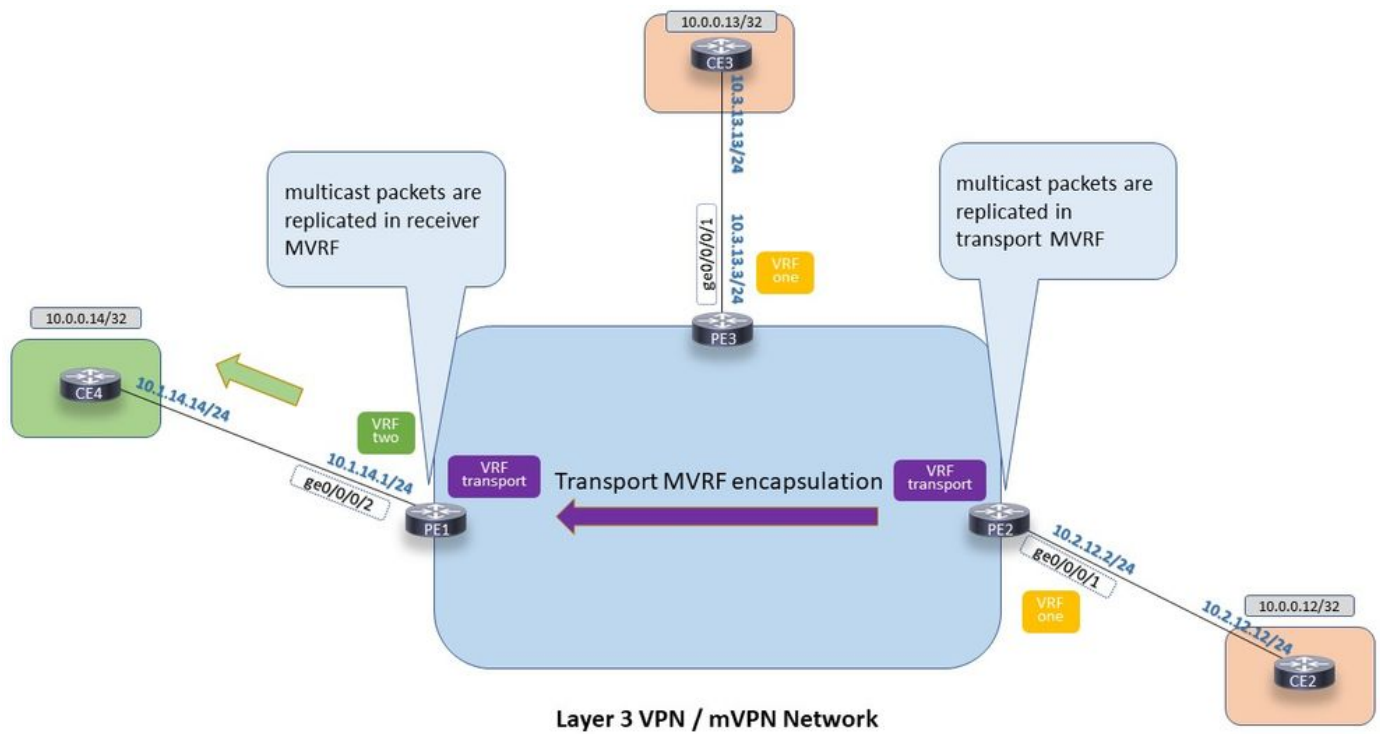
Extranet mVPN no IOS-XR: Fluxo de pacote multicast para a Opção de extranet 2

Imagem 3. Fluxo de pacote multicast para a Opção de extranet 2.

O tráfego multicast atravessa a rede central e usa o encapsulamento do MVRF de origem e do MVRF de receptor. Portanto, o tráfego multicast usa duas vezes a quantidade de largura de banda na rede central.

Há uma terceira opção, uma solução híbrida entre a Opção 1 e a Opção 2.

Opção 3: Um MVRF de transporte é usado. O roteador de entrada PE extranets o tráfego multicast do VRF de origem para o VRF de transporte. O roteador PE de saída extranet o tráfego multicast do VRF de transporte para o VRF receptor. Esse MVRF de transporte não tem interfaces para o cliente associadas a ele.



Extranet mVPN no IOS-XR: Fluxo de pacote multicast para a extranet usando um terceiro VRF, o VRF de transporte

Imagem 4. Fluxo de pacote multicast para extranet usando um terceiro VRF, o VRF de transporte.

## Visão geral do suporte

### Suporte da Opção 1

Todos os perfis têm suporte baseado em RPL.

Somente os perfis que usam o protocolo multicast core-tree (perfil 0, 3 e 11) suportam mVPN extranet baseada em RIB.

### Suporte da Opção 2

Todos os perfis suportam suporte baseado em RPL e em RIB, exceto os perfis que usam a sinalização do cliente com BGP (por exemplo, perfis 2, 11, ...). Estes últimos suportam apenas a opção 2 de forma especial. O exemplo 2.2 ilustra isso.

Procure aqui uma visão geral e uma configuração para os diferentes perfis: [Configurar perfis mVPN no Cisco IOS-XR](#)

## Examples

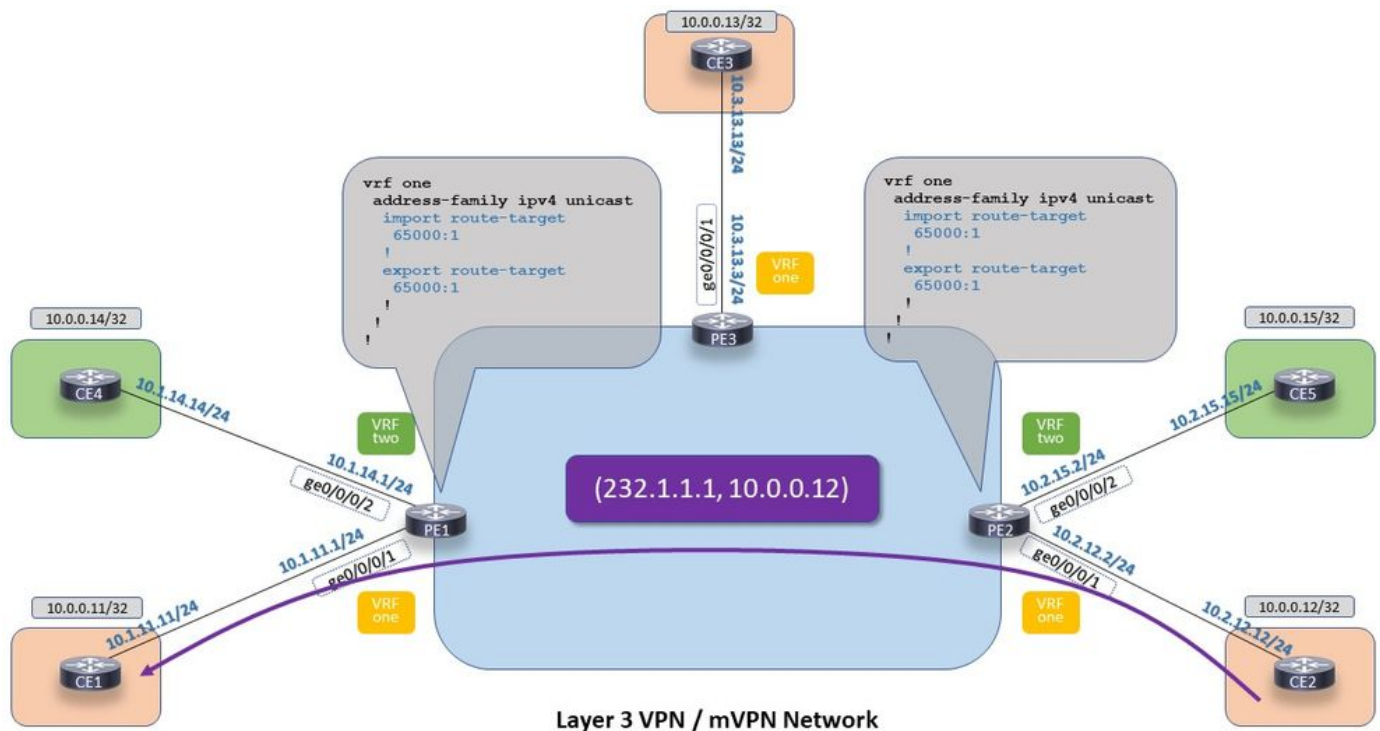
Observe as flags EX ou Extranet nas entradas Multicast RIB (MRIB). Eles estão presentes no VRF de origem e de receptor, nas entradas multicast e nas interfaces.

### Perfil 0

O perfil 0 usa o MDT padrão, com sinalização de multicast PIM na parte inferior e na sobreposição (contexto VRF).

Esse perfil suporta as Opções 1 e 2 (e, portanto, 3).

A imagem 5 mostra o tráfego multicast intra-VRF, VRF 1 para VRF 1.



Extranet mVPN no IOS-XR: Perfil 0 - Fluxo de pacote multicast para MVRF intranet

Imagem 5 Perfil 0 - Fluxo de pacote multicast para MVRF intranet

Configuração do perfil 0.

```
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
!
!
```

Observe que o perfil 0 é o único perfil que não exige um comando de topologia RPF.

Como alternativa, você pode configurar o comando de topologia RPF para o perfil 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
!
```

A saída da entrada MRIB na saída PE 1 é semelhante a esta:

```
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
```

O RPF aponta para o tom mdtone, que é a **Árvore de Distribuição Multicast (MDT - Multicast Distribution Tree)** para o VRF um.

```
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

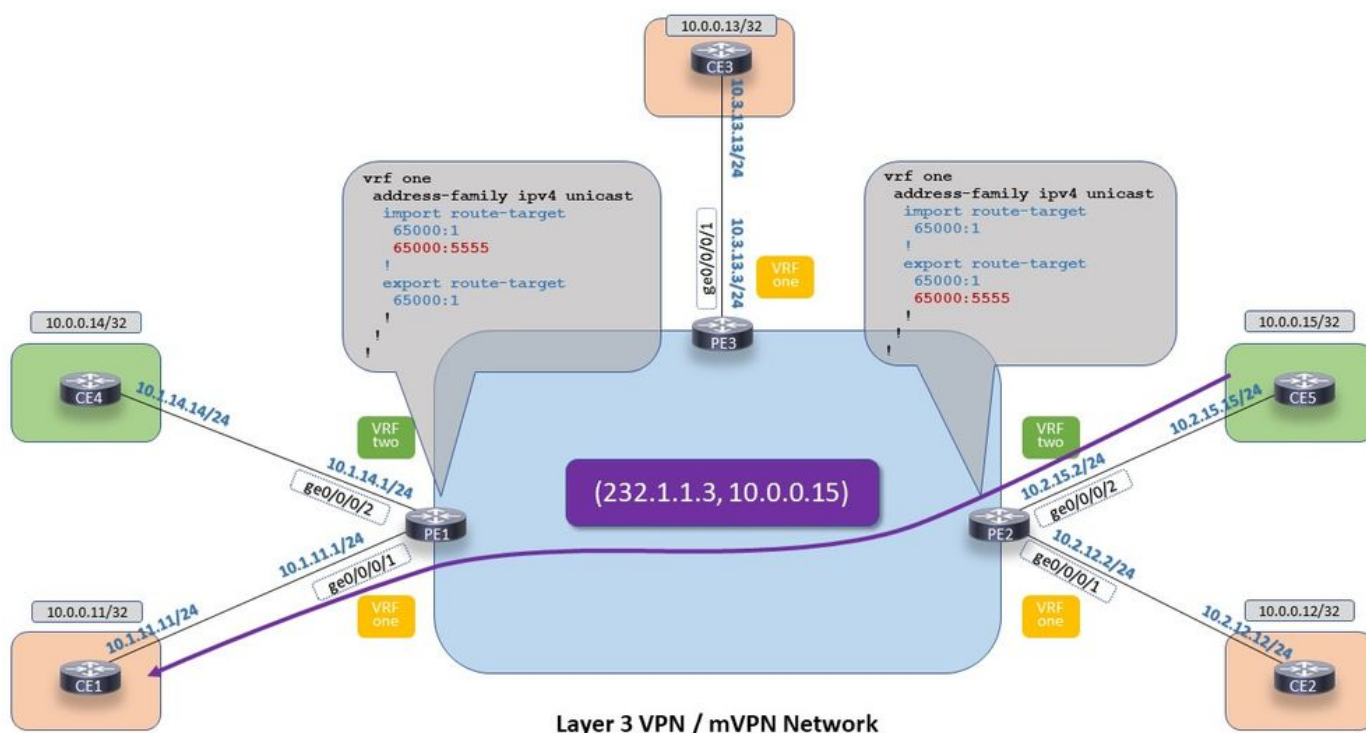
Table: IPv4-Unicast-default

\* 10.0.0.12/32 [20/0]

via GigabitEthernet0/0/0/1 with rpf neighbor 10.2.12.12

### Exemplo 1.1 . Opção 1. O MVRF de origem está no MVRF do receptor

O perfil 0 suporta a opção 1 baseada em RIB. A rota de volta à origem precisa estar presente no VRF receptor.



Extranet mVPN no IOS-XR: Perfil 0 - Opção 1 O MVRF de origem está no MVRF do receptor

Imagem 6. Perfil 0 - Opção 1. O MVRF de origem está no receptor MVRF

A Imagem 6 mostra que o roteador PE de entrada, PE2, anuncia a rota de origem do VRF dois, o VRF de origem, com rota-destino 65000:555. O roteador PE de saída, PE1, importa as rotas com esse destino de rota para o VRF um, o VRF receptor.



O VRF um e o VRF dois usam o perfil 0.

```
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
  !
  !
!
```

O roteador PE de entrada, PE2, exporta a rota de origem com rota-destino 65000:5555. O roteador PE de saída, PE1, importa essa rota com o rota-alvo 65000:5555 no VRF um.

```
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

Como o roteador PE de saída, PE1, sabe que o RPF deve ocorrer no VRF dois?

A rota unicast BGP vpn4 em VRF se parece com esta:

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

Esse diferenciador de rota está vinculado a um VRF. O PE1 localiza o endereço do grupo multicast usado para este RD (Route Distinguisher) por uma pesquisa do RD na tabela mdt ipv4 da família de endereços BGP.

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

Esse endereço de grupo 239.1.1.2 é o endereço de grupo usado pelo VRF dois. Cada roteador PE, que inclui este roteador PE1, tem esse grupo configurado como o endereço de grupo MDT padrão para VRF dois.

```
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
```

O tráfego multicast usa o padrão ou um MDT de dados do VRF dois para cruzar a rede central.

```
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

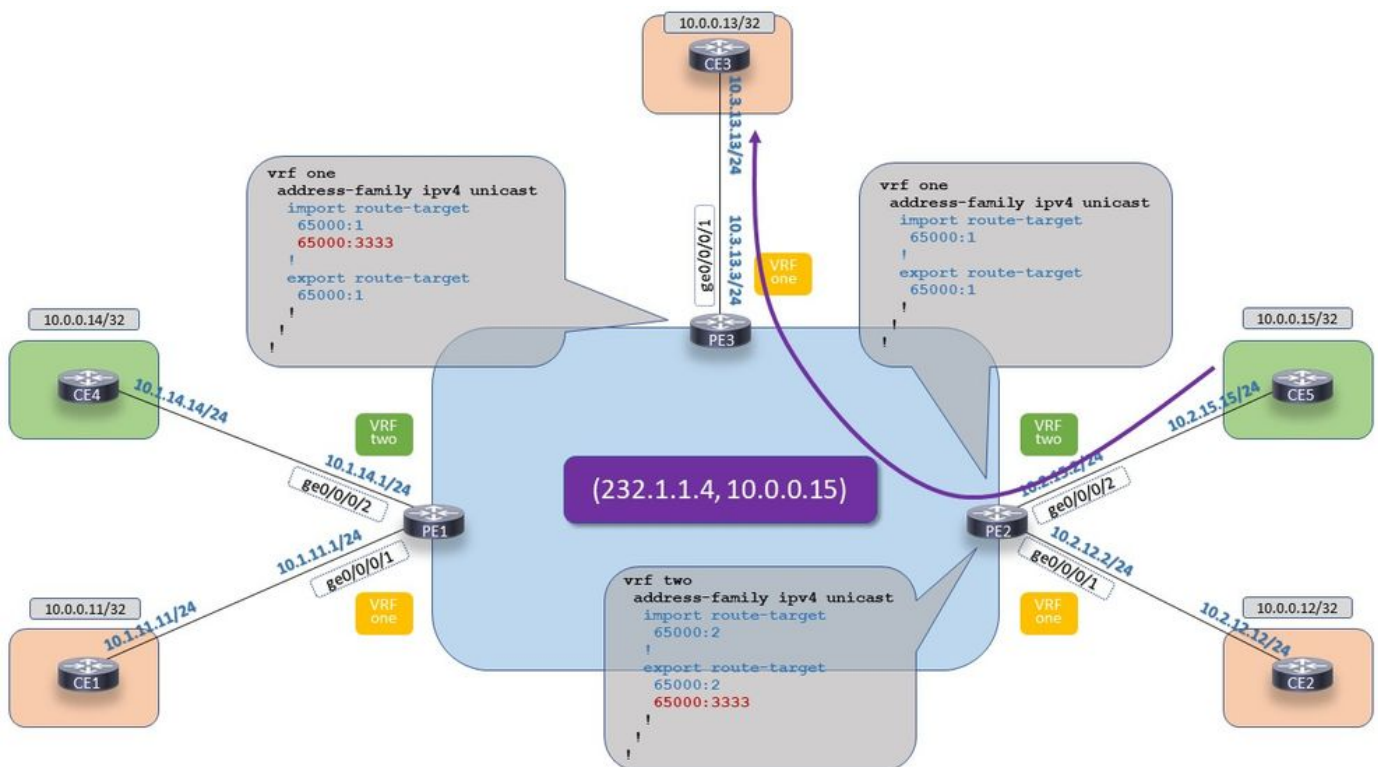
mDttwo Flags: F MI, Up: 00:02:49

Não há estado para (10.0.0.15, 232.1.1.3) em PE de entrada, PE2, em VRF um, se VRF um estiver presente mesmo no roteador PE de entrada, PE2.

O método alternativo ao método baseado em RIB é o método baseado em RPL. Isso significa que uma política de rota é usada para alterar o RPF. Veja o exemplo 2.1 para um exemplo dessa política de rota RPF.

### Exemplo 1.2 . Opção 2. O MVRF do receptor está no MVRF de origem

Esta é a abordagem baseada em RIB.



Extranet mVPN no IOS-XR: Perfil 0 - Opção 2 O receptor MVRF está no MVRF de origem

Image 7 Profile 0 - Option 2 (Perfil de imagem 0 - Opção 2) O receptor MVRF está no MVRF de origem

Um Route-Target é usado para importar duas rotas de VRF para VRF uma no PE receptor, PE3.

O PE de entrada, PE2, precisa de uma rota estática no VRF um (VRF de receptor) apontado para o VRF dois (VRF de origem) para que o RPF seja bem-sucedido no roteador PE de entrada, PE2.

PE3:

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

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

PE2:

```
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
!
```

Não há necessidade de redistribuir essa rota estática no BGP. Essa rota é anunciada no VRF dois, o VRF de origem. O roteador PE de saída, PE3, recebe essa rota porque é anunciado pelo roteador PE de entrada, PE1, no VRF dois com Route-Target 65000:3333, que é importado para o VRF um em PE3. A rota estática é necessária para que o RPF seja bem-sucedido em VRF no roteador PE de entrada, PE2.

O tráfego multicast usa o MDT do VRF um para cruzar a rede central.

```
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

**O PE2 tem um mdtone de interface de saída no VRF um para a entrada MRIB, a interface MDT do VRF um.**

RP/0/0/CPU0:PE2#show mrrib 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
```

O PE2 tem um tom de interface de saída também no VRF dois para a entrada MRIB, a interface MDT do VRF um.

```
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
```

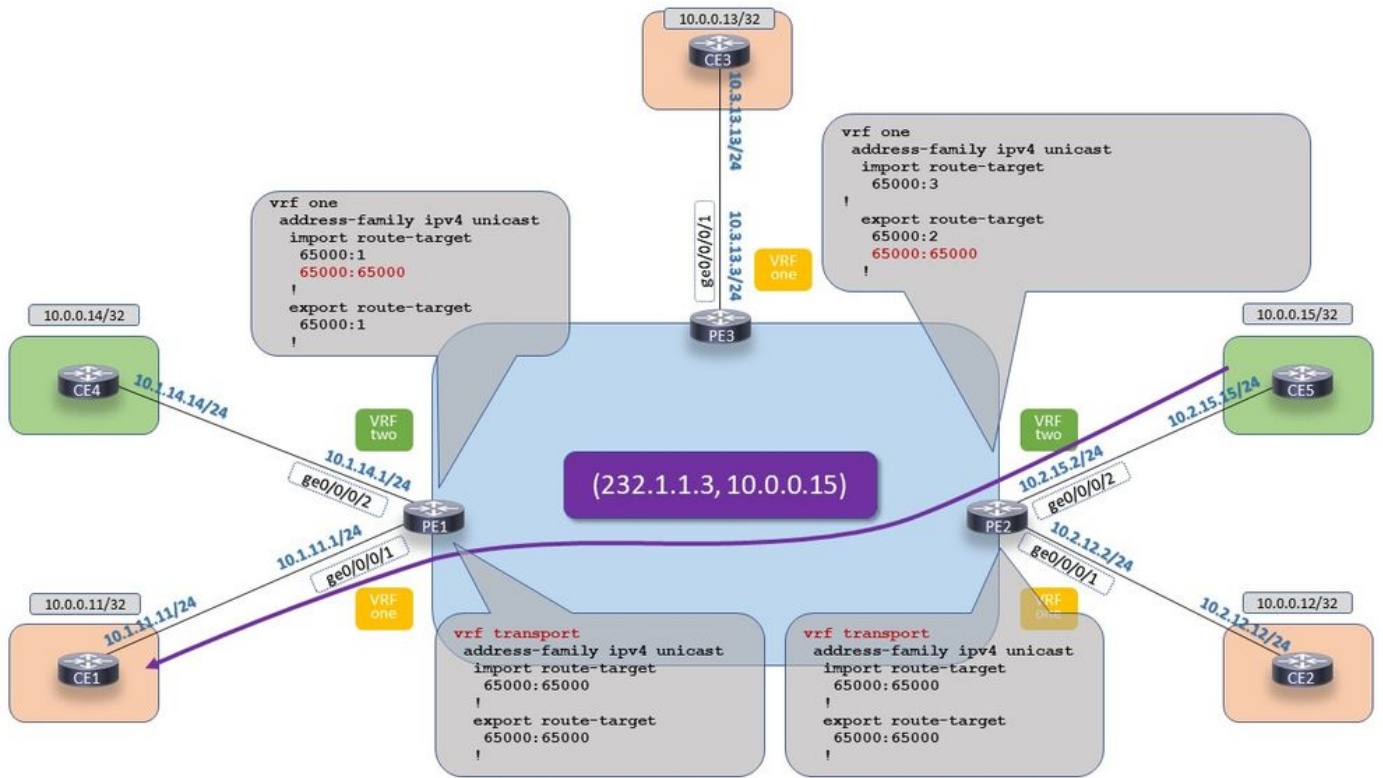
```
RP/0/0/CPU0:PE2#show pim vrf one rpf 10.0.0.15
```

```
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
```

### Exemplo 1.3 . Opção 3. Um MVRF de transporte é usado



## Extranet mVPN no IOS-XR: Perfil 0 - Opção 3 Um MVRF de transporte é usado

Imagem 8. Perfil 0 - Opção 3 Um MVRF de transporte é usado

O MVRF de transporte não precisa de nenhuma interface. No entanto, tudo o resto precisa estar lá: a configuração do VRF, a configuração do BGP, a configuração do roteamento multicast e a configuração do PIM do roteador.

A configuração da opção 1 está no PE de saída, PE1 e a configuração da opção 2 está no PE de entrada, PE2.

PE1:

```
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:

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 232.1.1.3
!
```

```
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
```

A rota para a origem deve ser conhecida no transporte VRF no roteador PE de saída.

```
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.
```

PE de entrada, 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

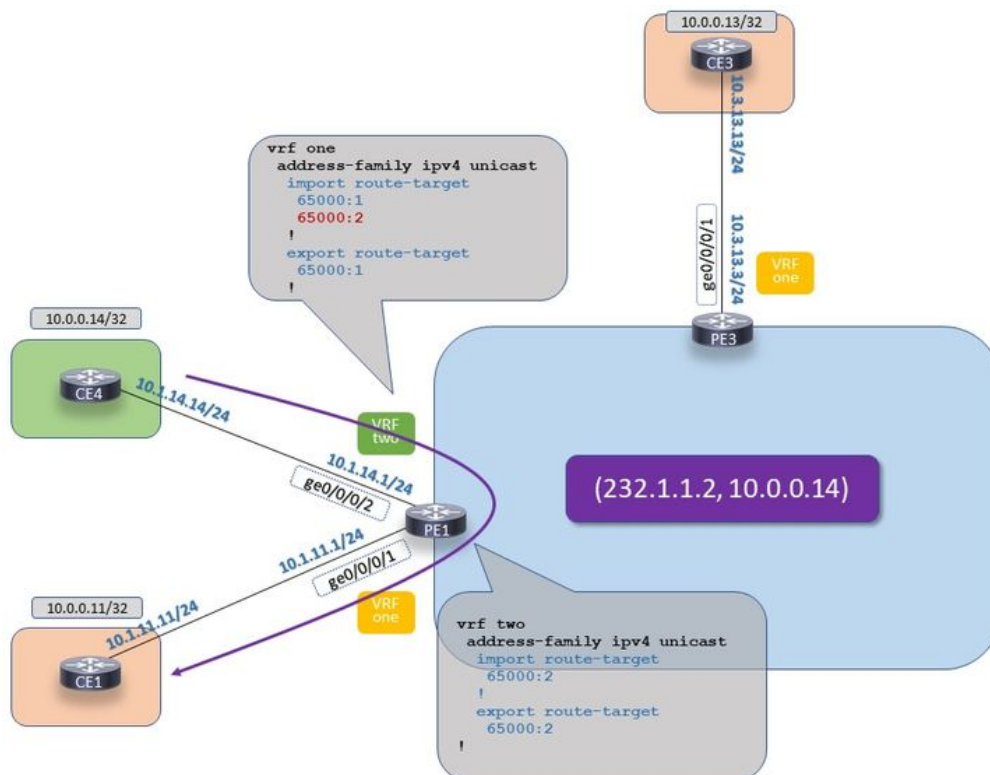
```
(10.0.0.15,232.1.1.3) RPF TID: 0xe0000011 Flags: RPF EX
Up: 00:11:44
Incoming Interface List
  GigabitEthernet0/0/0/2 Flags: A EX, Up: 00:11:44
Outgoing Interface List
  mdtransport Flags: F NS MI, Up: 00:11:44
```

```
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
```

### Exemplo 1.4 . Extranet local

Há apenas um roteador PE envolvido. Ter uma rota de volta no VRF receptor para o VRF de origem é o único requisito aqui para a solução baseada em RIB.

Uma solução é fazer com que o VRF um (VRF de origem) importe as rotas do VRF dois (VRF de receptor) usando o Route-Target apropriado.



Extranet mVPN no IOS-XR: Perfil 0 - Extranet local

Imagem 9. Perfil 0 - Extranet local

PE1:

```
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

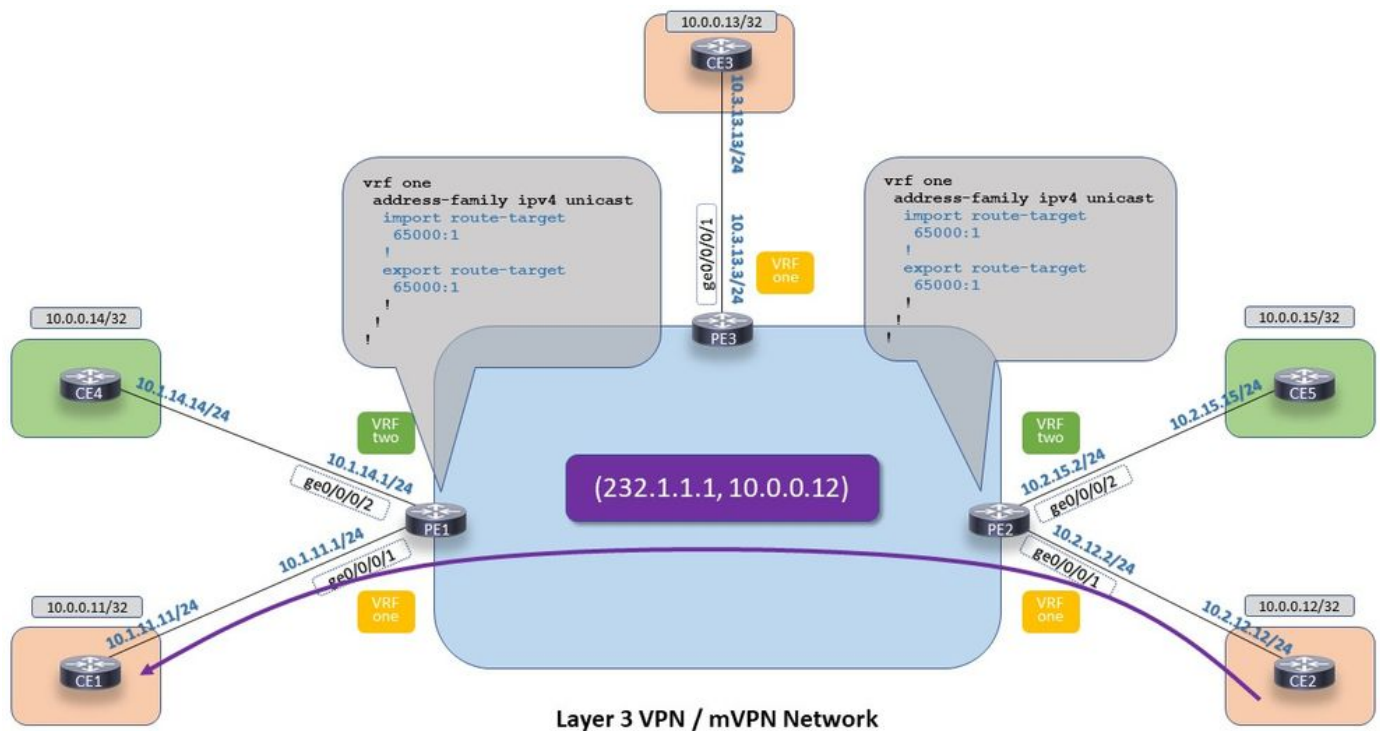
## Perfil 14

O perfil 14 usa MDT particionado, com sinalização multicast mLDP na parte inferior e sinalização BGP (cliente) na sobreposição (contexto VRF).

Este perfil suporta a opção 1.

As Opções 2 e 3 podem ser feitas para trabalhar com um truque de roteamento.

A imagem 10 mostra o tráfego multicast intra-VRF, VRF um para VRF um.



## Extranet mVPN no IOS-XR: Perfil 14 - Tráfego multicast intra-VRF

### Perfil de imagem 10 14 - Tráfego multicast intra-VRF

A saída da entrada MRIB na saída PE 1 é semelhante a esta:

```
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

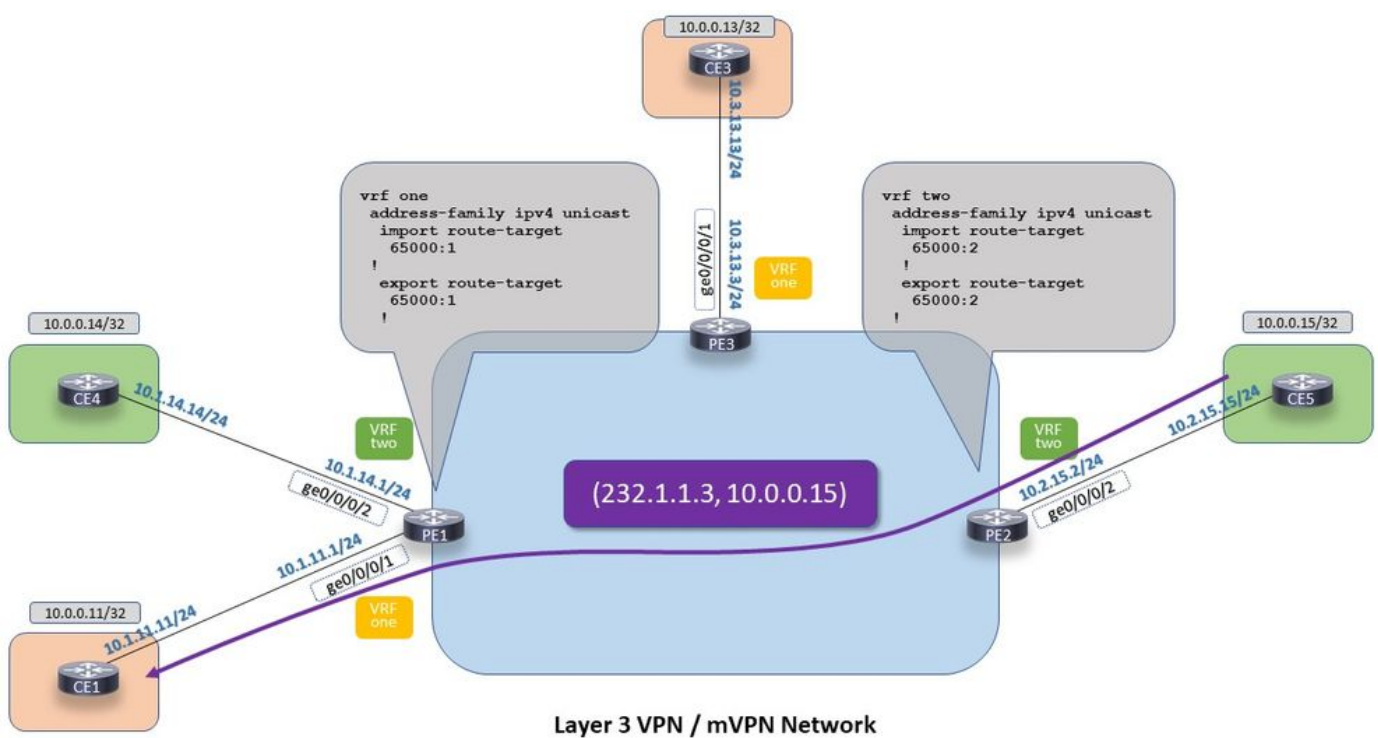
```
* 10.0.0.12/32 [200/0]
  via Lmdtone with rpf neighbor 10.0.0.2
```

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
!
```

### Exemplo 2.1 . Opção 1. O MVRF de origem está no MVRF do receptor



Extranet mVPN no IOS-XR: Perfil 14 - Opção 1 O MVRF de origem está no MVRF receptor

Image 11 Profile 14 - Option 1 (Perfil de imagem 14 - Opção 1) O MVRF de origem está no receptor MVRF

O RPF deve ser alterado no VRF receptor no PE receptor.

As instruções de importação e exportação permanecem as mesmas para o VRF um e dois.

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

```

!
!
router pim
 vrf two
 address-family ipv4
  rpf topology route-policy profile-14
  mdt 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
!

```

O RPF em VRF um para o grupo multicast 232.1.1.3 pontos para o VRF dois.

```
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

```

**Note:** Não há interface de entrada para a entrada MRIB no VRF um. Isso não tem impacto no encaminhamento de tráfego.

```

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

```



**Note:** O RPF falha no VRF um no PE de saída. Isso não tem impacto no encaminhamento de tráfego.

```
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
```

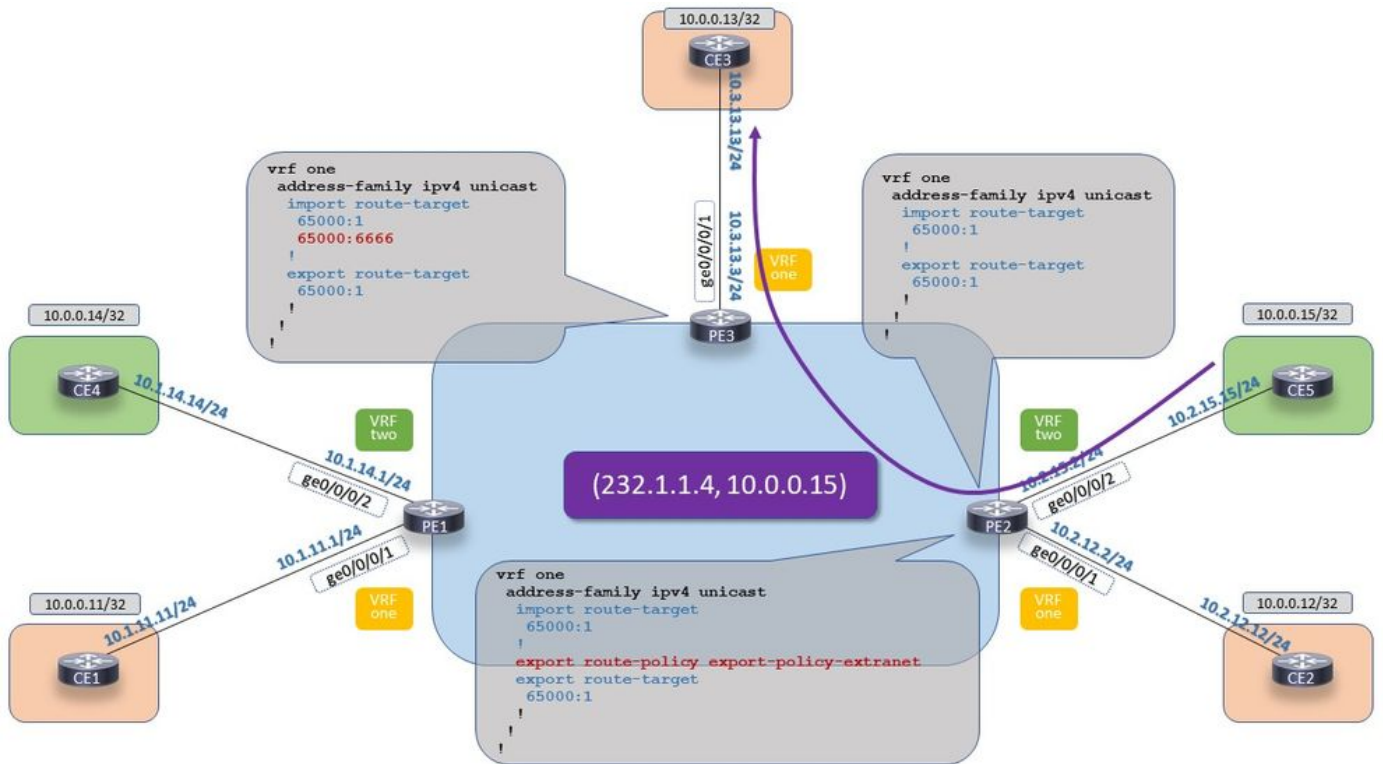
Observe que a interface GE0/0/0/1 está no VRF um.

## Exemplo 2.2 . Opção 2. O MVRF do receptor está no MVRF de origem

Essa solução não pode funcionar manipulando as instruções de importação e exportação para os destinos da rota ou por uma alteração da política de rota usada somente pelo RPF.

Um truque ajuda a corrigir o RPF no roteador PE de entrada. O truque é adicionar uma rota estática no VRF do receptor e apontá-la para o VRF de origem no roteador PE de entrada.

A rota estática anuncia o endereço de origem no VRF receptor. Essa rota estática é marcada com um novo Route-Target exclusivo no BGP para que essa rota possa ser diferenciada da mesma rota anunciada no VRF de origem. Isso evita a importação da rota estática do VRF receptor no PE de entrada para o VRF receptor dos outros roteadores PE, o que causa um problema de roteamento.



Extranet mVPN no IOS-XR: Perfil 14 - Opção 2 O receptor MVRF está no MVRF de origem

Imagem 12 Perfil 14 - Opção 2 O receptor MVRF está no MVRF de origem

PE2:

```

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
```

**O PE de saída vê a rota BGP com o destino da rota definido no PE de entrada.**

```
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
```

**O PE de saída tem a entrada RPF correta para o PE de entrada, no VRF de origem, no VRF um.**

```
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

**O PE de entrada tem as entradas extranet no VRF de origem e de receptor. VRF de origem:**

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

**VRF do receptor:**

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

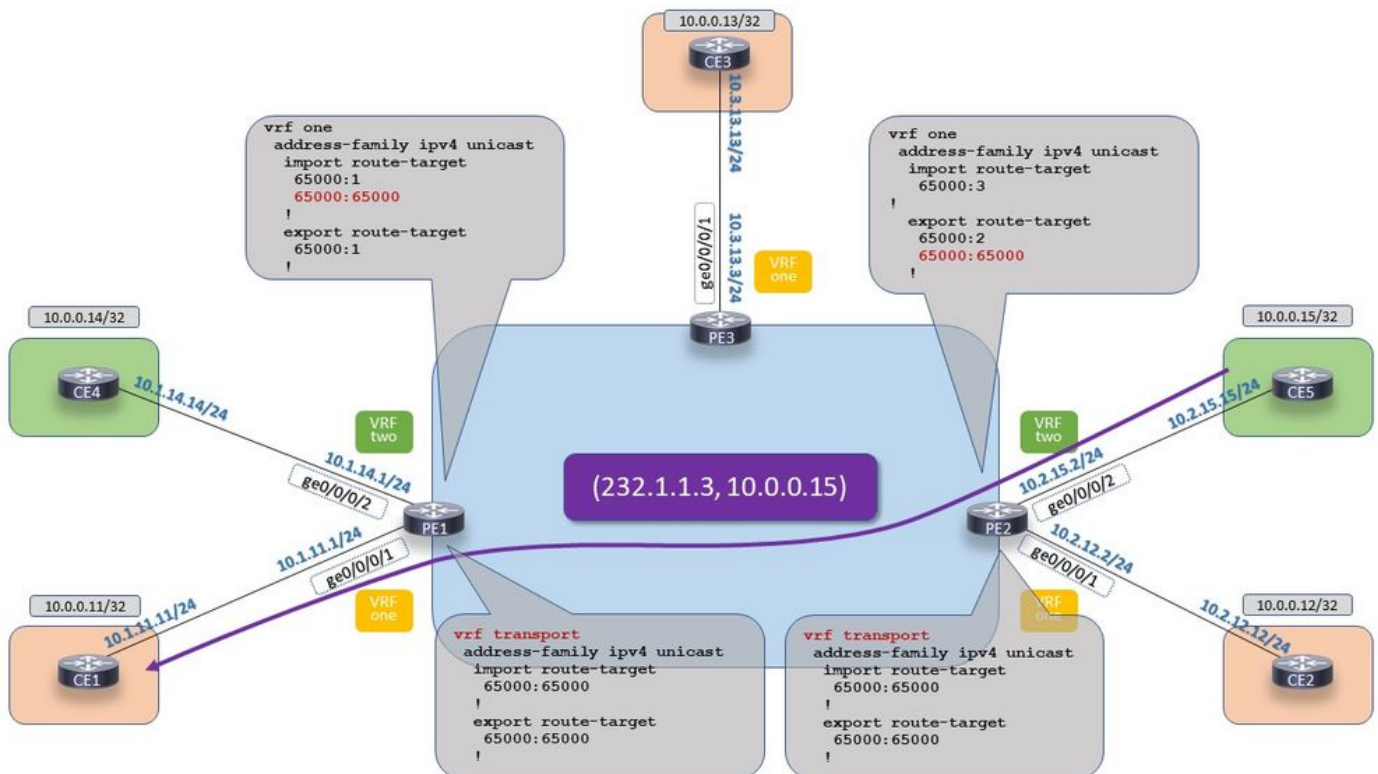
Incoming Interface List

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

Outgoing Interface List

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

### Exemplo 2.3 . Opção 3. Um MVRF de transporte é usado



Extranet mVPN no IOS-XR: Perfil 14 - Opção 3 Um MVRF de transporte é usado

Imagem 13 Perfil 14 - Opção 3 Um MVRF de transporte é usado

O VRF de transporte não precisa de nenhuma interface. No entanto, tudo o resto precisa estar lá: a configuração do VRF, a configuração do BGP, a configuração do roteamento multicast e a configuração do PIM do roteador.

A configuração da opção 1 está no PE de saída, PE1 e a configuração da opção 2 está no PE de entrada, PE2. 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:

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
```

**Note:** Não há interface de entrada para a entrada MRIB no VRF um. Isso não tem impacto no encaminhamento de tráfego.

```
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
```

**Note:** O RPF falha no VRF um no PE de saída. Isso não tem impacto no encaminhamento de tráfego.

```
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,

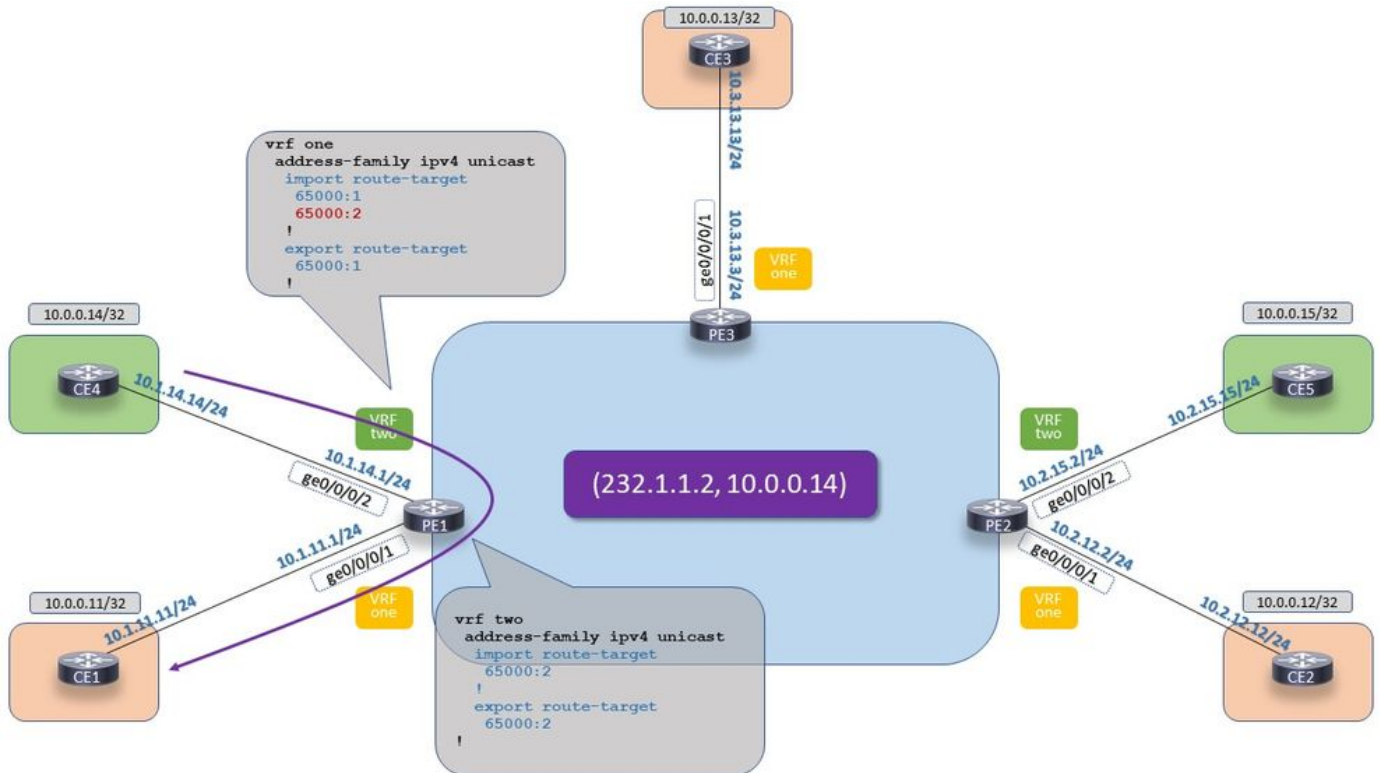
NS - Negate Signal, DP - Don't Preserve, SP - Signal Present,

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
```

## Exemplo 2.4 . Extranet local



Extranet mVPN no IOS-XR: Perfil 14 - Extranet local

Imagem 14 Perfil 14 - Extranet Local

A rota de origem do VRF de origem deve ser importada para o VRF receptor.

```
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