

Multicast Routing - MSDP e PIM Walk Through

Sommario

[Introduzione](#)

[Topologia](#)

[Control-Plane](#)

[Registrazione dell'origine \(fasi 1-3\)](#)

[Il ricevitore si unisce al gruppo \(punti 4 - 11\)](#)

[R4 PIM RP Elimina \(S,G\) Passo 12](#)

[Riepilogo](#)

[Informazioni correlate](#)

Introduzione

In questo documento viene descritto il funzionamento di PIM (Protocol Independent Multicast) e MSDP (Multicast Source Discovery Protocol) con l'utilizzo di una topologia multicast semplice. Questa funzione è utile per comprendere il funzionamento del control plane e la sequenza di eventi dal momento in cui viene registrata una sorgente al momento in cui il ricevitore inizia a ricevere pacchetti multicast.

Nota: Sui dispositivi menzionati nel presente documento viene eseguito Cisco IOS® versione 15.3M in un ambiente di emulazione.

Topologia

Autonomous System AS65000 a sinistra contiene l'origine multicast. R1 funge da router di primo hop (FHR) e registrerà l'origine (10.1.1.1) con PIM Rendezvous Point (PIM RP) R3. R7 e R3 sono vicini iBGP, mentre R3-R4 e R7-R6 sono vicini eBGP. R7 e R6 sono configurati come il percorso preferito tra i due sistemi autonomi. In AS64999, R5 ha un ricevitore collegato localmente. R5 è configurato per utilizzare R4 come PIM RP.

Control-Plane

Il video mostra quali messaggi vengono inviati e quando. Visualizza questo video e continua a leggere per descrizioni dettagliate in ogni passaggio.

Registrazione dell'origine (fasi 1-3)

L'origine inizia a inviare dati multicast alla versione 239.1.1.1. Alla ricezione di questi dati, R1 (che è il PIM Designated Router (DR) per il segmento) accetta il pacchetto multicast e genera un messaggio PIM register.

Il messaggio di registro è un pacchetto PIM unicast inviato da R1 a R3 per informare il PIM RP dell'origine.

```
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 encap tunnel (Tunnel0) as forwarding
interface of (10.1.1.1, 239.1.1.1).
```

Ora, PIM RP, R3 riceve il messaggio di registro e risponde con register-stop. R3 invia inoltre un messaggio SA MSDP a R4 tramite MSDP. La bandiera "A" sulla rotta significa che è un candidato per la pubblicità di MSDP. L'indicatore "P" indica che è stato eliminato perché non si dispone di un ricevitore o di un'interfaccia in uscita per il gruppo.

```
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)
```

In questo caso, R1 riceve l'interruzione del registro da R3.

```
*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)
```

In R4 è possibile vedere che non è presente uno stato route, ma si dispone di un'associazione di protezione MSDP.

```
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
```

Il ricevitore si unisce al gruppo (punti 4 - 11)

R5 riceve un join IGMP sulla propria interfaccia e crea un pacchetto di join PIM (*,G join). Il join viene inviato a 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 riceve il join PIM (*,G) da R5 e invia (*,G) il join a R4 PIM RP.

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 (10.20.20.20/32, 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 riceve il join (*,G) da R6. Quindi invia un join (S,G) verso l'origine 10.1.1.1, che torna a 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 riceve il join (S,G) da R4, quindi invia un join (S,G) verso R7 in AS65000. Quando il join (S,G) viene ricevuto da R4, R6 invia una correzione (SGR) a R4 (PASSAGGIO 9). In questo modo, si evitano pacchetti duplicati sulla porta R4.

*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 riceve il join (S,G) da R6, quindi invia il join (S,G) a R2 seguendo il percorso verso l'origine.

```

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 Riceve il join (S,G) da R7, quindi invia il join (S,G) a R1 seguendo il percorso verso l'origine

```

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 riceve il join (S,G) da R2 e aggiunge l'interfaccia all'elenco delle interfacce in uscita

*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

A questo punto, i dati passano dall'origine al destinatario. Dopo aver ricevuto un pacchetto di dati, R5 passa dalla struttura (*,G) alla struttura (S,G).

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 riceve il join (S,G) da R5 e inoltra i pacchetti di dati da E2/0 a 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 Elimina (S,G) Passo 12

Infine, R4 PIM RP invia una prugna (S,G) a R6. Notare che il flag "M" è presente sul percorso (voce creata da MSDP).

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 (Tunnell) 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

In questo caso, l'interfaccia in uscita (OIF) da E1/0 a R4 viene rimossa da R6.

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#

Riepilogo

MSDP fornisce un metodo per l'interconnessione di domini PIM diversi, ognuno dei quali utilizza il proprio RP. Viene comunemente utilizzato anche per implementare "Anycast RP", che non è trattato in questo documento. MSDP e PIM interagiscono per consentire a un ricevitore in un dominio di ricevere traffico da un'origine in un altro dominio. I messaggi SA MSDP consentono agli altri RP di ottenere informazioni sulle origini in un altro dominio PIM, mentre PIM viene utilizzato per creare la struttura multicast.

Per ulteriori dettagli sulle operazioni del protocollo, fare riferimento alle RFC menzionate nelle informazioni correlate.

Informazioni correlate

- PIM RFC

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

- RFC MSDP

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