

# 多點傳送路由 — MSDP和PIM通過

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## 簡介

本檔案介紹使用簡單多點傳送拓撲的通訊協定無關多點傳送(PIM)和多點傳送來源探索通訊協定(MSDP)的運作方式。這對於瞭解從源註冊到接收方開始接收組播資料包時的控制平面操作和事件序列非常有用。

**附註：**本文中使用的裝置在實驗室環境中運行Cisco IOS®版本15.3M。

## 拓撲

左側的自65000系統AS1包含組播源。R1充當第一跳路由器(FHR)，並將向PIM集結點(PIM RP)R3註冊源(10.1.1.1)。R7和R3是iBGP鄰居，R3-R4和R7-R6是eBGP鄰居。R7和R6被配置為兩個自治系統之間的首選路徑。在AS64999中，R5有本地連線的接收器。R5配置為使用R4作為PIM RP。

## 控制平面

該影片演示了傳送哪些消息以及何時傳送消息。檢視此影片和上的閱讀以瞭解每個步驟的詳細說明。

## 源註冊 ( 步驟1-3 )

源開始向239.1.1.1傳送組播資料。收到此資料後，R1(該網段的PIM指定路由器(DR))將接收該組播資料包，並建立PIM註冊消息。

註冊消息是從R1傳送到R3的單播PIM資料包，用於通知源的PIM RP。

```
R1#
*May 21 14:54:08.461: PIM(0): Check RP 10.10.10.10 into the (*, 239.1.1.1) entry
*May 21 14:54:08.461: PIM(0): Building Triggered (*,G) Join / (S,G,RP-bit) Prune message
for 239.1.1.1
*May 21 14:54:08.461: PIM(0): Adding register encaps tunnel (Tunnel0) as forwarding
```

```
interface of (10.1.1.1, 239.1.1.1).
```

現在，PIM RP、R3收到註冊消息並用註冊停止進行響應。R3還通過MSDP向R4傳送MSDP SA消息。mroute上的「A」標誌表示它是MSDP通告的候選對象。「P」標誌表示已修剪該標誌，因為您沒有該組的接收器或傳出介面。

```
R3#
```

```
*May 21 14:54:08.459: PIM(0): Received v2 Register on Ethernet1/0 from 10.0.12.1
*May 21 14:54:08.459:           for 10.1.1.1, group 239.1.1.1
*May 21 14:54:08.459: PIM(0): Check RP 10.10.10.10 into the (*, 239.1.1.1) entry
*May 21 14:54:08.459: PIM(0): Adding register decap tunnel (Tunnel1) as accepting
interface of (*, 239.1.1.1).
*May 21 14:54:08.459: PIM(0): Adding register decap tunnel (Tunnel1) as accepting
interface of (10.1.1.1, 239.1.1.1).
*May 21 14:54:08.459: PIM(0): Send v2 Register-Stop to 10.0.12.1 for 10.1.1.1,
group 239.1.1.1
```

```
R3#show ip mroute 239.1.1.1
```

```
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, E - Extranet,
       X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
       U - URD, I - Received Source Specific Host Report,
       Z - Multicast Tunnel, z - MDT-data group sender,
       Y - Joined MDT-data group, y - Sending to MDT-data group,
       G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
       Q - Received BGP S-A Route, q - Sent BGP S-A Route,
       V - RD & Vector, v - Vector
```

```
Outgoing interface flags: H - Hardware switched, A - Assert winner
```

```
Timers: Uptime/Expires
```

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

```
(*, 239.1.1.1), 00:00:33/stopped, RP 10.10.10.10, flags: SP
```

```
Incoming interface: Null, RPF nbr 0.0.0.0
```

```
Outgoing interface list: Null
```

```
(10.1.1.1, 239.1.1.1), 00:00:33/00:02:26, flags: PA
```

```
Incoming interface: Ethernet1/0, RPF nbr 10.0.37.7
```

```
Outgoing interface list: Null
```

```
R3#show ip msdp sa-cache
```

```
MSDP Source-Active Cache - 0 entries
```

```
R3#
```

```
*May 21 14:54:58.511: MSDP(0): (10.1.1.1/32, 239.1.1.1)
```

這裡，R1收到來自R3的暫存器停止。

```
*May 21 14:54:08.461: PIM(0): Received v2 Register-Stop on Ethernet0/0 from 10.10.10.10
```

```
*May 21 14:54:08.461: PIM(0):           for source 10.1.1.1, group 239.1.1.1
```

```
*May 21 14:54:08.461: PIM(0): Removing register encap tunnel (Tunnel0) as forwarding
interface of (10.1.1.1, 239.1.1.1).
```

```
*May 21 14:54:08.461: PIM(0): Clear Registering flag to 10.10.10.10 for
(10.1.1.1/32, 239.1.1.1)
```

在R4上，您可以看到沒有mroute狀態，但您有MSDP SA。

```
R4#show ip mroute
*May 21 14:54:58.591: MSDP(0): (10.1.1.1/32, 239.1.1.1), accepted
```

```
R4#show ip mroute
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, E - Extranet,
      X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
      U - URD, I - Received Source Specific Host Report,
      Z - Multicast Tunnel, z - MDT-data group sender,
      Y - Joined MDT-data group, y - Sending to MDT-data group,
      G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
      Q - Received BGP S-A Route, q - Sent BGP S-A Route,
      V - RD & Vector, v - Vector
Outgoing interface flags: H - Hardware switched, A - Assert winner
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 224.0.1.40), 00:35:32/00:02:31, RP 10.20.20.20, flags: SJCL
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  Ethernet1/0, Forward/Sparse, 00:23:16/00:02:36
  Loopback0, Forward/Sparse, 00:35:31/00:02:31
```

```
R4#show ip msdp sa-cache
MSDP Source-Active Cache - 1 entries
(10.1.1.1, 239.1.1.1), RP 10.10.10.10, BGP/AS 65000, 00:01:00/00:05:49, Peer 10.33.33.33
```

## 接收器連線組 ( 步驟4 - 11 )

R5在其介面上接收IGMP連線，並構建PIM連線資料包 (\*,G連線)。該加入被傳送到R6。

```
R5#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R5(config)#int e0/1
R5(config-if)#ip igmp join-group 239.1.1.1
R5(config-if)#
*May 21 14:56:43.234: PIM(0): Check RP 10.20.20.20 into the (*, 239.1.1.1) entry
*May 21 14:56:43.234: PIM(0): Building Triggered (*,G) Join / (S,G,RP-bit) Prune message
for 239.1.1.1
*May 21 14:56:43.234: PIM(0): Building Triggered (*,G) Join / (S,G,RP-bit) Prune message
for 239.1.1.1
*May 21 14:56:43.234: PIM(0): Insert (*,239.1.1.1) join in nbr 10.0.56.6's queue
*May 21 14:56:43.246: PIM(0): Building Join/Prune packet for nbr 10.0.56.6
*May 21 14:56:43.246: PIM(0): Adding v2 (10.20.20.20/32, 239.1.1.1), WC-bit, RPT-bit,
S-bit Join
*May 21 14:56:43.246: PIM(0): Send v2 join/prune to 10.0.56.6 (Ethernet0/0)
```

R6收到來自R5的(\*,G)PIM加入，並向R4 PIM RP傳送(\*,G)加入。

```
R6#
*May 21 14:56:43.248: PIM(0): Received v2 Join/Prune on Ethernet2/0 from 10.0.56.5,
to us
*May 21 14:56:43.248: PIM(0): Join-list: (*, 239.1.1.1), RPT-bit set, WC-bit set,
S-bit set
*May 21 14:56:43.248: PIM(0): Check RP 10.20.20.20 into the (*, 239.1.1.1) entry
*May 21 14:56:43.248: PIM(0): Building Triggered (*,G) Join / (S,G,RP-bit) Prune
```

```
message for 239.1.1.1
*May 21 14:56:43.248: PIM(0): Add Ethernet2/0/10.0.56.5 to (*, 239.1.1.1), Forward
state, by PIM *G Join
*May 21 14:56:43.248: PIM(0): Building Triggered (*,G) Join / (S,G,RP-bit) Prune
message for 239.1.1.1
*May 21 14:56:43.248: PIM(0): Insert (*,239.1.1.1) join in nbr 10.0.46.4's queue
*May 21 14:56:43.248: PIM(0): Building Join/Prune packet for nbr 10.0.46.4
*May 21 14:56:43.248: PIM(0): Adding v2 (10.20.20/32, 239.1.1.1), WC-bit,
RPT-bit, S-bit Join
*May 21 14:56:43.248: PIM(0): Send v2 join/prune to 10.0.46.4 (Ethernet1/0)
```

R4 PIM RP收到來自R6的(\*,G)連線。然後向源10.1.1.1傳送(S, G)連線，該連線返回到R6。

```
R4#
*May 21 14:56:43.331: PIM(0): Received v2 Join/Prune on Ethernet1/0 from 10.0.46.6,
to us
*May 21 14:56:43.331: PIM(0): Join-list: (*, 239.1.1.1), RPT-bit set, WC-bit set,
S-bit set
*May 21 14:56:43.331: PIM(0): Check RP 10.20.20.20 into the (*, 239.1.1.1) entry
*May 21 14:56:43.331: PIM(0): Adding register decap tunnel (Tunnell) as accepting
interface of (*, 239.1.1.1).
*May 21 14:56:43.331: PIM(0): Add Ethernet1/0/10.0.46.6 to (*, 239.1.1.1), Forward
state, by PIM *G Join
*May 21 14:56:43.331: PIM(0): Adding register decap tunnel (Tunnell) as accepting
interface of (10.1.1.1, 239.1.1.1).
*May 21 14:56:43.331: PIM(0): Insert (10.1.1.1,239.1.1.1) join in nbr 10.0.46.6's queue
```

R4#

```
*May 21 14:56:43.331: PIM(0): Building Join/Prune packet for nbr 10.0.46.6
*May 21 14:56:43.331: PIM(0): Adding v2 (10.1.1.1/32, 239.1.1.1), S-bit Join
*May 21 14:56:43.331: PIM(0): Send v2 join/prune to 10.0.46.6 (Ethernet1/0)
```

R6收到來自R4的(S, G)連線，然後在AS4中向R7傳送(S, G)連65000。從R4收到(S, G)加入時，R6向R4傳送(SGR)修剪（步驟9）。這樣做是為了避免R4上的資料包重複。

```
*May 21 14:56:43.248: PIM(0): Received v2 Join/Prune on Ethernet1/0 from 10.0.46.4,
to us
*May 21 14:56:43.248: PIM(0): Join-list: (10.1.1.1/32, 239.1.1.1), S-bit set
*May 21 14:56:43.248: PIM(0): Add Ethernet1/0/10.0.46.4 to (10.1.1.1, 239.1.1.1),
Forward state, by PIM SG Join
*May 21 14:56:43.248: PIM(0): Insert (10.1.1.1,239.1.1.1) join in nbr 10.0.67.7's queue
```

R6#

```
*May 21 14:56:43.248: PIM(0): Building Join/Prune packet for nbr 10.0.67.7
*May 21 14:56:43.248: PIM(0): Adding v2 (10.1.1.1/32, 239.1.1.1), S-bit Join
*May 21 14:56:43.248: PIM(0): Send v2 join/prune to 10.0.67.7 (Ethernet0/0)
```

R6#

```
*May 21 14:56:44.476: PIM(0): Insert (10.1.1.1,239.1.1.1) sgr prune in nbr 10.0.46.4's
queue
*May 21 14:56:44.476: PIM(0): Building Join/Prune packet for nbr 10.0.46.4
*May 21 14:56:44.476: PIM(0): Adding v2 (10.1.1.1/32, 239.1.1.1), RPT-bit, S-bit Prune
*May 21 14:56:44.476: PIM(0): Send v2 join/prune to 10.0.46.4 (Ethernet1/0)
```

R7收到來自R6的(S, G)連線，然後將該連線按照到達源的路由傳送到R2。

R7#

```
*May 21 14:56:43.241: PIM(0): Received v2 Join/Prune on Ethernet0/0 from 10.0.67.6,
to us
*May 21 14:56:43.241: PIM(0): Join-list: (10.1.1.1/32, 239.1.1.1), S-bit set
*May 21 14:56:43.241: PIM(0): Check RP 10.10.10.10 into the (*, 239.1.1.1) entry
*May 21 14:56:43.241: PIM(0): Building Triggered (*,G) Join / (S,G,RP-bit) Prune message
for 239.1.1.1
*May 21 14:56:43.241: PIM(0): Add Ethernet0/0/10.0.67.6 to (10.1.1.1, 239.1.1.1),
```

Forward state, by PIM SG Join

\*May 21 14:56:43.241: PIM(0): Insert (10.1.1.1,239.1.1.1) join in nbr 10.0.27.2's queue

\*May 21 14:56:43.241: PIM(0): Building Join/Prune packet for nbr 10.0.27.2

R7#

\*May 21 14:56:43.241: PIM(0): Adding v2 (10.1.1.1/32, 239.1.1.1), S-bit Join

\*May 21 14:56:43.241: PIM(0): Send v2 join/prune to 10.0.27.2 (Ethernet2/0)

R7#show ip mroute

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, E - Extranet,

X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,

U - URD, I - Received Source Specific Host Report,

Z - Multicast Tunnel, z - MDT-data group sender,

Y - Joined MDT-data group, y - Sending to MDT-data group,

G - Received BGP C-Mroute, g - Sent BGP C-Mroute,

Q - Received BGP S-A Route, q - Sent BGP S-A Route,

V - RD & Vector, v - Vector

Outgoing interface flags: H - Hardware switched, A - Assert winner

Timers: Uptime/Expires

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

(\* , 239.1.1.1), 00:03:33/stopped, RP 10.10.10.10, flags: SP

Incoming interface: Ethernet1/0, RPF nbr 10.0.37.3

Outgoing interface list: Null

(10.1.1.1, 239.1.1.1), 00:03:33/00:02:56, flags: T

Incoming interface: Ethernet2/0, RPF nbr 10.0.27.2

Outgoing interface list:

Ethernet0/0, Forward/Sparse, 00:03:33/00:02:53

R2收到來自R7的(S , G)加入 , 然後將該加入(S , G)傳送到源路由器

R2#

\*May 21 14:56:43.253: PIM(0): Received v2 Join/Prune on Ethernet1/0 from 10.0.27.7, to us

\*May 21 14:56:43.253: PIM(0): Join-list: (10.1.1.1/32, 239.1.1.1), S-bit set

\*May 21 14:56:43.253: PIM(0): Check RP 10.10.10.10 into the (\* , 239.1.1.1) entry

\*May 21 14:56:43.253: PIM(0): Building Triggered (\*,G) Join / (S,G,RP-bit) Prune message for 239.1.1.1

\*May 21 14:56:43.253: PIM(0): Add Ethernet1/0/10.0.27.7 to (10.1.1.1, 239.1.1.1),

Forward state, by PIM SG Join

\*May 21 14:56:43.253: PIM(0): Insert (10.1.1.1,239.1.1.1) join in nbr 10.0.12.1's queue

\*May 21 14:56:43.253: PIM(0): Building Join/Prune packet for nbr 10.0.12.1

R2#

\*May 21 14:56:43.253: PIM(0): Adding v2 (10.1.1.1/32, 239.1.1.1), S-bit Join

\*May 21 14:56:43.253: PIM(0): Send v2 join/prune to 10.0.12.1 (Ethernet0/0)

R2#show ip mroute

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, E - Extranet,

X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,

U - URD, I - Received Source Specific Host Report,

Z - Multicast Tunnel, z - MDT-data group sender,

Y - Joined MDT-data group, y - Sending to MDT-data group,

G - Received BGP C-Mroute, g - Sent BGP C-Mroute,

Q - Received BGP S-A Route, q - Sent BGP S-A Route,

V - RD & Vector, v - Vector

Outgoing interface flags: H - Hardware switched, A - Assert winner

Timers: Uptime/Expires

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

```
(* , 239.1.1.1), 00:01:27/stopped, RP 10.10.10.10, flags: SP
Incoming interface: Ethernet1/0, RPF nbr 10.0.27.7
Outgoing interface list: Null
```

```
(10.1.1.1, 239.1.1.1), 00:01:27/00:01:32, flags: T
Incoming interface: Ethernet0/0, RPF nbr 10.0.12.1
Outgoing interface list:
  Ethernet1/0, Forward/Sparse, 00:01:27/00:03:01
```

R1收到來自R2的(S , G)連線 , 並將該介面新增到傳出介面清單

```
*May 21 14:56:43.261: PIM(0): Received v2 Join/Prune on Ethernet0/0 from 10.0.12.2,
to us
*May 21 14:56:43.261: PIM(0): Join-list: (10.1.1.1/32, 239.1.1.1), S-bit set
*May 21 14:56:43.261: PIM(0): Add Ethernet0/0/10.0.12.2 to (10.1.1.1, 239.1.1.1),
Forward state, by PIM SG Join
```

R1#show ip mroute

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, E - Extranet,
  X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
  U - URD, I - Received Source Specific Host Report,
  Z - Multicast Tunnel, z - MDT-data group sender,
  Y - Joined MDT-data group, y - Sending to MDT-data group,
  G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
  Q - Received BGP S-A Route, q - Sent BGP S-A Route,
  V - RD & Vector, v - Vector
```

Outgoing interface flags: H - Hardware switched, A - Assert winner

Timers: Uptime/Expires

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

```
(* , 239.1.1.1), 00:03:25/stopped, RP 10.10.10.10, flags: SPF
Incoming interface: Ethernet0/0, RPF nbr 10.0.12.2
Outgoing interface list: Null
```

```
(10.1.1.1, 239.1.1.1), 00:03:25/00:03:24, flags: FT
Incoming interface: Ethernet0/1, RPF nbr 0.0.0.0
Outgoing interface list:
  Ethernet0/0, Forward/Sparse, 00:00:50/00:02:39
```

此時 , 資料從源一直流向接收器。收到資料包後 , R5將從(\*,G)樹切換到(S , G)樹。

R5#

```
*May 21 14:56:44.494: PIM(0): Insert (10.1.1.1,239.1.1.1) join in nbr 10.0.56.6's queue
*May 21 14:56:44.498: PIM(0): Building Join/Prune packet for nbr 10.0.56.6
*May 21 14:56:44.498: PIM(0): Adding v2 (10.1.1.1/32, 239.1.1.1), S-bit Join
*May 21 14:56:44.498: PIM(0): Send v2 join/prune to 10.0.56.6 (Ethernet0/0)
```

R5#show ip mroute

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, E - Extranet,
  X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
  U - URD, I - Received Source Specific Host Report,
  Z - Multicast Tunnel, z - MDT-data group sender,
  Y - Joined MDT-data group, y - Sending to MDT-data group,
  G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
```

Q - Received BGP S-A Route, q - Sent BGP S-A Route,  
V - RD & Vector, v - Vector  
Outgoing interface flags: H - Hardware switched, A - Assert winner  
Timers: Uptime/Expires  
Interface state: Interface, Next-Hop or VCD, State/Mode

(\* , 239.1.1.1), 00:02:47/stopped, RP 10.20.20.20, flags: SJCL  
Incoming interface: Ethernet0/0, RPF nbr 10.0.56.6  
Outgoing interface list:  
Ethernet0/1, Forward/Sparse, 00:02:47/00:02:14

(10.1.1.1, 239.1.1.1), 00:02:45/00:00:14, flags: LJT  
Incoming interface: Ethernet0/0, RPF nbr 10.0.56.6  
Outgoing interface list:  
Ethernet0/1, Forward/Sparse, 00:02:45/00:02:14

**R6收到來自R5的(S , G)連線 , 並將資料包從E2/0轉發到R5。**

R6#

\*May 21 14:56:44.496: PIM(0): Received v2 Join/Prune on Ethernet2/0 from 10.0.56.5,  
to us

\*May 21 14:56:44.496: PIM(0): Join-list: (10.1.1.1/32, 239.1.1.1), S-bit set

\*May 21 14:56:44.496: PIM(0): Update Ethernet2/0/10.0.56.5 to (10.1.1.1, 239.1.1.1),  
Forward state, by PIM SG Join

\*May 21 14:56:49.056: PIM(0): Received v2 Join/Prune on Ethernet1/0 from 10.0.46.4,  
to us

\*May 21 14:56:49.056: PIM(0): Prune-list: (10.1.1.1/32, 239.1.1.1)

\*May 21 14:56:49.056: PIM(0): Prune Ethernet1/0/239.1.1.1 from (10.1.1.1/32, 239.1.1.1)  
- deleted

R6#show ip mroute

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, E - Extranet,  
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,  
U - URD, I - Received Source Specific Host Report,  
Z - Multicast Tunnel, z - MDT-data group sender,  
Y - Joined MDT-data group, y - Sending to MDT-data group,  
G - Received BGP C-Mroute, g - Sent BGP C-Mroute,  
Q - Received BGP S-A Route, q - Sent BGP S-A Route,  
V - RD & Vector, v - Vector

Outgoing interface flags: H - Hardware switched, A - Assert winner  
Timers: Uptime/Expires  
Interface state: Interface, Next-Hop or VCD, State/Mode

(\* , 239.1.1.1), 00:03:43/00:02:42, RP 10.20.20.20, flags: S  
Incoming interface: Ethernet1/0, RPF nbr 10.0.46.4  
Outgoing interface list:  
Ethernet2/0, Forward/Sparse, 00:03:43/00:02:42

(10.1.1.1, 239.1.1.1), 00:03:43/00:02:46, flags: T  
Incoming interface: Ethernet0/0, RPF nbr 10.0.67.7  
Outgoing interface list:  
Ethernet2/0, Forward/Sparse, 00:03:43/00:02:44

## **R4 PIM RP修剪關閉(S , G)步驟12**

最後 , R4 PIM RP向R6傳送(S , G)修剪。 請注意 , mroute ( MSDP Created條目 ) 上存在「M」標誌。

```
R4#
*May 21 14:56:44.559: PIM(0): Received v2 Join/Prune on Ethernet1/0 from 10.0.46.6,
to us
*May 21 14:56:44.559: PIM(0): Prune-list: (10.1.1.1/32, 239.1.1.1) RPT-bit set
*May 21 14:56:44.579: PIM(0): Removing register decap tunnel (Tunnel1) as accepting
interface of (10.1.1.1, 239.1.1.1).
*May 21 14:56:44.579: PIM(0): Installing Ethernet1/0 as accepting interface for
(10.1.1.1, 239.1.1.1).

*May 21 14:56:46.107: MSDP(0): (10.1.1.1/32, 239.1.1.1), accepted

*May 21 14:56:49.139: PIM(0): Insert (10.1.1.1,239.1.1.1) prune in nbr 10.0.46.6's queue
*May 21 14:56:49.139: PIM(0): Building Join/Prune packet for nbr 10.0.46.6
*May 21 14:56:49.139: PIM(0): Adding v2 (10.1.1.1/32, 239.1.1.1), S-bit Prune
*May 21 14:56:49.139: PIM(0): Send v2 join/prune to 10.0.46.6 (Ethernet1/0)
```

```
R4#show ip mroute
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, E - Extranet,
      X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
      U - URD, I - Received Source Specific Host Report,
      Z - Multicast Tunnel, z - MDT-data group sender,
      Y - Joined MDT-data group, y - Sending to MDT-data group,
      G - Received BGP C-Mroute, g - Sent BGP C-Mroute,
      Q - Received BGP S-A Route, q - Sent BGP S-A Route,
      V - RD & Vector, v - Vector
Outgoing interface flags: H - Hardware switched, A - Assert winner
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 239.1.1.1), 00:02:15/00:03:12, RP 10.20.20.20, flags: S
Incoming interface: Null, RPF nbr 0.0.0.0
Outgoing interface list:
  Ethernet1/0, Forward/Sparse, 00:02:15/00:03:12
```

```
(10.1.1.1, 239.1.1.1), 00:02:15/00:02:46, flags: PMT
Incoming interface: Ethernet1/0, RPF nbr 10.0.46.6
Outgoing interface list: Null
```

在這裡，從R6刪除到R4的傳出介面(OIF)E1/0。

```
R6#
*May 21 14:56:49.056: PIM(0): Received v2 Join/Prune on Ethernet1/0 from 10.0.46.4,to us
*May 21 14:56:49.056: PIM(0): Prune-list: (10.1.1.1/32, 239.1.1.1)
*May 21 14:56:49.056: PIM(0): Prune Ethernet1/0/239.1.1.1 from (10.1.1.1/32, 239.1.1.1)
- deleted
R6#
```

## 摘要

MSDP提供了一種互連不同的PIM域的方法，每個域使用自己的RP。它通常還用於實現本文檔未介紹的「任播RP」。MSDP和PIM協同工作，允許一個域中的接收器接收來自另一個域中的源的流量。MSDP SA消息允許其他RP瞭解另一個PIM域中的源，而PIM用於構建組播樹。

有關協定操作的詳細資訊，請參閱相關資訊中提到的RFC。

## 相關資訊



- PIM RFC

<https://tools.ietf.org/html/rfc4601>

- MSDP RFC

<https://tools.ietf.org/html/rfc3618>