

適用於MPLS VPN的多點傳送支援組態範例

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簡介

本文提供為多重協定標籤交換(MPLS)VPN設定多點傳送支援的範例設定和一般准則。此功能是在Cisco IOS[®]軟體版本12.0(23)S和12.2(13)T中匯入。

必要條件

需求

嘗試此設定之前，請確保符合以下要求：

- 服務提供商必須具有支援組播的核心才能使用思科組播VPN功能。

採用元件

本檔案中的資訊是根據Cisco IOS軟體版本12.2(13)T

注意：要獲取有關此功能的平台支援的更新資訊，請使用[Software Advisor](#)(僅限註冊客戶)。在為功能新增新的平台支援時，軟體顧問會動態更新支援的平台清單。

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。如果您的網路正在作用，請確保您已瞭解任何指令可能造成的影響。

慣例

如需文件慣例的詳細資訊，請參閱[思科技術提示慣例](#)。

背景資訊

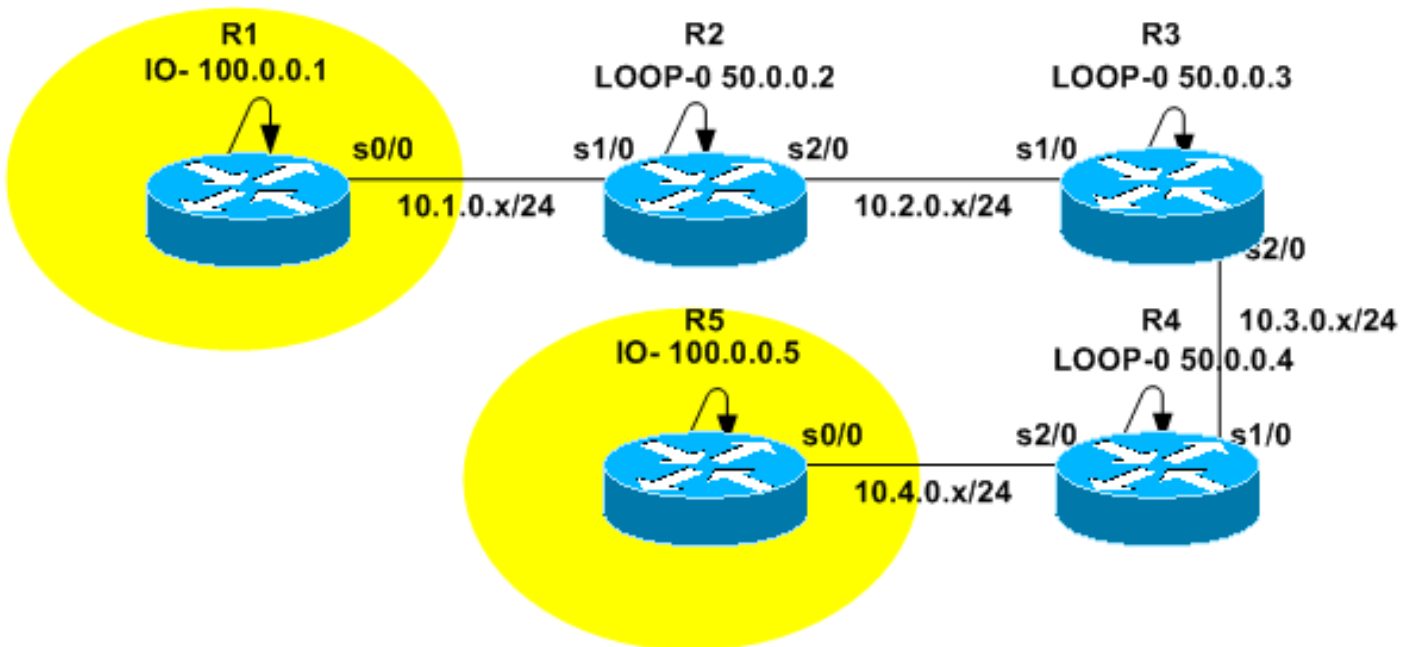
如需背景資訊，請參閱Cisco IOS軟體版本12.2(13)T的新功能檔案，以瞭解[適用於MPLS VPN的IP多點傳送支援](#)。

設定

本節提供用於設定本文件中所述功能的資訊。

網路圖表

本檔案會使用下圖中所示的網路設定。



組態

[網路圖表](#)代表服務供應商的主幹。這包括路由器R2、R3和R4。主幹配置為支援MPLS VPN。R2和R4是提供商邊緣(PE)路由器，而R3是提供商(P)路由器。R1和R5代表屬於同一VPN路由和轉發(VRF)例項的客戶邊緣(CE)路由器，顯示為黃色。

為了提供組播服務，必須將骨幹網配置為運行組播路由。為此目的選擇的組播協定是協定無關組播(PIM),R3配置為集結點(RP)。R2和R4還配置為將組播路由運行到VRF黃色。PIM稀疏 — 密集模式被配置為PE和CE之間的組播路由協定。R2已配置為VRF黃色的RP。

為了測試多點傳送連線，R5的s0/0介面設定為加入多點傳送群組224.2.2.2。Ping會從R1的回送位址傳送到224.2.2.2。網際網路控制訊息通訊協定(ICMP)回應是多點傳送封包，而ICMP回應是單點傳播封包，因為IP目的地位址是R1回送位址。

本文檔中顯示的配置包括：

- [R1-\(CE\)](#)

- [R2-\(PE\)](#)
- [R3-\(P\)](#)
- [R4-\(PE\)](#)
- [R5-\(CE\)](#)

R1-(CE)

```

version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R1
!
!
clock timezone CET 1
ip subnet-zero
no ip domain lookup
!
ip multicast-routing
!--- Enable multicast routing. !! interface Loopback0
ip address 100.0.0.1 255.255.255.255 ! interface
Serial0/0 ip address 10.1.0.1 255.255.255.0 ip pim
sparse-dense-mode !--- PIM sparse-dense mode is used
between the PE and CE. !--- PIM sparse-dense mode is the
multicast routing protocol. ! router rip version 2
network 10.0.0.0 network 100.0.0.0 no auto-summary ! ip
classless no ip http server ip pim bidir-enable ! ! !
line con 0 exec-timeout 0 0 line aux 0 line vty 0 4
login ! end

```

R2-(PE)

```

version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R2
!
!
clock timezone CET 1
ip subnet-zero
no ip domain lookup
!
ip vrf yellow
rd 2:200
route-target export 2:200
route-target import 2:200
mdt default 239.1.1.1
!--- Configure the default Multicast Distribution Tree
(MDT) !--- for VRF yellow. mdt data 239.2.2.0 0.0.0.255
threshold 1 !--- Configure the range global addresses
for !--- data MDTs and the threshold. ip multicast-
routing !--- Enable global multicast routing. ip
multicast-routing vrf yellow !--- Enable multicast
routing in VRF yellow. ip cef mpls label protocol ldp
tag-switching tdp router-id Loopback0 ! ! ! interface
Loopback0 ip address 50.0.0.2 255.255.255.255 ip pim
sparse-dense-mode !--- Multicast needs to be enabled on
loopback !--- interface. This is used as a source !---

```

```

for MPBGP sessions between PE routers that participate
in MVPN. ! interface Loopback100 ip vrf forwarding
yellow ip address 100.0.0.2 255.255.255.255 ip pim
sparse-dense-mode ! !--- This router needs to be RP for
!--- multicast in VRF yellow. Therefore, multicast !---
needs to be enabled on the interface which is used as
RP. ! interface Serial1/0 ip vrf forwarding yellow ip
address 10.1.0.2 255.255.255.0 ip pim sparse-dense-mode
!--- Multicast is enabled on PE-CE interfaces in VRF. !
interface Serial2/0 ip address 10.2.0.2 255.255.255.0 ip
pim sparse-dense-mode !--- Service provider core needs
to run multicast !--- to support MVPN services, !--- so
multicast is enabled on PE-P links. tag-switching ip !
router ospf 1 router-id 50.0.0.2 log-adjacency-changes
network 10.0.0.0 0.255.255.255 area 0 network 50.0.0.0
0.0.0.255 area 0 ! router rip version 2 no auto-summary
! address-family ipv4 vrf yellow version 2 redistribute
bgp 1 network 10.0.0.0 network 100.0.0.0 default-metric
5 no auto-summary exit-address-family ! router bgp 1 no
synchronization no bgp default ipv4-unicast bgp log-
neighbor-changes redistribute rip neighbor 50.0.0.4
remote-as 1 neighbor 50.0.0.4 update-source Loopback0
neighbor 50.0.0.4 activate neighbor 50.0.0.6 remote-as 1
neighbor 50.0.0.6 update-source Loopback0 neighbor
50.0.0.6 activate no auto-summary ! address-family ipv4
vrf yellow redistribute connected redistribute rip no
auto-summary no synchronization exit-address-family !
address-family vpnv4 neighbor 50.0.0.4 activate neighbor
50.0.0.4 send-community extended neighbor 50.0.0.6
activate neighbor 50.0.0.6 send-community extended no
auto-summary exit-address-family ! ip classless no ip
http server ip pim bidir-enable ip pim vrf yellow send-
rp-announce Loopback100 scope 100 ip pim vrf yellow
send-rp-discovery Loopback100 scope 100 !--- Configure
auto-RP. The R2's loopback !--- 100 is the RP in VRF
yellow. ! ! ! line con 0 exec-timeout 0 0 line aux 0
line vty 0 4 login ! end

```

R3(P)

```

version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R3
!
!
clock timezone CET 1
ip subnet-zero
!
ip multicast-routing
!--- Enable global multicast routing. ip cef mpls label
protocol ldp tag-switching tdp router-id Loopback0 ! ! !
interface Loopback0 ip address 50.0.0.3 255.255.255.255
ip pim sparse-dense-mode ! ! interface Serial1/0 ip
address 10.2.0.3 255.255.255.0 ip pim sparse-dense-mode
!--- Enable multicast on links to PE routers !--- which
have MVPNs configured. tag-switching ip ! interface
Serial2/0 ip address 10.3.0.3 255.255.255.0 ip pim
sparse-dense-mode tag-switching ip ! router ospf 1
router-id 50.0.0.3 log-adjacency-changes network
10.0.0.0 0.255.255.255 area 0 network 50.0.0.0 0.0.0.255

```

```
area 0 ! ip classless no ip http server ip pim bidir-
enable ip pim send-rp-announce Loopback0 scope 100 ip
pim send-rp-discovery Loopback0 scope 100 !--- R3 is
configured to announce itself as !--- the RP through
auto-RP. ! ! ! ! line con 0 exec-timeout 0 0 line aux 0
line vty 0 4 login ! end
```

R4-(PE)

```
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R4
!
!
clock timezone CET 1
ip subnet-zero
no ip domain lookup
!
ip vrf yellow
  rd 2:200
  route-target export 2:200
  route-target import 2:200
  mdt default 239.1.1.1
!--- Configure the default MDT address. mdt data
238.2.2.0 0.0.0.255 threshold 1 !--- Configure the data
MDT range and threshold. ! ip multicast-routing !---
Enable global multicast routing. ip multicast-routing
vrf yellow !--- Enable multicast routing in VRF yellow.
ip cef mpls label protocol ldp tag-switching tdp router-
id Loopback0 ! ! ! interface Loopback0 ip address
50.0.0.4 255.255.255.255 ip pim sparse-dense-mode !
interface Loopback100 ip vrf forwarding yellow ip
address 100.0.0.4 255.255.255.255 ip pim sparse-dense-
mode ! interface Serial1/0 ip address 10.3.0.4
255.255.255.0 ip pim sparse-dense-mode tag-switching ip
! interface Serial2/0 ip vrf forwarding yellow ip
address 10.4.0.4 255.255.255.0 ip pim sparse-dense-mode
!--- Enable the PIM toward the CE. ! router ospf 1
router-id 50.0.0.4 log-adjacency-changes network
10.0.0.0 0.255.255.255 area 0 network 50.0.0.0 0.0.0.255
area 0 ! router rip version 2 no auto-summary ! address-
family ipv4 vrf yellow version 2 redistribute bgp 1
network 10.0.0.0 network 100.0.0.0 default-metric 5 no
auto-summary exit-address-family ! router bgp 1 no
synchronization no bgp default ipv4-unicast bgp log-
neighbor-changes redistribute rip neighbor 50.0.0.2
remote-as 1 neighbor 50.0.0.2 update-source Loopback0
neighbor 50.0.0.2 activate no auto-summary ! address-
family ipv4 vrf yellow redistribute connected
redistribute rip no auto-summary no synchronization
exit-address-family ! address-family vpnv4 neighbor
50.0.0.2 activate neighbor 50.0.0.2 send-community
extended no auto-summary exit-address-family ! ip
classless no ip http server ip pim bidir-enable ! ! ! !
! line con 0 exec-timeout 0 0 line aux 0 line vty 0 4
login ! end
```

R5-(CE)

```
version 12.2
```

```
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R5
!
!
clock timezone CET 1
ip subnet-zero
no ip domain lookup
!
ip multicast-routing
!--- Enable global multicast routing in the CE. !!
interface Loopback0 ip address 100.0.0.5 255.255.255.255
! interface Serial0/0 ip address 10.4.0.5 255.255.255.0
ip pim sparse-dense-mode ip igmp join-group 224.2.2.2 !
router rip version 2 network 10.0.0.0 network 100.0.0.0
no auto-summary ! ip classless no ip http server ip pim
bidir-enable ! ! ! ! ! line con 0 exec-timeout 0 0 line
aux 0 line vty 0 4 login ! end
```

設計提示

- MPLS VPN(MVPN)組播配置在VPN配置之上。需要仔細設計MPLS VPN網路，以首先遵守MPLS VPN網路的所有建議。
- 必須為本地組播服務配置服務提供商核心。核心必須配置為PIM稀疏模式(PIM-SM)、源特定組播(PIM-SSM)或雙向PIM(PIM-BIDIR)。在MVPN配置中，不支援將密集模式PIM(PIM-DM)作為核心協定。可以在提供商核心中配置一系列受支援的協定。當一些組播組由一個PIM模式處理，而另一些組由另一個支援的PIM模式處理時，可以完成此操作。
- 組播VRF支援所有組播協定。即，在多播VRF中，除了PIM-SM、PIM-SSM和PIM-BIDIR之外，您還可以使用MSDP和PIM-DM
- 可以逐個VRF單獨新增MVPN服務。也就是說，一個PE路由器可能同時配置了支援組播的VRF和僅單播VRF。
- 並非必須將單個單播VRF的所有站點配置為進行組播。某些站點（甚至是MVPN PE路由器的介面）可能未啟用組播。必須確保路由從不會計算為指向啟用組播的介面。否則，組播轉發將中斷。
- 多個VRF可以屬於同一個MVPN組播域。IP編址在組播域內必須是唯一的。當前無法向全域性組播路由表中洩漏組播域之間的路由和/或資料包。
- MDT預設配置是MVPN工作的必備配置。配置資料MDT是可選的。如果您選擇配置資料MDT，強烈建議設定其閾值。
- 預設MDT的IP地址確定VRF屬於哪個組播域。因此，一個以上的VRF可能具有相同的預設MDT地址。但是，它們將在它們之間共用組播資料包，並且必須遵守組播域的其他要求（如唯一的IP編址方案）。
- 在不同的PE路由器上，資料MDT可能配置有相同範圍的IP地址，也可能沒有配置。這取決於提供商核心中使用的PIM模式。如果服務提供商核心使用稀疏模式PIM，則每個PE路由器必須為資料MDT組使用唯一的IP地址範圍。如果服務提供商核心使用源特定組播，則所有PE路由器可能都配置了每個組播域的資料MDT的相同範圍的IP地址。

驗證

本節提供的資訊可用於確認您的組態是否正常運作。

[輸出直譯器工具](#)(僅供註冊客戶使用)支援某些show命令，此工具可讓您檢視show命令輸出的分析。

- **show ip igmp groups** — 顯示具有直接連線到路由器並通過Internet組管理協定(IGMP)獲知的接收器的組播組。
- **show ip pim mdt bgp** — 顯示MDT預設組的路由區分器(RD)的詳細邊界網關協定(BGP)通告。
- **show ip pim vrf <vrf-name> mdt send** — 顯示路由器在指定VRF中進行的資料MDT通告。
- **show ip pim vrf <vrf-name> mdt receive** — 顯示路由器在指定VRF中接收的資料MDT通告。
- **show ip mroute** — 顯示提供商核心中IP組播路由表的內容。
- **show ip mroute vrf <vrf-name>** — 顯示客戶端VRF中的組播路由表。

完成以下步驟以驗證您的組態是否正常運作。

1. 檢查PE是否已加入預設MDT隧道的IGMP組。如果在VRF配置下發出**default-mdt**命令後對其進行配置，則PE可能無法加入預設MDT組。配置環回後，從VRF中刪除**mdt**命令並將其放回以解決問題。對於PE-R2，發出**show ip igmp groups**命令。

```
IGMP Connected Group Membership
Group Address Interface Uptime Expires Last Reporter
224.0.1.40 Serial2/0 02:21:23 stopped 10.2.0.2
239.1.1.1 Loopback0 02:36:59 stopped 0.0.0.0
```

對於PE-R4，發出**show ip igmp groups**命令。

```
IGMP Connected Group Membership
Group Address Interface Uptime Expires Last Reporter
224.0.1.40 Loopback0 02:51:48 00:02:39 50.0.0.4
239.1.1.2 Loopback0 02:51:45 stopped 0.0.0.0
239.1.1.1 Loopback0 02:51:45 stopped 0.0.0.0
239.2.2.0 Loopback0 01:40:03 stopped 0.0.0.0
```

2. 檢查收到的每個PE的BGP通告。**注意**：在本示例中，請檢查來自對等PE PE-R2和PE-R4的MDT。對於PE-R2，發出**show ip pim mdt bgp**命令。

```
MDT-default group 239.1.1.1
rid: 50.0.0.4 next_hop: 50.0.0.4
```

WAVL tree nodes

```
MDT-default: 239.1.1.1 Tunnel0 source-interface: Loopback0
```

對於PE-R4，發出**show ip pim mdt bgp**命令

```
MDT-default group 239.1.1.1
rid: 50.0.0.2 next_hop: 50.0.0.2
```

WAVL tree nodes

```
MDT-default: 239.1.1.1 Tunnel0 source-interface: Loopback0
```

```
MDT-data : 239.2.2.0 Tunnel0 source-interface: Loopback0
```

3. 檢查資料MDT。**注意**：在本示例中，請檢查源自PE-R2和PE-R4或與之連線的資料MDT。對於PE-R2，發出**show ip pim vrf yellow mdt send**命令。

```
MDT-data send list for VRF: yellow
(source, group) MDT-data group ref_count
(100.0.0.1, 224.2.2.2) 239.2.2.0 1
```

對於PE-R2，發出**show ip pim vrf yellow mdt receive**命令。

```
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry,
X - Proxy Join Timer Running, A - Candidate MSDP Advertisement,
U - URD, I - Received Source Specific Host Report, Z - Multicast Tunnel
Y - Joined MDT-data group, y - Sending to MDT-data group
```

```
Joined MDT-data groups for VRF: yellow
group: 239.2.2.0 source: 0.0.0.0 ref_count: 1
```

檢查全域性組播路由表以獲取預設MDT。**注意**：請注意以下資訊：PE上的傳出介面清單

MVRF黃色。P路由器將該組視為常規組播組。每個PE都是預設MDT的源，並且僅位於PE路由器中。新標誌Z表示這是組播隧道。對於PE-R2，發出show ip mroute 239.1.1.1命令。

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry,
X - Proxy Join Timer Running, A - Candidate MSDP Advertisement,
U - URD, I - Received Source Specific Host Report, Z - Multicast Tunnel
Y - Joined MDT-data group, y - Sending to MDT-data group

Outgoing interface flags: H - Hardware switched

Timers: Uptime/Expires

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

(* , 239.1.1.1), 02:37:16/stopped, RP 50.0.0.3, flags: SJCFZ

Incoming interface: Serial2/0, RPF nbr 10.2.0.3

Outgoing interface list:

MVRF yellow, Forward/Sparse-Dense, 02:21:26/00:00:28

(50.0.0.2, 239.1.1.1), 02:37:12/00:03:29, flags: FTZ

Incoming interface: Loopback0, RPF nbr 0.0.0.0

Outgoing interface list:

Serial2/0, Forward/Sparse-Dense, 02:36:09/00:02:33

(

50.0.0.4, 239.1.1.1), 02:36:02/00:02:59, flags: JTZ

Incoming interface: Serial2/0, RPF nbr 10.2.0.3

Outgoing interface list:

MVRF yellow, Forward/Sparse-Dense, 02:21:26/00:00:28

對於P-R3，發出show ip mroute 239.1.1.1命令。

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry,
X - Proxy Join Timer Running, A - Candidate MSDP Advertisement,
U - URD, I - Received Source Specific Host Report, Z - Multicast Tunnel
Y - Joined MDT-data group, y - Sending to MDT-data group

Outgoing interface flags: H - Hardware switched

Timers: Uptime/Expires

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

(* , 239.1.1.1), 02:50:24/stopped, RP 50.0.0.3, flags: S

Incoming interface: Null, RPF nbr 0.0.0.0

Outgoing interface list:

Serial1/0, Forward/Sparse-Dense, 02:34:41/00:03:16

Serial2/0, Forward/Sparse-Dense, 02:49:24/00:02:37

(50.0.0.2, 239.1.1.1), 02:49:56/00:03:23, flags: T

Incoming interface: Serial1/0, RPF nbr 10.2.0.2

Outgoing interface list:

Serial2/0, Forward/Sparse-Dense, 02:49:24/00:02:37

(50.0.0.4, 239.1.1.1), 02:49:47/00:03:23, flags: T

Incoming interface: Serial2/0, RPF nbr 10.3.0.4

Outgoing interface list:

Serial1/0, Forward/Sparse-Dense, 02:34:41/00:03:16

對於PE-R4，發出show ip mroute 239.1.1.1命令。

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry,
X - Proxy Join Timer Running, A - Candidate MSDP Advertisement,
U - URD, I - Received Source Specific Host Report, Z - Multicast Tunnel

Y - Joined MDT-data group, y - Sending to MDT-data group
Outgoing interface flags: H - Hardware switched
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(* , 239.1.1.1), 02:51:06/stopped, RP 50.0.0.3, flags: SJCFZ
Incoming interface: Serial1/0, RPF nbr 10.3.0.3
Outgoing interface list:
MVRP yellow, Forward/Sparse-Dense, 02:51:06/00:00:48

(50.0.0.2, 239.1.1.1), 02:50:06/00:02:58, flags: JTZ
Incoming interface: Serial1/0, RPF nbr 10.3.0.3
Outgoing interface list:
MVRP yellow, Forward/Sparse-Dense, 02:50:06/00:00:48

(50.0.0.4, 239.1.1.1), 02:51:00/00:03:10, flags: FTZ
Incoming interface: Loopback0, RPF nbr 0.0.0.0
Outgoing interface list:
Serial1/0, Forward/Sparse-Dense, 02:35:24/00:03:00

4. 檢查全域性組播路由表以查詢資料MDT。注意：對於PE-R2，請注意傳出介面為tunnel0。對於源所在的PE-R2 (VRF端)，發出show ip mroute vrf yellow 224.2.2.2 命令。

IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry,
X - Proxy Join Timer Running, A - Candidate MSDP Advertisement,
U - URD, I - Received Source Specific Host Report, Z - Multicast Tunnel
Y - Joined MDT-data group, y - Sending to MDT-data group
Outgoing interface flags: H - Hardware switched
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(* , 224.2.2.2), 2d01h/stopped, RP 100.0.0.2, flags: S
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
Tunnel0, Forward/Sparse-Dense, 2d01h/00:02:34

(100.0.0.1, 224.2.2.2), 00:05:32/00:03:26, flags: Ty
Incoming interface: Serial1/0, RPF nbr 10.1.0.1
Outgoing interface list:
Tunnel0, Forward/Sparse-Dense, 00:05:37/00:02:34

對於源所在的PE-R2 (全域性組播路由)，發出show ip mroute 239.2.2.0 命令。

IP Multicast Routing Table
Flags: D - Dense, S - Sparse, B - Bidir Group, s - SSM Group, C - Connected,
L - Local, P - Pruned, R - RP-bit set, F - Register flag,
T - SPT-bit set, J - Join SPT, M - MSDP created entry,
X - Proxy Join Timer Running, A - Candidate MSDP Advertisement,
U - URD, I - Received Source Specific Host Report, Z - Multicast Tunnel
Y - Joined MDT-data group, y - Sending to MDT-data group
Outgoing interface flags: H - Hardware switched
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(* , 239.2.2.0), 02:13:27/stopped, RP 50.0.0.3, flags: SJPFZ
Incoming interface: Serial2/0, RPF nbr 10.2.0.3
Outgoing interface list: Null

(50.0.0.2, 239.2.2.0), 02:13:27/00:03:22, flags: FTZ
Incoming interface: Loopback0, RPF nbr 0.0.0.0
Outgoing interface list:
Serial2/0, Forward/Sparse-Dense, 02:13:27/00:03:26

注意：只有連線了組播源的PE路由器才會顯示為資料MDT組地址的組播流量的源。

疑難排解

- 發出**show ip pim vrf neighbor**命令，檢查PE路由器是否通過動態隧道介面建立了PIM鄰居關係。如果失敗，則預設MDT正常運行。
- 如果Default MDT不起作用，請發出**show ip pim mdt bgp**命令，檢查本地路由器是否知道參與MVPN的遠端PE路由器的環回。如果失敗，請確認在用作MP BGP作業階段來源的回送介面上啟用了PIM
- 檢查SP核心是否已正確配置為在PE路由器之間傳送組播。出於測試目的，您可以在一台PE路由器的環回介面上配置**ip igmp join-group**，然後執行源自另一台PE路由器環回的組播ping。

相關資訊

- [MPLS VPN新功能文檔](#)
- [MPLS支援頁面](#)
- [IP多點傳送支援頁面](#)
- [技術支援 - Cisco Systems](#)