

在Cisco IOS-XR上配置mVPN外聯網並對其進行故障排除

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簡介

本檔案介紹Extranet mVPN，並提供Cisco IOS[®] XR中的配置範例。

必要條件

需求

本文件沒有特定需求。

採用元件

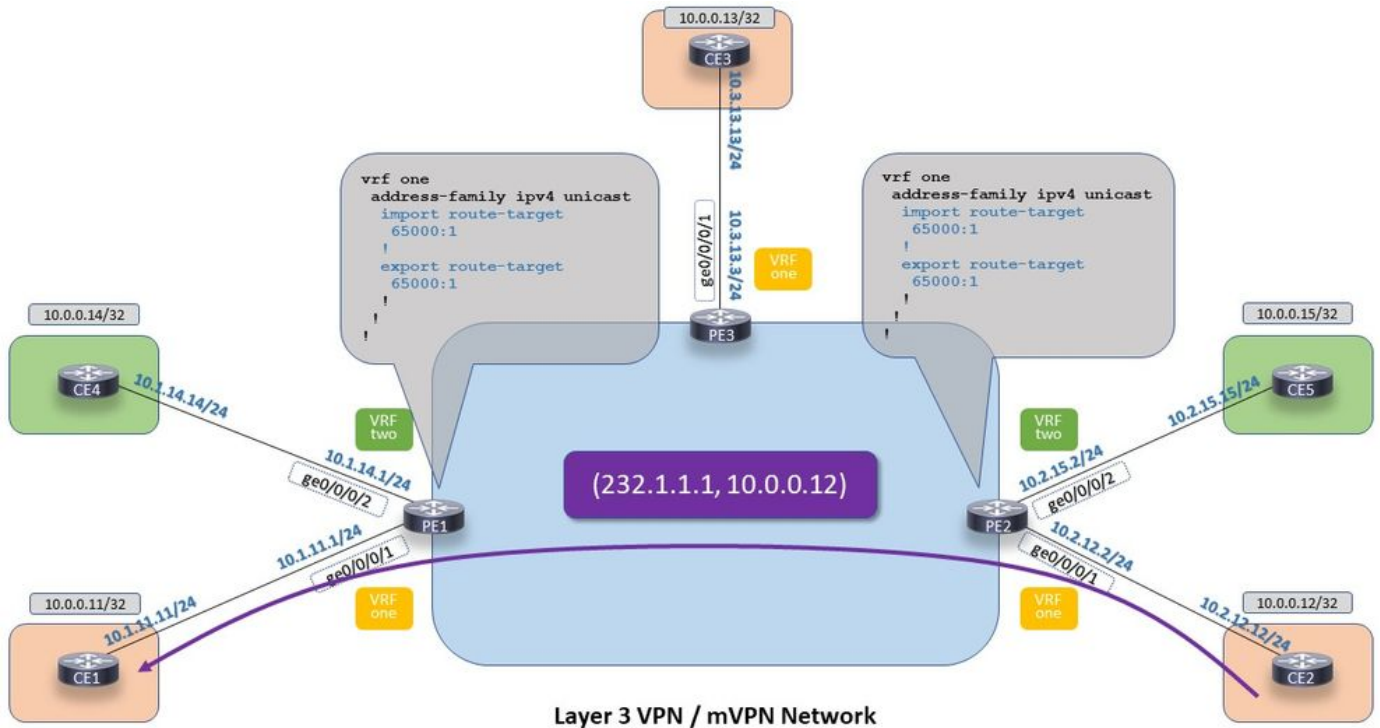
本檔案是Cisco IOS XR特有的，但不限於特定軟體版本或硬體。

本文中的資訊是根據特定實驗室環境內的裝置所建立。文中使用到的所有裝置皆從已清除（預設）的組態來啟動。如果您的網路運作中，請確保您瞭解任何指令可能造成的影響。

mVPN簡介

支援組播的VPN(mVPN)支援組播。mVPN使用與單播第3層VPN網路相同的虛擬路由和轉發(VRF)概念。

此圖顯示VRF內多點傳送轉送(使用設定檔0)。



IOS-XR上的mVPN外聯網：Intranet MVRF的組播資料包流

圖1. Intranet MVRF的組播資料包流

組播依賴於反向路徑轉發(RPF)。這也適用於VRF間多點傳送流量。這意味著為了使組播從一個VRF流向另一個VRF，需要有一個VRF到RPF作為到另一個VRF的組播流量的源。因此，組播源的路由需要在PE路由器上的接收器VRF路由表中可用。有兩種方法可以確保RPF在VRF環境中成功。

1. 基於路由資訊庫(RIB)。這意味著來自一個VRF(源VRF)的路由需要在另一個VRF(接收器VRF)中洩漏。這可以通過使用路由目標(RT)的匯入和匯出功能來實現。
2. 基於路由策略語言(RPL)。這表示由於路由策略強制RPF指向VRF和/或介面(在另一個VRF中)，RPF成功了。

PE路由器不會重新通告VPN路由。如果PE路由器收到來自遠端PE路由器的VPN路由並將其匯入VRF 1，則它無法將VPN字首從VRF 1本地匯出到VRF 2。無論此PE路由器上是否存在從VRF 1本地匯入VRF 2的路由目標匯入路由，都不會發生匯入VRF 2的情況。

組播主要是RPF成功。時刻留意RPF。為了讓外聯網組播起作用，RPF必須從一個到另一個從接收器到源VRF。因此，接收器VRF中的源必須存在回源VRF的單播路由。

Lmdt:標籤的多播分發樹

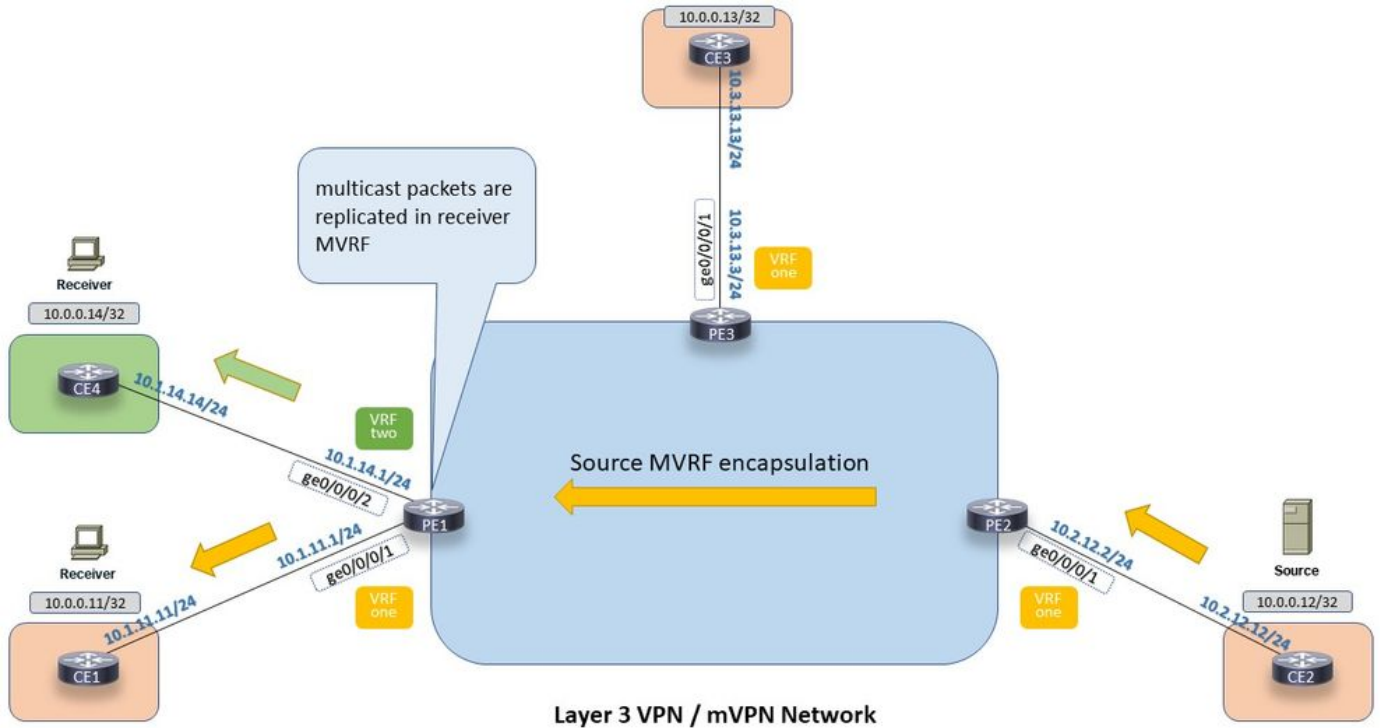
方案

Cisco IOS XE也支援外網mVPN。過去，IOS(-XE)引入了兩種方案來實現外網mVPN。它們稱為選

項1和選項2。IOS-XR支援具有相同方案的外網。

選項1:來源多點傳送虛擬路由和轉送(MVRF)位於接收器MVRF上。這表示用於組播流量的輸入PE路由器上的VRF (源VRF) 也在輸出PE路由器上配置了相應的路由目標。

檢視圖2。其中顯示了選項1的多播資料包流。



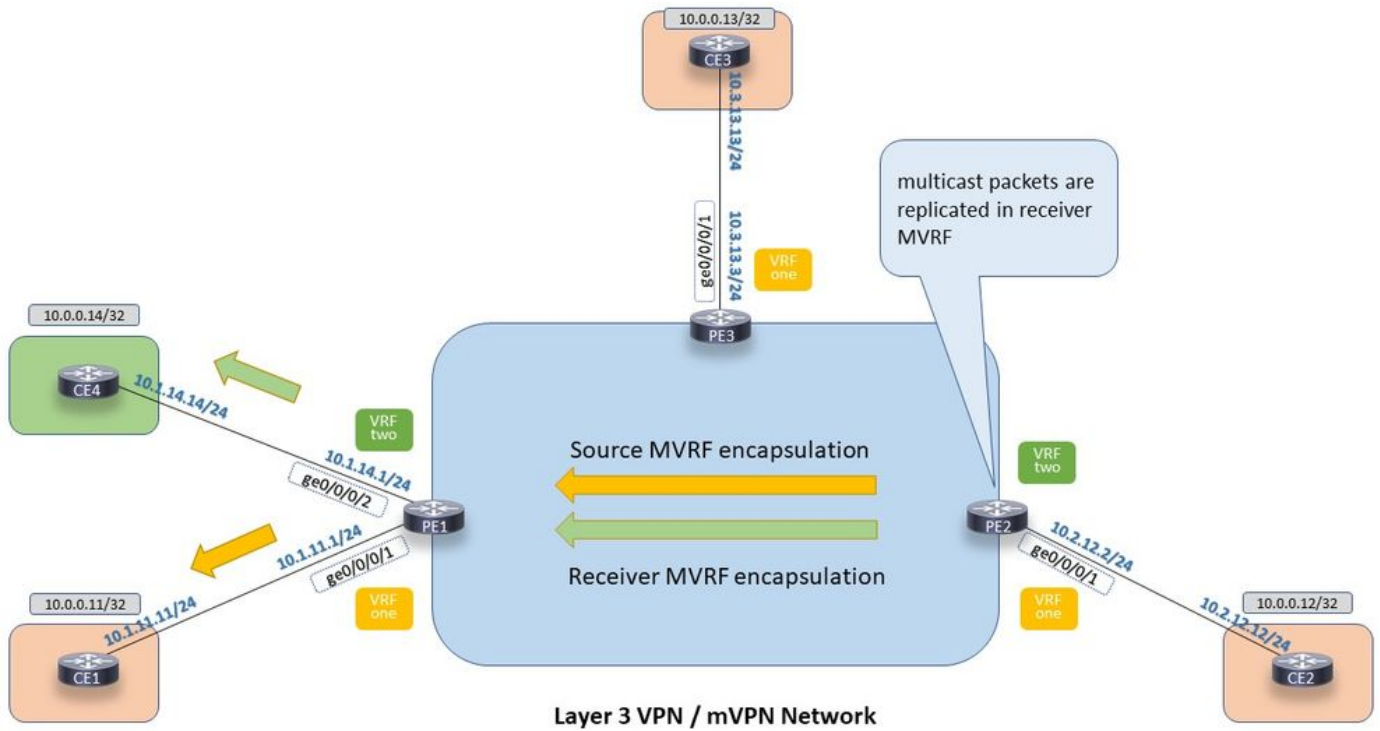
IOS-XR上的mVPN外聯網：Extranet選項1的組播資料包流

圖2. Extranet選項1的組播資料包流。

組播流量通過核心網路並使用源MVRF的封裝。

選項2:接收器MVRF位於源MVRF上。這表示輸出PE路由器上用於組播流量的VRF (接收器VRF) 也使用適當的路由目標在輸入PE路由器上配置。

請檢視圖3。其中顯示了選項2的多播資料包流。



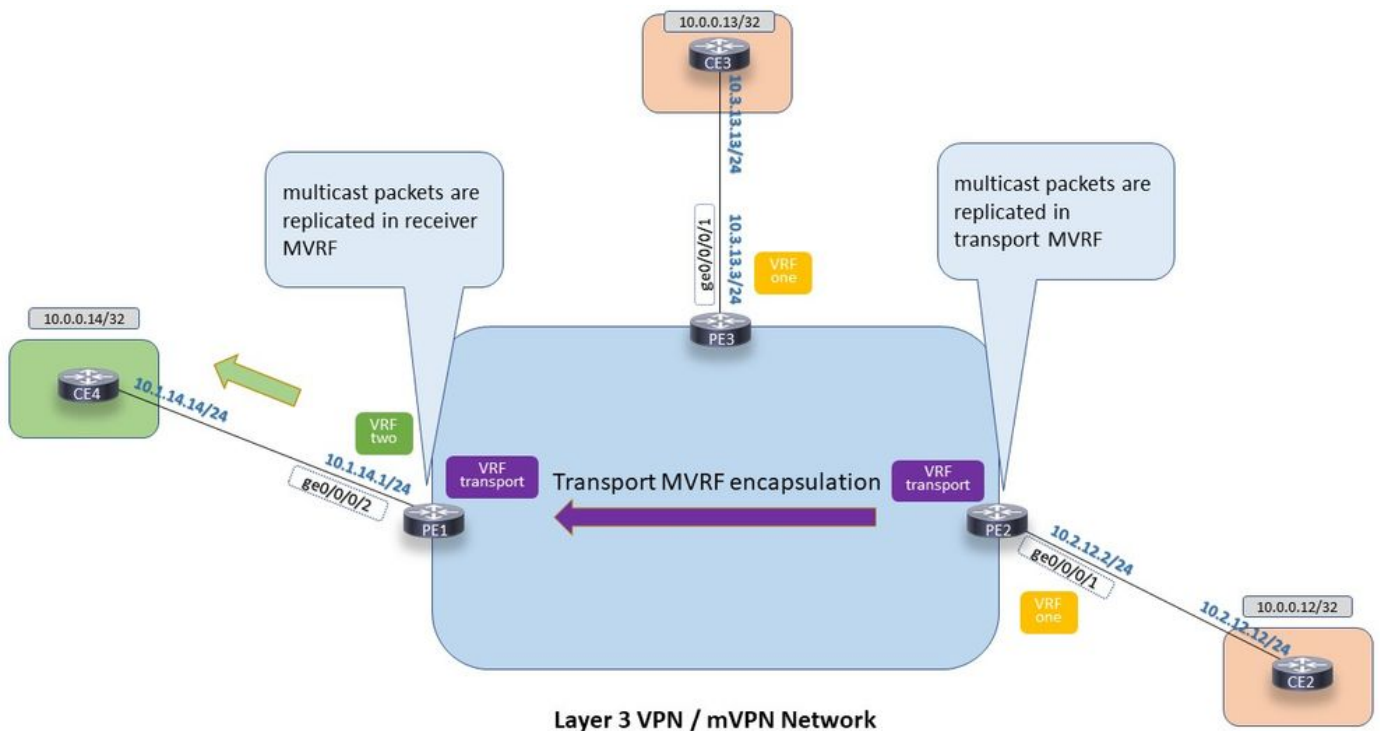
IOS-XR上的mVPN外聯網：Extranet選項2的組播資料包流

圖3.外聯網選項2的組播資料包流。

組播流量通過核心網路並使用源MVRF和接收器MVRF的封裝。因此，組播流量使用兩倍於核心網路的頻寬。

第三個選項，選項1和選項2之間的混合解決方案。

選項3:使用傳輸MVRF。輸入PE路由器將組播流量從源VRF外傳送到傳輸VRF。輸出PE路由器將組播流量從傳輸VRF外傳送到接收器VRF。此傳輸MVRF沒有關聯的面向客戶的介面。



IOS-XR上的mVPN外聯網：使用第三個VRF (傳輸VRF) 的外聯網的組播資料包流

圖4.使用第三個VRF (傳輸VRF) 的外聯網組播資料包流。

支援概述

選項1支援

所有配置檔案都提供基於RPL的支援。

只有使用組播核心樹協定的配置檔案 (配置檔案0、3和11) 支援基於RIB的外聯網mVPN。

選項2支援

所有配置檔案都支援基於RPL和基於RIB的支援，但使用帶BGP的客戶信令的配置檔案除外 (例如，配置檔案2、11、...)。最後幾個只以特殊方式支援選項2。範例2.2說明了這一點。

檢視此處，瞭解不同配置檔案的概述和配置：[在Cisco IOS-XR內配置mVPN配置檔案](#)

範例

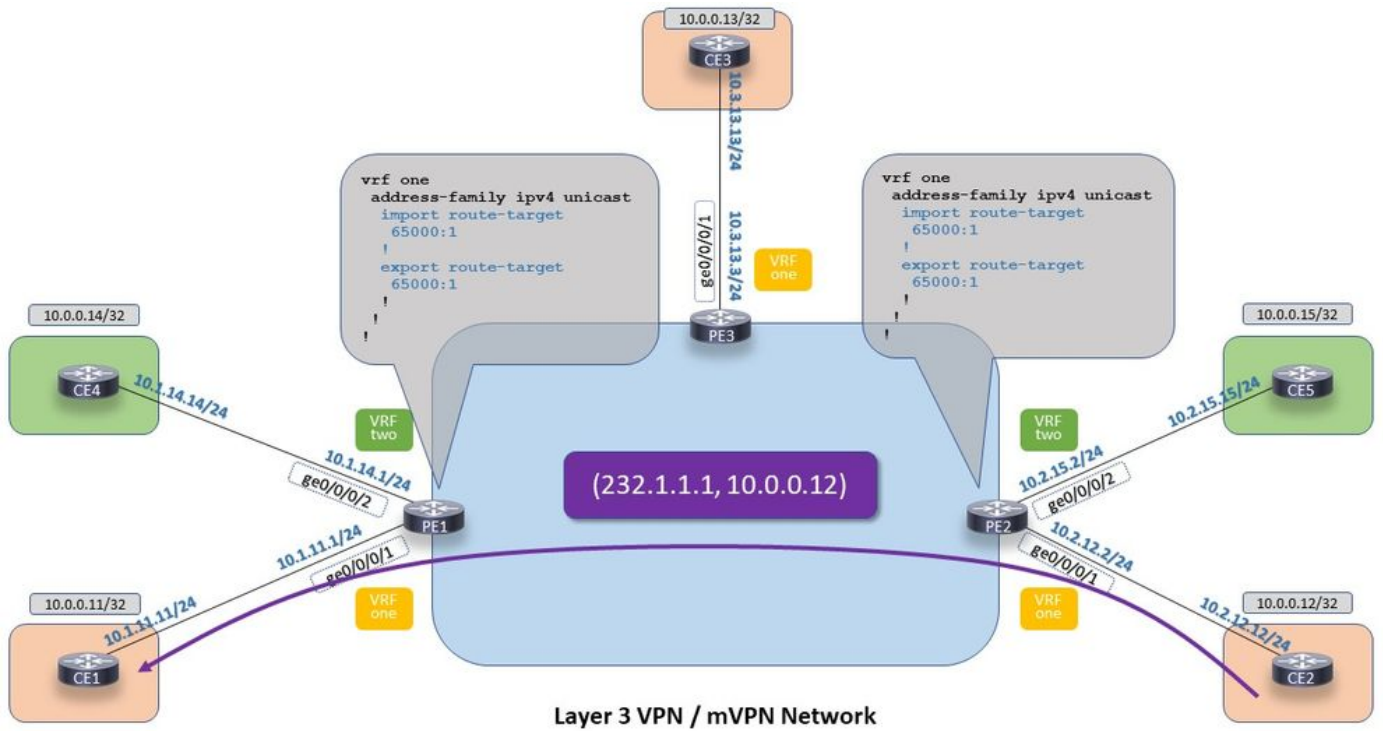
請注意Multicast RIB(MRIB)條目上的EX或Extranet標誌。它們存在於源和接收器VRF、組播條目和介面上。

配置檔案0

配置檔案0使用預設MDT，在底層和重疊 (VRF上下文) 中具有PIM組播信令。

此配置檔案支援選項1和2 (因此支援選項3)。

圖5顯示VRF內組播流量，即VRF一到VRF一的流量。



IOS-XR上的mVPN外聯網：配置檔案0 — 內部網MVRF的組播資料包流

映像5配置檔案0 — 內部網MVRF的組播資料包流

配置檔案0的配置。

```
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
!
!
```

請注意，配置檔案0是唯一不要求RPF拓撲命令的配置檔案。

或者，也可以為配置檔案0配置RPF拓撲命令。

```
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  
!
```

出口PE 1上的MRIB條目的輸出如下所示：

```
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
```

RPF指向mdtone，即VRF one的組播分佈樹(MDT)。

```
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
```

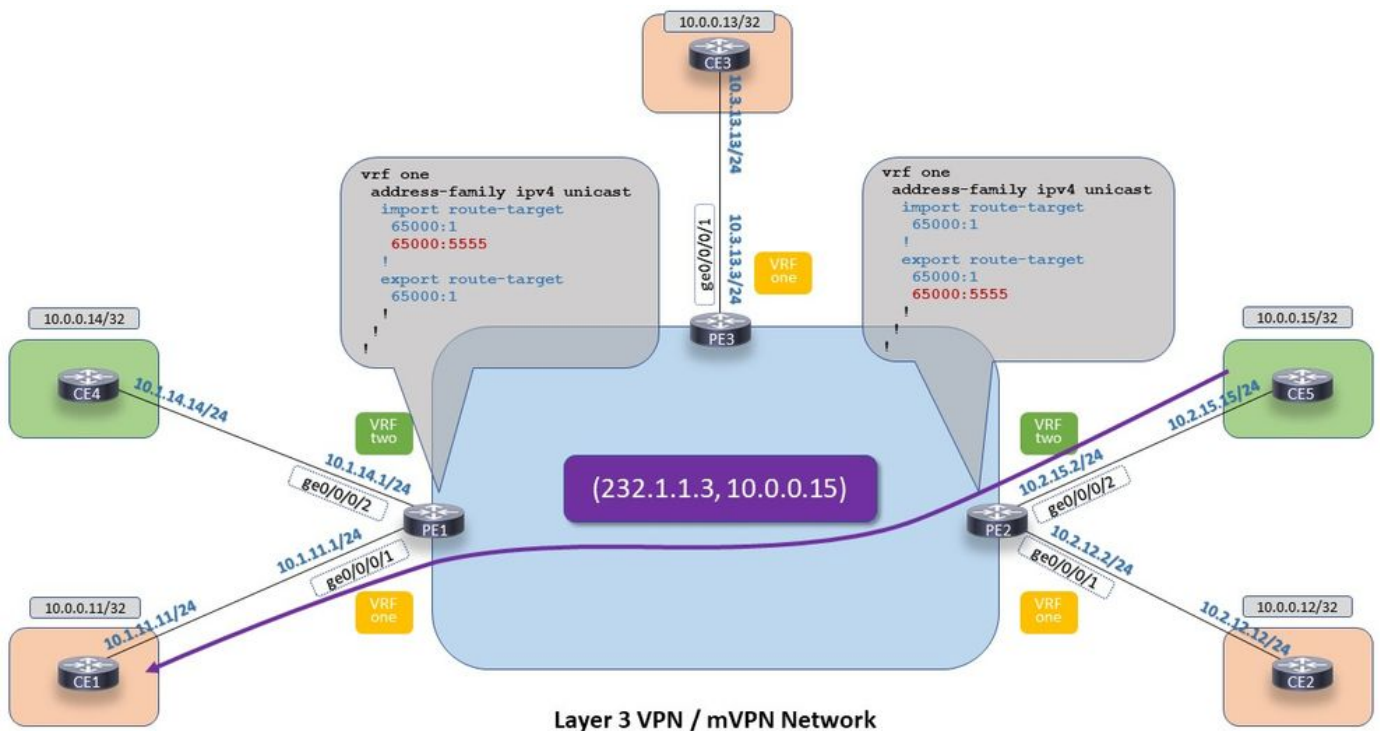
```
RP/0/0/CPU0:PE2#show pim vrf one rpf 10.0.0.12
```

Table: IPv4-Unicast-default

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

示例1.1. 選項1。源MVRF位於接收器MVRF上

配置檔案0支援基於RIB的選項1。到達源的路由需要存在於接收器VRF中。



IOS-XR上的mVPN外聯網：配置檔案0 — 選項1源MVRF位於接收器MVRF上

圖6.配置檔案0 — 選項1。源MVRF位於接收器MVRF上

圖6顯示輸入PE路由器PE2通告來自VRF 2的源路由，即源VRF，路由目標為65000:5555。出口PE路由器PE1將具有此路由目標的路由匯入到VRF路由器，即接收器VRF。

VRF 1和VRF 2使用配置檔案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
!
!
!

```

輸入PE路由器PE2使用route-target 65000:5555匯出源路由。出口PE路由器PE1將路由目標為65000:5555的此路由匯入VRF 1。

```
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
```

出口PE路由器PE1如何知道必須在VRF 2中發生RPF?

VRF 1中的BGP vpn4單播路由如下所示：

```
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
```

此路由識別符號與VRF關聯。PE1通過在BGP地址系列ipv4 mdt表中查詢RD來查詢用於此RD (路由區分器) 的組播組地址。

```
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
```

此組地址239.1.1.2是VRF 2使用的組地址。每個PE路由器 (包括此路由器PE1) 都將此組配置為VRF 2的預設MDT組地址。

```
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
```

```
mdtwo 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 mdtwo with rpf neighbor 10.0.0.2
```

```
Connector: 65000:2002:10.0.0.2, Nexthop: 10.0.0.2
```

組播流量使用VRF的Default或一個Data MDT通過核心網路。

```
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
```

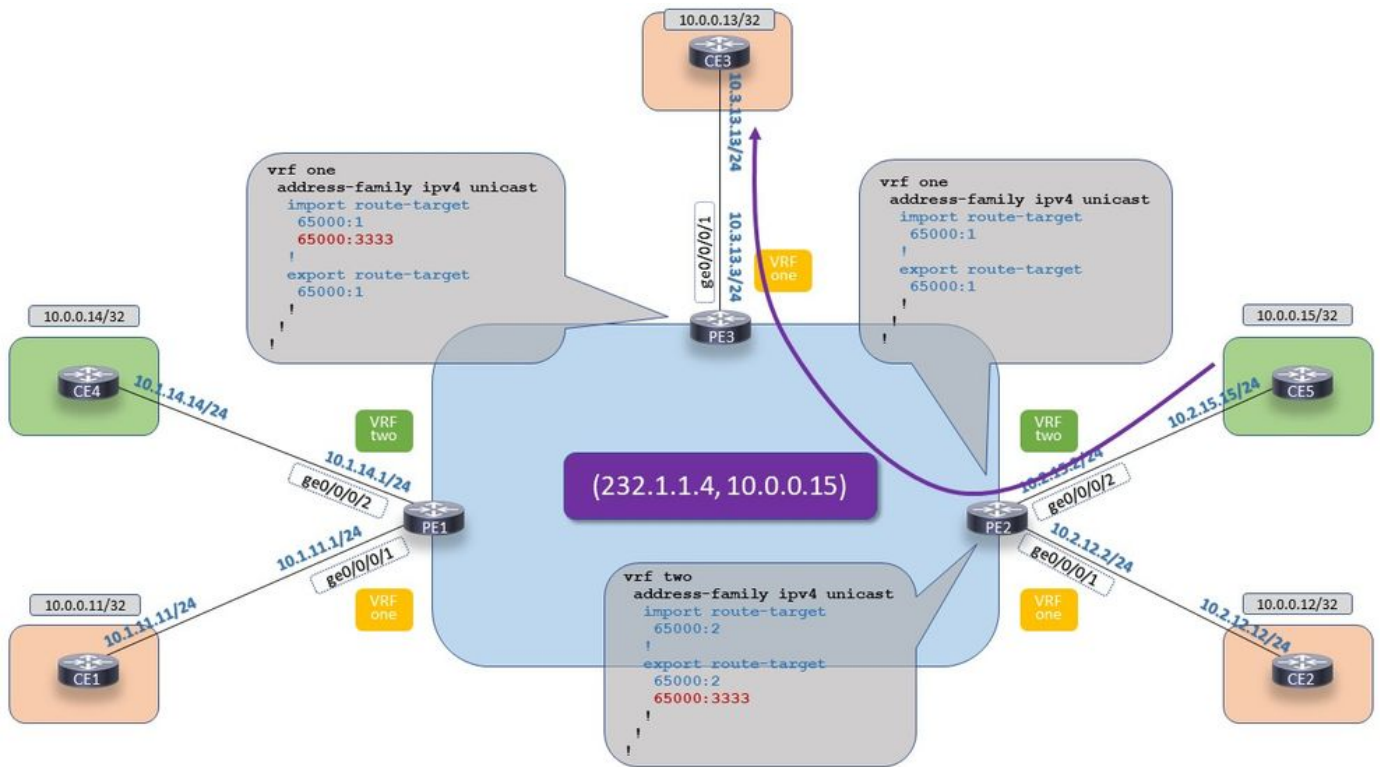
```
mdtwo Flags: F MI, Up: 00:02:49
```

如果輸入PE路由器PE2上甚至存在VRF狀態，則在VRF狀態中，輸入PE、PE2上沒有狀態(10.0.0.15、232.1.1.3)。

基於RIB的方法的替代方法是基於RPL的方法。這表示使用路由策略來更改RPF。請參見示例2.1以獲得此RPF路由策略的示例。

示例1.2.選項2.接收器MVRF位於源MVRF上

這是基於RIB的方法。



IOS-XR上的mVPN外聯網：配置檔案0 — 選項2接收器MVRF位於源MVRF上

影象7配置檔案0 — 選項2接收器MVRF位於源MVRF上

Route-Target用於將VRF兩條路由匯入接收器PE(PE3)上的VRF一中。

輸入PE(PE2)需要在VRF一 (接收器VRF) 中指向VRF二 (源VRF) 的靜態路由，以便RPF在輸入PE路由器(PE2)上成功。

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
!
```

無需將此靜態路由重新分發到BGP。此路由在VRF 2 (源VRF) 中通告。出口PE路由器PE3收到此路由，因為入口PE路由器PE1在VRF 2中通告該路由，且路由目標65000:3333將匯入到PE3上的VRF一中。需要靜態路由才能使入口PE路由器PE2上的VRF一上的RPF成功。

組播流量使用來自VRF的MDT通過核心網路。

```
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
```

PE2在VRF one中具有用於MRIB條目的傳出介面模組，即VRF one的MDT介面。

```
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
```

PE2在VRF 2中也有用於MRIB條目的傳出介面MDTONE，即VRF 1的MDT介面。

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

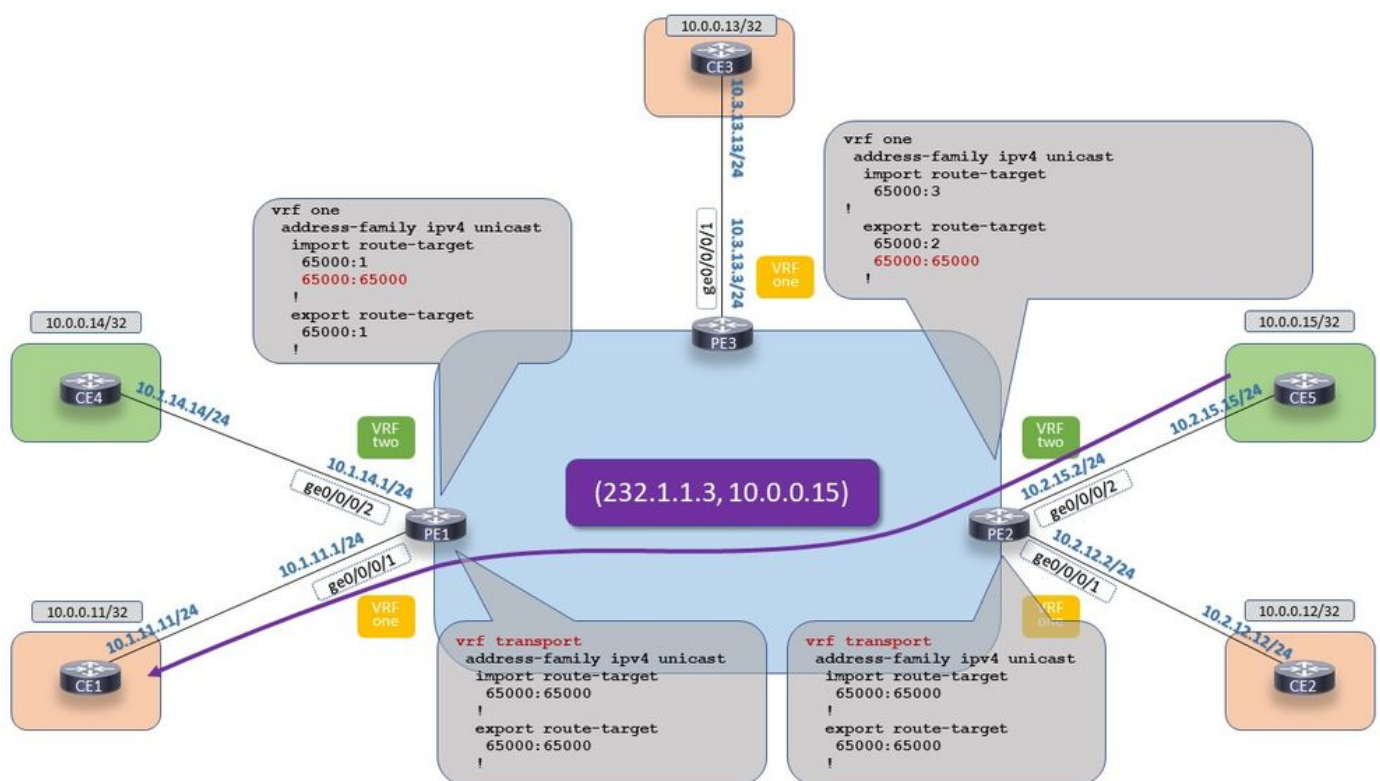
IP Multicast Routing Information Base
Entry flags: L - Domain-Local Source, E - External Source to the Domain,
  C - Directly-Connected Check, S - Signal, IA - Inherit Accept,
  IF - Inherit From, D - Drop, ME - MDT Encap, EID - Encap ID,
  MD - MDT Decap, MT - MDT Threshold Crossed, MH - MDT interface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

範例1.3.選項3.使用傳輸MVRF



IOS-XR上的mVPN外聯網：配置檔案0 — 選項3使用傳輸MVRF

圖8.配置檔案0 — 選項3使用傳輸MVRF

傳輸MVRF不需要任何介面。然而，其他一切都需要存在：vrf組態、BGP組態、多點傳送路由組態和路由器PIM組態。

選項1的配置在輸出PE、PE1上，而選項2的配置在輸入PE、PE2上。

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 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

源的路由必須在出口PE路由器上的VRF傳輸中是已知的。

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.

輸入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
```

```
mdttransport 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
```

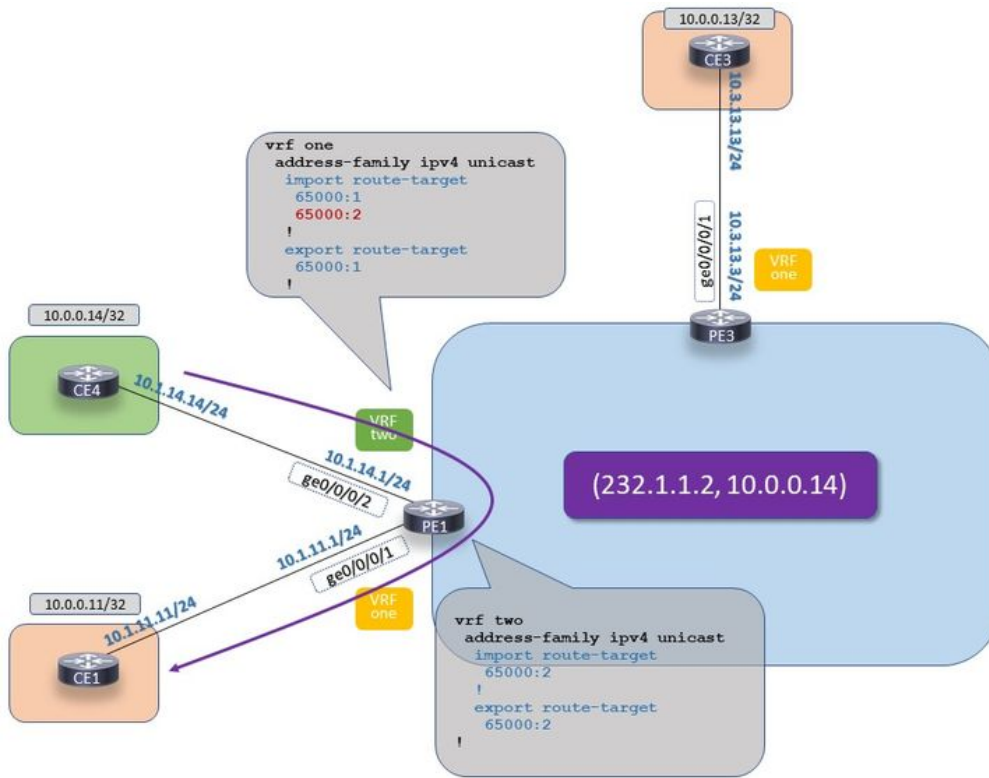
```
* 10.0.0.15/32 [1/0]
```

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

範例1.4.本地外網

僅涉及一個PE路由器。在基於RIB的解決方案中，唯一需要的是在接收機VRF中有一個返回到源VRF的路由。

一個解決方案是讓VRF one (源VRF) 使用適當的路由目標從VRF two (接收器VRF) 匯入路由。



IOS-XR上的mVPN外聯網：配置檔案0 — 本地外網

圖9.配置檔案0 — 本地外網

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

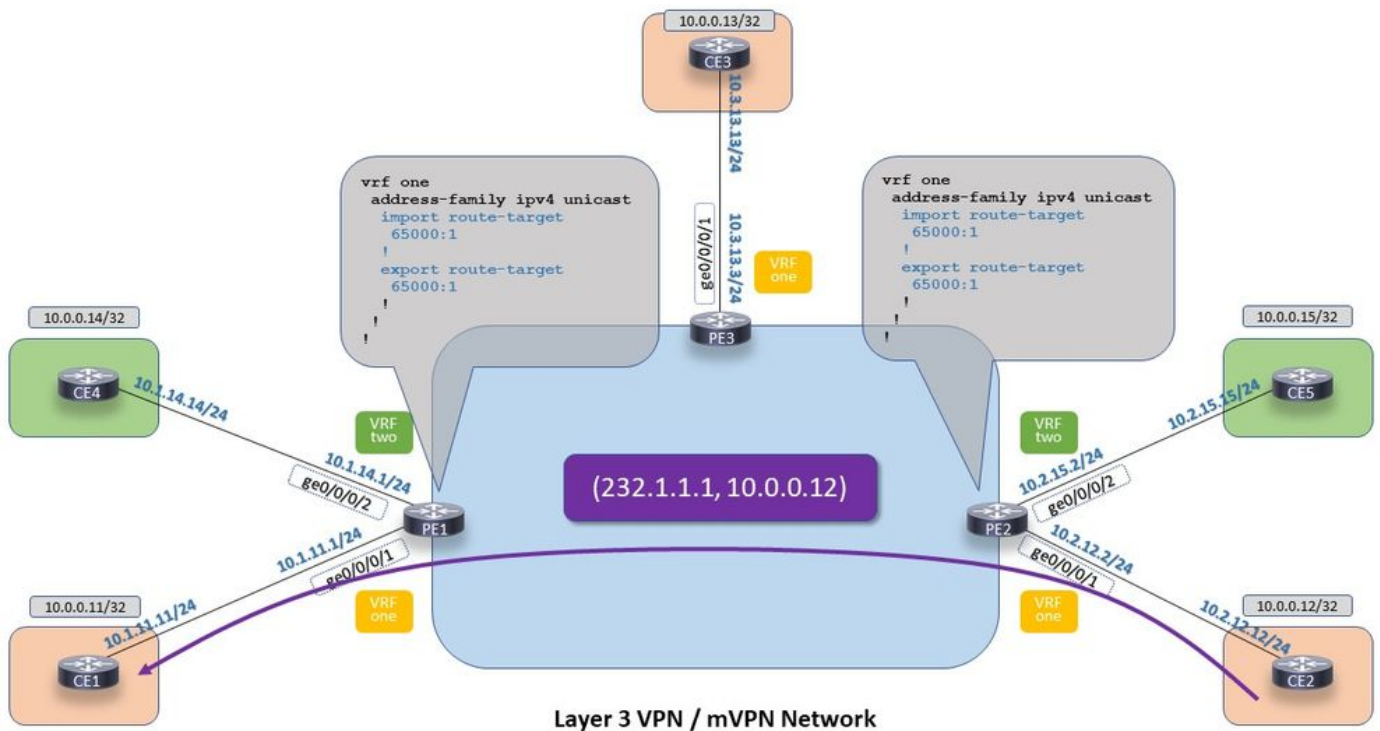
配置檔案14

設定檔14使用分割槽的MDT，在底層中具有mLDP多點傳送訊號以及在重疊中（VRF上下文）具有BGP（客戶）訊號傳送。

此配置檔案支援選項1。

選項2和3可以用作路由技巧。

圖10顯示VRF內組播流量，即VRF一對VRF一。



IOS-XR上的mVPN外聯網：配置檔案14 - VRF內組播流量

映像10配置檔案14 - VRF內組播流量

出口PE 1上的MRIB條目的輸出如下所示：

```
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
```

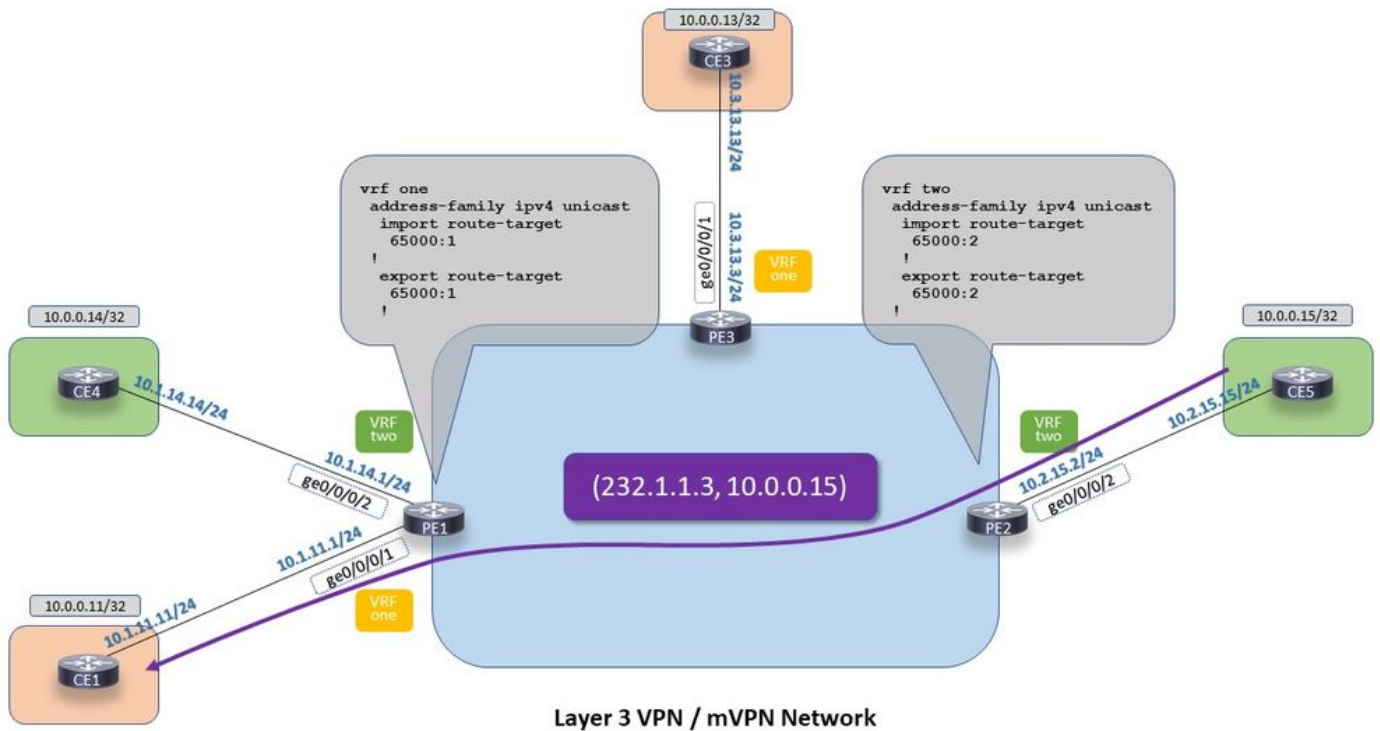
```
RP/0/0/CPU0:PE1#show pim vrf one rpf 10.0.0.12
```

```
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
!
```

示例2.1。選項1。源MVRF位於接收器MVRF上



IOS-XR上的mVPN外聯網：配置檔案14 — 選項1源MVRF位於接收器MVRF上

影象11配置檔案14 — 選項1源MVRF位於接收器MVRF上

必須在接收器PE上的接收器VRF上更改RPF。

VRF一和二的匯入和匯出語句保持不變。

```
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
!
```

組播組232.1.1.3的VRF 1中的RPF指向VRF 2。

```
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

附註： VRF one中的MRIB條目沒有傳入介面。這不會影響流量轉發。

```
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
```

附註： RPF在出口PE上的VRF 1中失敗。這不會影響流量轉發。

```
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
```

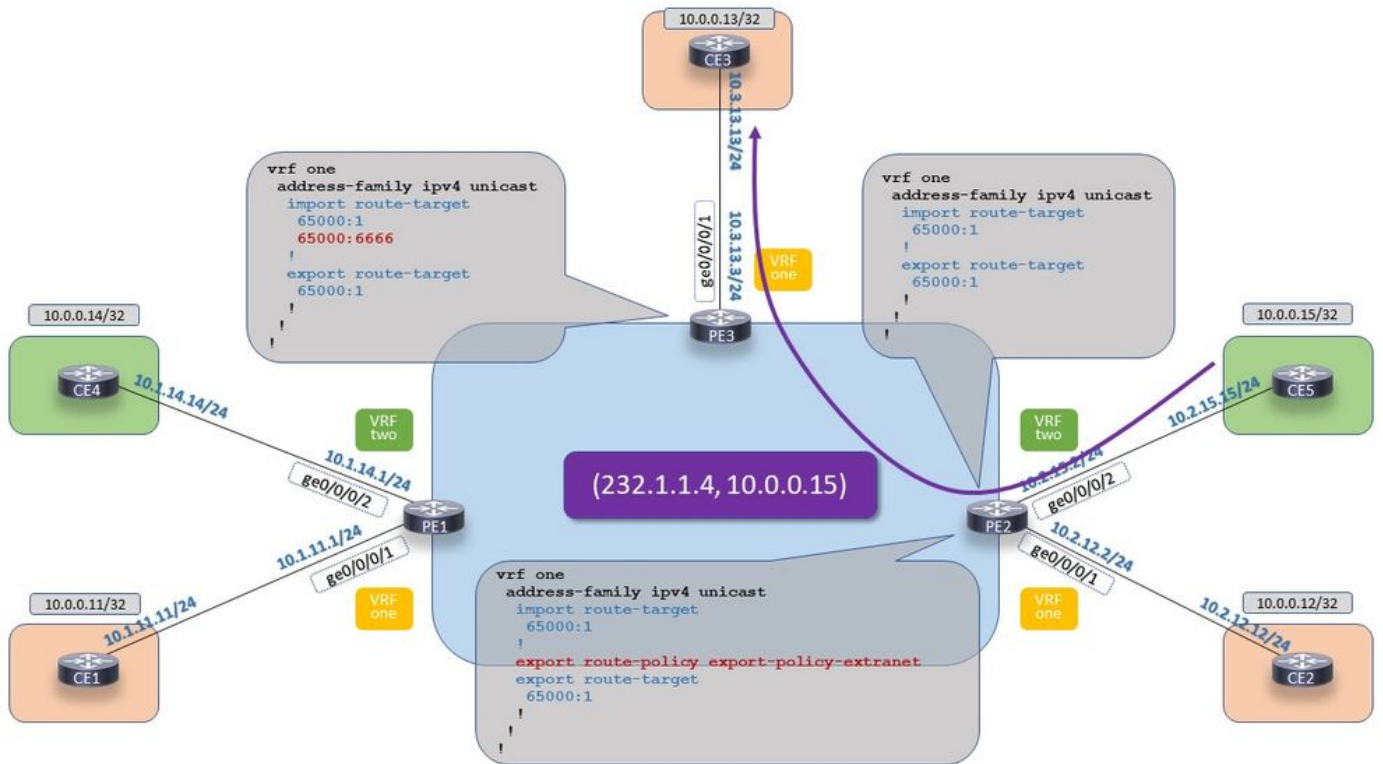
請注意，介面GE0/0/0/1位於VRF 1。

示例2.2.選項2.接收器MVRF位於源MVRF上

此解決方案無法通過操縱路由目標的import和export語句或僅更改RPF使用的路由策略來工作。

一個技巧有助於修復輸入PE路由器上的RPF。訣竅是在接收器VRF中新增靜態路由，並將其指向輸入PE路由器上的源VRF。

靜態路由在接收器VRF中通告源地址。此靜態路由使用BGP中的新唯一路由目標進行標籤，以便可以將此路由與源VRF中通告的同一路由區分開來。這避免了將靜態路由從入口PE上的接收器VRF匯入其他PE路由器的接收器VRF而導致路由問題。



IOS-XR上的mVPN外聯網：配置檔案14 — 選項2接收器MVRF位於源MVRF上

影象12配置檔案14 — 選項2接收器MVRF位於源MVRF上

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
```

輸出PE看到在輸入PE上設定路由目標的BGP路由。

```
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
```

輸出PE具有到輸入PE的正確RPF條目，在源VRF(VRF)中。

```
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

輸入PE在源和接收器VRF中都擁有外聯網條目。源VRF:

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

接收器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

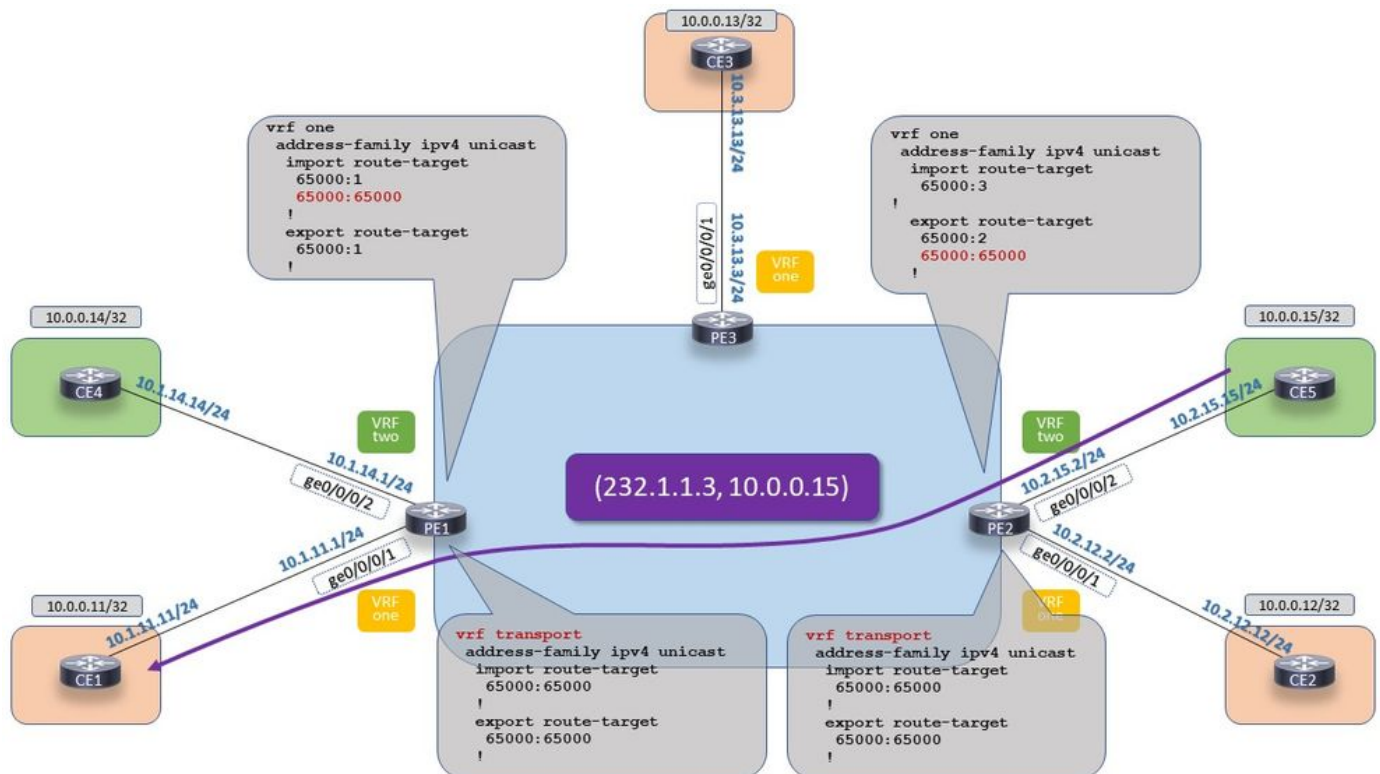
Up: 00:06:28

```

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

```

範例2.3.選項3.使用傳輸MVRF



IOS-XR上的mVPN外聯網：配置式14 — 選項3：使用傳輸MVRF

影象13配置檔案14 — 選項3使用傳輸MVRF

傳輸VRF不需要任何介面。然而，其他一切都需要存在：vrf組態、BGP組態、多點傳送路由組態和路由器PIM組態。

選項1的配置在輸出PE、PE1上，選項2的配置在輸入PE、PE2上。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
```

附註： VRF one中的MRIB條目沒有傳入介面。這不會影響流量轉發。

```
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
```

附註： RPF在出口PE上的VRF 1中失敗。這不會影響流量轉發。

```
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

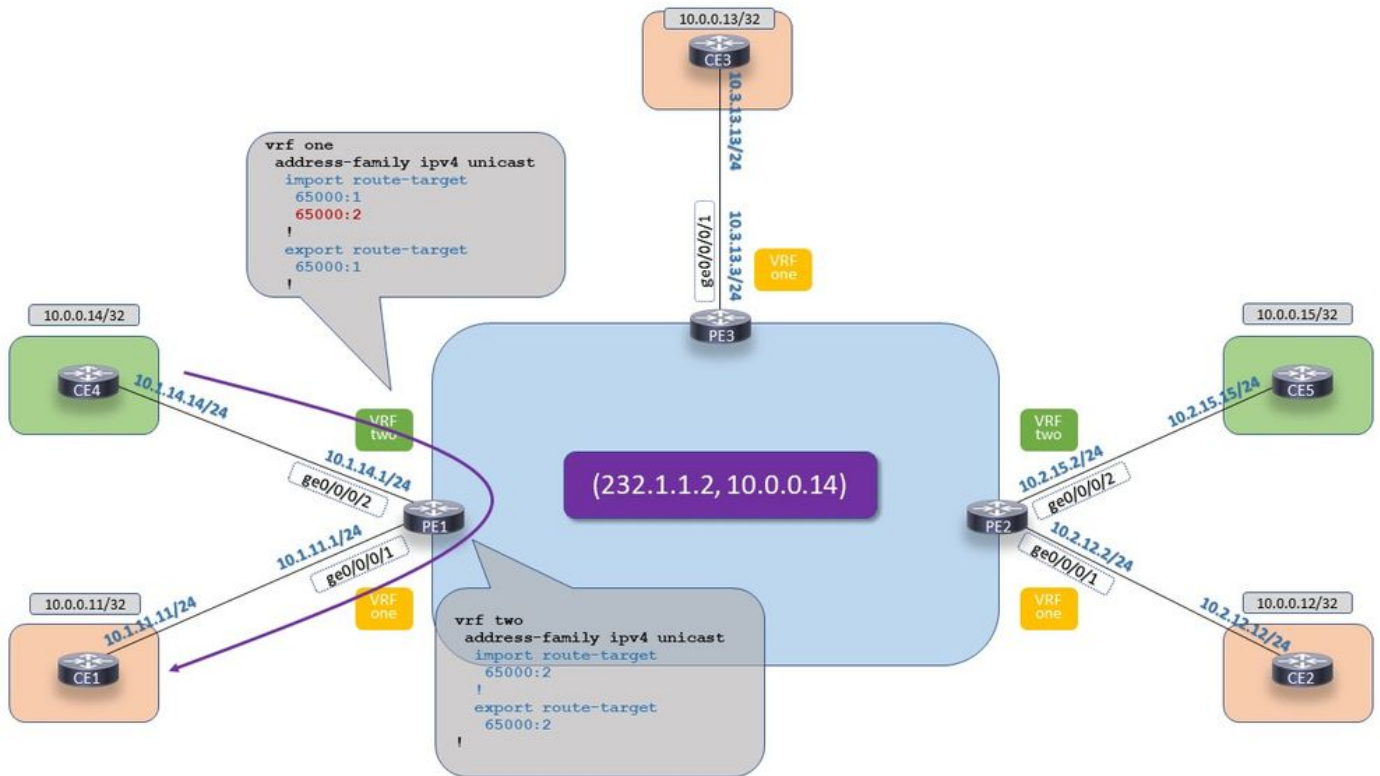
IP Multicast Routing Information Base

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
```

範例2.4.本地外網



IOS-XR上的mVPN外聯網：配置檔案14 — 本地外聯網

影象14配置檔案14 — 本地外聯網

必須將來自源VRF的源路由匯入接收器VRF。

```
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