MPLS VPN的组播支持配置示例

目录

简介

本文提供一配置示例和一般使用指南配置多协议标签交换(MPLS) VPN的组播支持。此功能在Cisco IOS软件版本12.0(23)S和12.2(13)T介绍。

先决条件

要求

在尝试此配置前，请保证您符合这些要求：

- 服务提供商必须有一个支持组播的核心为了使用思科组播VPN功能。

使用的组件

本文档中的信息根据Cisco IOS软件版本12.2(13)T

注意： 要得到关于平台支持的更新信息此功能的，请使用软件顾问(仅限注册用户)。软件顾问动态地更新支持的平台列表和新的平台支持为功能被添加。

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

规则

有关文档规则的详细信息，请参阅 Cisco 技术提示规则。

背景信息

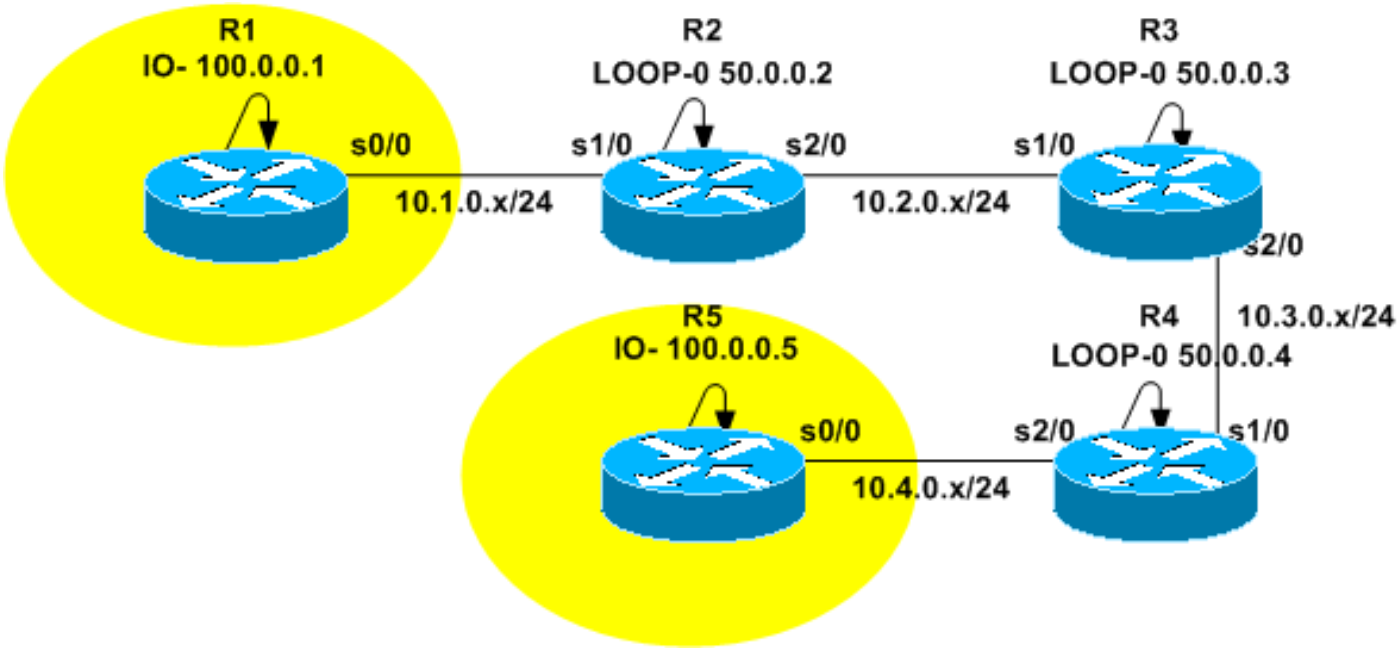
背景信息，参考IP组播支持的Cisco IOS软件版本12.2(13)T新特性文档MPLS VPN的。

配置

本部分提供有关如何配置本文档所述功能的信息。

网络图

本文档使用此图所示的网络设置。



配置

网络图代表服务提供商的骨干网。这包括路由器R2、R3和R4。骨干网配置支持MPLS VPN。当R3是供应商(p)路由器时，R2和R4是服务商边缘路由器。R1和R5代表属于同一个VPN路由与转发的用户边缘(CE)路由器(VRF)实例，黄色。

为了提供多点传送服务器，必须配置骨干网运行组播路由。为此选择的组播协议是独立于协议的组播(PIM)，并且R3配置作为聚合点(RP)。R2和R4也配置遇到组播路由VRF黄色。PIM sparse-dense模式配置作为在观点扫描器和CES之间的组播路由协议。R2配置是VRF黄色的RP。

为了测试组播连接， R5 s0/0接口配置参加组播组224.2.2.2。Ping从R1的环回地址被发送到224.2.2.2。互联网控制消息协议(ICMP)响应是组播信息包，而ICMP回复是单播信息包，因为IP目的地地址是R1环回地址。

在本文提交的配置包括这些：

- 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 sparce-dense mode is used
between the PE and CE. !--- PIM sparce-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
```

设计提示

- MPLS VPN的(MVPN)组播配置在VPN配置顶部。MPLS VPN网络需要仔细设计，首先观察MPLS VPN网络的所有建议。
- 必须为本地多点传送服务器配置服务提供商核心。必须为PIM稀疏模式(PIM-SM)，特定源的组播(PIM-SSM)，或者双向PIM (PIM-BIDIR)配置核心。密集式PIM (PIM-DM)在MVPN配置方面不支持作为核心协议。配置支持的协议的混合在供应商的核心的是可能的。这可以执行，当一些组播组由一个PIM模式时处理，并且一些其他组由别的处理支持的PIM模式。
- 所有组播协议在组播VRF内支持。除PIM-SM、PIM-SSM和PIM-BIDIR之外，即在组播VRF内您能使用MSDP和PIM-DM
- MVPN服务可以分开被添加根据按VRF的基本类型。即一个PE路由器可能有支持组播的配置的VRF和仅单播VRF。
- 必须为组播配置单个单播VRF的不是整个场地。是可能的有一些站点(和MVPN PE路由器均等接口)组播没有启用的地方。您必须保证路由从未计算指向非多播启用接口。否则，将中断组播转发。
- 超过一个VRF能属于同一个MVPN组播域。IP寻址一定是唯一在组播域内。漏路由和数据包在组播域之间或到一个全局组播路由表里当前不是可能的。
- MDT默认配置对于MVPN是必需工作。配置数据MDT可选。如果选择配置一，它是高度推荐的设置数据MDT的阈值。
- 默认MDT的IP地址确定哪个组播域VRF属于。所以，有超过一个VRF的同一个默认MDT地址是可能的。然而，他们将共享在他们之间的组播信息包并且必须观察在组播域的其他需求(例如唯一IP编址方案)。
- 数据MDT可能或也许不配置与在不同的PE路由器的同样IP地址范围。这取决于哪个PIM模式用于供应商的核心。如果服务提供商核心使用稀疏模式PIM，则每个PE路由器必须使用一套独特的IP地址数据MDT组。如果服务提供商核心使用特定源组播，则所有PE路由器也许配置与每个组播域数据MDT的同样IP地址范围。

验证

本部分所提供的信息可用于确认您的配置是否正常工作。

命令输出解释程序工具（仅限注册用户）支持某些 **show** 命令，使用此工具可以查看对 show 命令输出的分析。

- **show ip igmp groups** —显示组播组用直接地连接到路由器，并且通过互联网组管理协议(IGMP)了解的接收方。
- **show ip pim mdt bgp** —显示路由辨别器(RD)的详细的边界网关协议(BGP)广告MDT默认组的。
- **显示ip pim VRF** *<vrf-name>* **mdt发送**—显示路由器在指定的VRF做的数据MDT广告。

- **显示ip pim VRF** *<vrf-name>* **mdt接收**—显示在指定的VRF的路由器接收的数据MDT广告。
- **show ip mroute** —显示IP组播路由表的内容在供应商的核心的。
- **show ip mroute VRF** *<vrf-name>* —显示在客户端的VRF的组播路由表。

完成这些步骤验证您的配置是工作正常。

1. 检查观点扫描器加入默认MDT通道的IGMP组。如果它配置，在**default-mdt命令**发出在VRF配置下后， PE也许不能参加默认MDT组。一旦环回配置，请从VRF删除**mdt命令**并且放置它回到解决问题。对于PE-R2，请发出**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`对于PE-R4，请发出**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. 检查接收的BGP广告每个PE。**注意：** 对于此示例，请检查从对等体观点扫描器PE-R2和PE-R4来源的MDTs。对于PE-R2，请发出**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`PE-R4问题**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. 检查数据MDTs。**注意：** 对于此示例，请检查PE-R2和PE-R4来源或加入的数据MDT。对于PE-R2，请发出**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` 对于PE-R2，请发出**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` 检查全局组播路由表默认MDT。**注意：** 注意此信息：流出接口列表是在观点扫描器的`MVRF`。P路由器看到组作为一个普通组播组。每个PE是默认MDT的一来源，并且仅在PE路由器。一新的标志， Z，指示这是组播通道。对于PE-R2，请发出**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
```

对于P-R3，请发出**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
```

对于PE-R4，请发出**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:
    MVRF 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:
    MVRF 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. 检查全局组播路由表数据MDTs。**注意：** 对于PE-R2，请注意流出接口是隧道0。对于PE-R2，来源查找(VRF支持)，请发出**show ip mroute VRF黄色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
```
对于PE-R2，来源查找(全局组播路由)，请发出**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： 仅PE路由器与有组播源附加对它出现作为数据MDT组地址组播数据流的来源。

故障排除

- 发出**show ip pim vrf neighbor命令**检查PE路由器通过动态隧道接口建立了一种PIM邻接关系。如果他们，则默认MDT正常运行。
- 如果默认MDT不作用，请发出**show ip pim mdt bgp命令**检查参加MVPN的远程PE路由器环回由本地路由器知道。如果他们不是，请验证PIM在作为MP BGP会话来源使用的回环接口启用
- 检查SP核心适当地配置提供在PE路由器之间的组播。对于测试目的您也许配置**ip igmp join-group**在一个PE路由器回环接口，并且组播从另一个PE路由器环回来源的**ping**。

相关信息

- MPLS VPN新特性文档
- MPLS 支持页
- IP 组播支持页
- 技术支持 - Cisco Systems