

# 在 Cisco Catalyst 8540 MSR 上配置 ATM 路由模块 (ARM) 上的 IP 组播路由

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## [简介](#)

随着网络规模的扩大，IP组播路由成为确定哪些网段需要组播流量以及哪些网段不需要组播流量的重要手段。IP组播是一种路由技术，它允许IP流量从一个源传播到多个目标，或从多个源传播到多个目标。一个数据包不是向每个目标发送一个数据包，而是发送到由单个IP目标组地址标识的组播组。

本文档显示如何在Catalyst 8540 MSR上配置ATM路由器模块(ARM)上的IP组播路由。此配置在ARM和增强型ARM (分别称为ARM I和ARM II) 上受支持。

## [先决条件](#)

### [要求](#)

本文档的读者应了解思科路由器上的基本IP组播配置。有关背景信息，请参阅以下文档：

- [配置IP组播路由](#)
- [IP组播路由命令](#)
- [IP 组播故障排除指南](#)

## 使用的组件

本文档中的信息基于以下软件和硬件版本：

- 运行Cisco IOS®软件版本12.1.(7)的Cisco 3600、7200和7500系列路由器
- 运行Cisco IOS软件版本12.1(7)EY的Catalyst 8540 MSR和Catalyst 8510 MSR

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](#)。

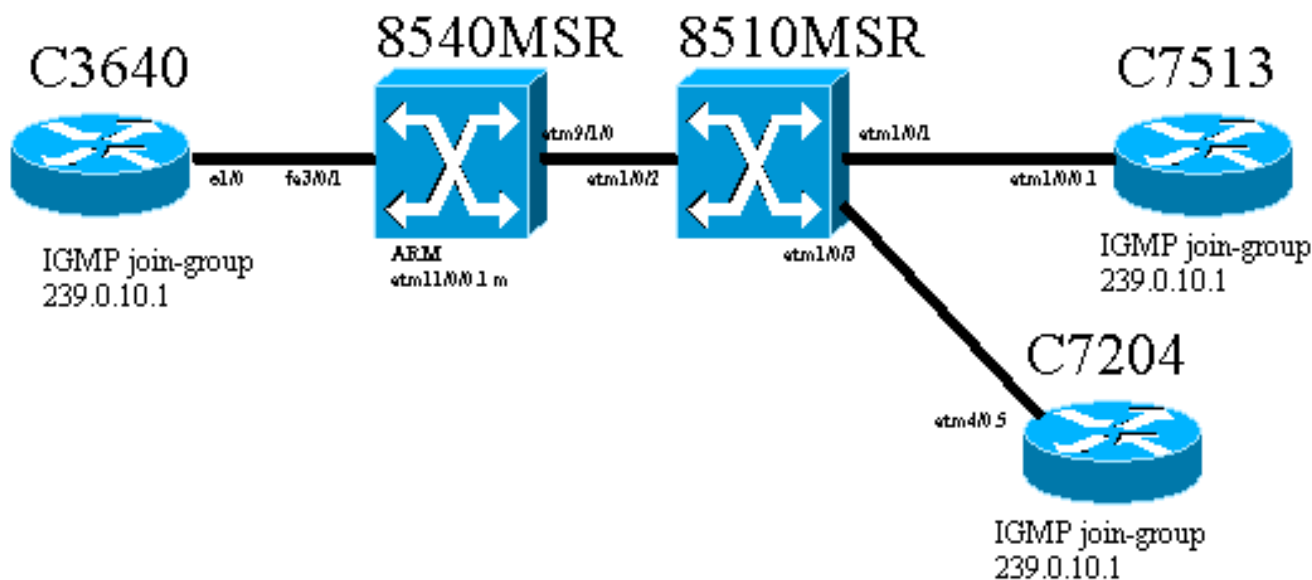
## 配置

本部分提供有关如何配置本文档所述功能的信息。

注：要查找有关本文档中使用的命令的其他信息，请使用命令[查找工具](#)([仅注册客户](#))。

## 网络图

本文档使用此图中所示的网络设置：



Cisco 3640路由器（称为C3640）通过快速以太网端口3/0/1连接到Cisco Catalyst 8540 MSR（称为8540MSR）。8540MSR在插槽11上有ARM。C8540MSR使用接口atm 9/1/0与8510MSR物理连接。8510MSR ATM交换机在ATM接口1/0/2上连接到8540MSR。

通过8510MSR构建有两个永久虚电路(PVC)。一个从8540MSR ARM多点子接口到C7513路由器，另一个从同一个8540MSR ARM多点子接口到C7204路由器。使用的路由协议是开放最短路径优先(OSPF)。路由器上配置了IP协议独立组播(PIM)密集模式。这包括8540MSR上的ARM模块。C3640、C7513和C7204有一个接口配置为加入组播组239.0.10.1。从C3640对组播地址

239.0.10.1执行ping操作时，C3644会做出响应0、C7513和C7204。

## 配置

本节包含网络图中描述的路由器和交换机上配置的部分。以下是有关配置的一些特定信息：

- 本文档中显示的配置使用encapsulation aal5mux。
- 在ARM上创建多点子接口，同时为远程站点配置ATM PVC。
- PIM用于密集模式。就PIM而言，ARM不区分多点接口上的各个VC。
- 组播流量会转发到所有配置了“广播”的虚电路。
- **show ip mroute**输出说明PIM仅标识传出接口，而不标识单个VC。

IP组播路由在PIM的帮助下的配置如下所示。IP组播路由的所有相关命令都以粗体显示。

### C3640

```
ip multicast-routing
!
interface Ethernet1/0
 ip address 10.10.200.1 255.255.255.0
 ip pim dense-mode
 ip igmp join-group 239.0.10.1
 half-duplex
!
!
router ospf 1
 log-adjacency-changes
 network 10.10.200.0 0.0.0.255 area 0
!
```

### C8540MSR

```
ip multicast-routing
!
interface FastEthernet3/0/1
 ip address 10.10.200.2 255.255.255.0
 ip pim dense-mode
 no ip route-cache
 no ip mroute-cache
!
!
interface ATM11/0/0.1 multipoint
 ip address 75.75.75.2 255.255.255.0
 ip pim dense-mode
 ip ospf network point-to-multipoint
 map-group multicast
 atm pvc 2 1000 pd on encap aal5mux ip interface
 ATM9/1/0 0 1000
 atm pvc 2 1001 pd on encap aal5mux ip interface
 ATM9/1/0 0 1001
!
!
router ospf 1
 log-adjacency-changes
 network 10.10.200.0 0.0.0.255 area 0
 network 75.75.75.0 0.0.0.255 area 0
!
```

```
map-list multicast
ip 75.75.75.1 atm-vc 1000 aal5mux broadcast
ip 75.75.75.3 atm-vc 1001 aal5mux broadcast
```

## 8510MSR

```
interface ATM1/0/2
no ip address
atm pvc 0 1000 interface ATM1/0/1 0 1000
!
interface ATM1/0/3
no ip address
atm pvc 0 1001 interface ATM1/0/2 0 1001
!
```

## C7513

```
ip multicast-routing
!
!
interface Ethernet9/0/2
ip address 30.30.30.1 255.255.255.0
ip pim dense-mode
ip igmp join-group 239.0.10.1
!
interface ATM1/0/0.1 multipoint
ip address 75.75.75.1 255.255.255.0
ip pim dense-mode
no ip route-cache
ip ospf network point-to-multipoint
no ip mroute-cache
map-group multicast
atm pvc 1000 0 1000 aal5mux ip
!
!
router ospf 1
log-adjacency-changes
network 30.30.30.0 0.0.0.255 area 0
network 75.75.75.0 0.0.0.255 area 0
!
map-list multicast
ip 75.75.75.2 atm-vc 1000 broadcast
!
```

## C7204

```
ip multicast-routing
!
interface Loopback0
ip address 40.40.40.1 255.255.255.0
ip igmp join-group 239.0.10.1
!
!
interface ATM4/0.5 multipoint
ip address 75.75.75.3 255.255.255.0
ip pim dense-mode
no ip route-cache
ip ospf network point-to-multipoint
no ip mroute-cache
map-group multicast
atm pvc 1 0 1001 aal5mux ip
```

```

!
router ospf 1
  log-adjacency-changes
  network 40.40.40.0 0.0.0.255 area 0
  network 75.75.75.0 0.0.0.255 area 0
!
map-list multicast
  ip 75.75.75.2 atm-vc 1 broadcast

```

## 验证

使用以下命令测试您的网络是否正常运行：

[命令输出解释程序工具（仅限注册用户）支持某些 show 命令](#)。通过此工具可查看对 show 命令输出的分析。

- **show ip route** - 显示 IP 路由表条目。
- **show ip pim neighbor** — 列出Cisco IOS®软件发现的PIM邻居。
- **show ip mroute** — 显示IP组播路由表的内容。
- **show ip igmp groups** — 显示直接连接到路由器并通过IGMP获取的组播组。

此输出是在网络图所示的设备上输入这些show命令的结果。此输出显示网络运行正常。

## C3640

C3640上使用**show ip route**命令来检验此路由器是否到达了所有网络IP地址。它有到75.75.75.1、75.75.75.2、75.75.75.3的路由。环回接口已定义。所有路由都通过OSPF找到。

C3640#**show ip route**

```

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       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 - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

```

```

Gateway of last resort is not set
 40.0.0.0/32 is subnetted, 1 subnets
O       40.40.40.1 [110/12] via 10.10.200.2, 00:01:48, Ethernet1/0
 10.0.0.0/24 is subnetted, 1 subnets
C       10.10.200.0 is directly connected, Ethernet1/0
 75.0.0.0/32 is subnetted, 3 subnets
O       75.75.75.3 [110/11] via 10.10.200.2, 00:01:48, Ethernet1/0
O       75.75.75.2 [110/10] via 10.10.200.2, 00:01:48, Ethernet1/0
O       75.75.75.1 [110/11] via 10.10.200.2, 00:01:48, Ethernet1/0
 30.0.0.0/24 is subnetted, 1 subnets
O       30.30.30.0 [110/21] via 10.10.200.2, 00:01:49, Ethernet1/0

```

此命令用于标识IP PIM邻居。在本例中，邻居是C8540MSR。

C3640#**show ip pim neighbor**

```

PIM Neighbor Table
Neighbor          Interface                Uptime/Expires    Ver   DR
Address
10.10.200.2      Ethernet1/0              3d03h/00:01:16   v2    N / DR

```

如果从C3640对组播组执行ping操作，则该组播组成功。这表示C3640与IP地址239.0.10.1定义的组播组通信。

```
C3640#ping 239.0.10.1
```

```
Type escape sequence to abort.
```

```
Sending 1, 100-byte ICMP Echos to 239.0.10.1, timeout is 2 seconds:
```

```
Reply to request 0 from 10.10.200.1, 4 ms
```

```
Reply to request 0 from 75.75.75.3, 4 ms
```

```
Reply to request 0 from 75.75.75.1, 4 ms
```

**show ip mroute**命令显示有关组播路由表的信息。在本示例中，239.0.10.1和224.0.1.40的路由为空。最后一个组播地址是互联网编号分配机构(IANA)为cisco-rp-discovery指定的地址。

```
C3640#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,  
X - Proxy Join Timer Running, A - Advertised via MSDP, U - URD,  
I - Received Source Specific Host Report
```

```
Outgoing interface flags: H - Hardware switched
```

```
Timers: Uptime/Expires
```

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

```
(* , 224.0.1.40), 2d23h/00:00:00, RP 0.0.0.0, flags: DJCL
```

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

```
Outgoing interface list:
```

```
Ethernet1/0, Forward/Dense, 2d23h/00:00:00
```

```
(* , 239.0.10.1), 1w1d/00:00:00, RP 0.0.0.0, flags: DJCL
```

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

```
Outgoing interface list:
```

```
Ethernet1/0, Forward/Dense, 2d23h/00:00:00
```

```
(10.10.200.1, 239.0.10.1), 00:02:37/00:00:22, flags: PCLTA
```

```
Incoming interface: Ethernet1/0, RPF nbr 0.0.0.0
```

```
Outgoing interface list: Null
```

使用**show ip igmp groups**命令检查IP IGMP组。发现C3640加入的cisco-rp-discovery组播IP地址和igmp组播组。

```
C3640#show ip igmp groups
```

```
IGMP Connected Group Membership
```

Group Address	Interface	Uptime	Expires	Last Reporter
224.0.1.40	Ethernet1/0	3d00h	00:02:38	10.10.200.2
239.0.10.1	Ethernet1/0	1w1d	00:02:44	10.10.200.1

## [C8540MSR](#)

C8540MSR Catalyst交换机中使用的**show**命令与C3640中使用的命令相同。**show ip route**命令显示C8540MSR可到达网络的所有子网。

```
C8540MSR#show ip route
```

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP  
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 - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area  
 \* - candidate default, U - per-user static route, o - ODR  
 P - periodic downloaded static route

```
Gateway of last resort is 10.118.1.21 to network 0.0.0.0
 40.0.0.0/32 is subnetted, 1 subnets
O   40.40.40.1 [110/2] via 75.75.75.3, 01:25:34, ATM11/0/0.1
 10.0.0.0/24 is subnetted, 2 subnets
C   10.118.1.0 is directly connected, Ethernet0
C   10.10.200.0 is directly connected, FastEthernet3/0/1
 75.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
O   75.75.75.3/32 [110/1] via 75.75.75.3, 01:25:34, ATM11/0/0.1
O   75.75.75.1/32 [110/1] via 75.75.75.1, 01:25:34, ATM11/0/0.1
C   75.75.75.0/24 is directly connected, ATM11/0/0.1
 30.0.0.0/24 is subnetted, 1 subnets
O   30.30.30.0 [110/11] via 75.75.75.1, 01:25:35, ATM11/0/0.1
S*  0.0.0.0/0 [1/0] via 10.118.1.21
```

**show ip pim neighbor**命令显示组播邻居。在C8540MSR中，IP PIM邻居是C3640(10.10.200.1)、C7513(75.75.75.1)和C7204(75.75.75.3)。

```
C8540MSR#show ip pim neighbor
PIM Neighbor Table
Neighbor Address  Interface                Uptime    Expires    Ver  Mode
10.10.200.1       FastEthernet3/0/1        3d02h     00:01:25   v2
75.75.75.3        ATM11/0/0.1              00:12:11  00:01:33   v2   (DR)
75.75.75.1        ATM11/0/0.1              00:18:43  00:01:32   v2
```

**show ip mroute**命令提供有关组播路由表的信息。此示例显示239.0.10.1和224.0.1.40有一个空路由。最后一个组播地址是IANA为cisco-rp-discovery指定的地址。

```
C8540MSR#show ip mroute
IP Multicast Routing Table
Flags: D - Dense, S - Sparse, 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 - Advertised via MSDP, U - URD, I - Received Source Specific Host
       Report
Outgoing interface flags: H - Hardware switched
Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode

(*, 224.0.1.40), 3d03h/00:00:00, RP 0.0.0.0, flags: DJCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    ATM11/0/0.1, Forward/Dense, 01:33:56/00:00:00
    FastEthernet3/0/1, Forward/Dense, 3d03h/00:00:00

(*, 239.0.10.1), 3d03h/00:02:59, RP 0.0.0.0, flags: DJC
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    ATM11/0/0.1, Forward/Dense, 01:33:56/00:00:00
    FastEthernet3/0/1, Forward/Dense, 3d03h/00:00:00

(10.10.200.1, 239.0.10.1), 00:00:17/00:02:49, flags: CT
  Incoming interface: FastEthernet3/0/1, RPF nbr 0.0.0.0
  Outgoing interface list:
    ATM11/0/0.1, Forward/Dense, 00:00:19/00:00:00
```

**C7513**

此处所示命令的说明和说明与C3640和C8540MSR提供的命令相同。

C7513#show ip route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP  
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 - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area  
\* - candidate default, U - per-user static route, o - ODR  
P - periodic downloaded static route

Gateway of last resort is 10.118.1.21 to network 0.0.0.0  
40.0.0.0/32 is subnetted, 1 subnets  
O 40.40.40.1 [110/3] via 75.75.75.2, 02:05:04, ATM1/0/0.1  
10.0.0.0/24 is subnetted, 2 subnets  
C 10.118.1.0 is directly connected, Ethernet9/0/1  
O 10.10.200.0 [110/2] via 75.75.75.2, 02:05:04, ATM1/0/0.1  
11.0.0.0/24 is subnetted, 2 subnets  
C 11.12.12.0 is directly connected, Serial0/0/0/2:2  
C 11.11.11.0 is directly connected, Serial0/0/0/1:1  
75.0.0.0/8 is variably subnetted, 3 subnets, 2 masks  
O 75.75.75.3/32 [110/2] via 75.75.75.2, 02:05:05, ATM1/0/0.1  
O 75.75.75.2/32 [110/1] via 75.75.75.2, 02:05:05, ATM1/0/0.1  
C 75.75.75.0/24 is directly connected, ATM1/0/0.1  
30.0.0.0/24 is subnetted, 1 subnets  
C 30.30.30.0 is directly connected, Ethernet9/0/2  
S\* 0.0.0.0/0 [1/0] via 10.118.1.21

C7513#show ip pim neighbor

PIM Neighbor Table

Neighbor Address	Interface	Uptime/Expires	Ver	DR Prio/Mode
75.75.75.2	ATM1/0/0.1	04:28:34/00:01:18	v2	N / DR

C7513#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,  
X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,  
U - URD, I - Received Source Specific Host Report

Outgoing interface flags: H - Hardware switched

Timers: Uptime/Expires

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

(\* , 224.0.1.40), 22:03:58/00:00:00, RP 0.0.0.0, flags: DCL

Incoming interface: Null, RPF nbr 0.0.0.0

Outgoing interface list:

Ethernet9/0/2, Forward/Dense, 22:03:58/00:00:00

ATM1/0/0.1, Forward/Dense, 04:28:37/00:00:00

(\* , 239.0.10.1), 22:03:58/00:00:00, RP 0.0.0.0, flags: DCL

Incoming interface: Null, RPF nbr 0.0.0.0

Outgoing interface list:

Ethernet9/0/2, Forward/Dense, 22:03:58/00:00:00

ATM1/0/0.1, Forward/Dense, 04:28:37/00:00:00

(10.10.200.1, 239.0.10.1), 00:00:51/00:02:08, flags: CLT

Incoming interface: ATM1/0/0.1, RPF nbr 75.75.75.2

Outgoing interface list:

Ethernet9/0/2, Forward/Dense, 00:00:52/00:00:00

C7513#show ip igmp groups

IGMP Connected Group Membership

Group Address	Interface	Uptime	Expires	Last Reporter
---------------	-----------	--------	---------	---------------



```
224.0.1.40      Ethernet9/0/2      22:04:09  00:02:50  30.30.30.1
239.0.10.1     Ethernet9/0/2      22:04:15  00:02:50  30.30.30.1
```

## C7204

此处所示命令的说明和说明与C3640和C8540MSR提供的命令相同。

### C7204#show ip route

```
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       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 - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route
```

```
Gateway of last resort is 10.118.1.21 to network 0.0.0.0
 40.0.0.0/24 is subnetted, 1 subnets
 C    40.40.40.0 is directly connected, Loopback0
 10.0.0.0/24 is subnetted, 2 subnets
 C    10.118.1.0 is directly connected, FastEthernet0/0
 O    10.10.200.0 [110/2] via 75.75.75.2, 03:31:48, ATM4/0.5
 75.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
 O    75.75.75.2/32 [110/1] via 75.75.75.2, 03:31:48, ATM4/0.5
 O    75.75.75.1/32 [110/2] via 75.75.75.2, 03:31:48, ATM4/0.5
 C    75.75.75.0/24 is directly connected, ATM4/0.5
 30.0.0.0/24 is subnetted, 1 subnets
 O    30.30.30.0 [110/12] via 75.75.75.2, 03:31:49, ATM4/0.5
 S*   0.0.0.0/0 [1/0] via 10.118.1.21
```

### C7204#show ip pim neighbor

PIM Neighbor Table

Neighbor Address	Interface	Uptime/Expires	Ver	DR Prio/Mode
75.75.75.2	ATM4/0.5	03:32:29/00:01:23	v2	N /

### C7204#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,
       X - Proxy Join Timer Running, A - Candidate for MSDP Advertisement,
       U - URD, I - Received Source Specific Host Report
```

Outgoing interface flags: H - Hardware switched

Timers: Uptime/Expires

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

```
(* , 224.0.1.40), 05:20:47/00:00:00, RP 0.0.0.0, flags: DCL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    ATM4/0.5, Forward/Dense, 03:57:26/00:00:00
```

```
(* , 239.0.10.1), 03:31:41/00:00:00, RP 0.0.0.0, flags: DL
  Incoming interface: Null, RPF nbr 0.0.0.0
  Outgoing interface list:
    ATM4/0.5, Forward/Dense, 03:31:41/00:00:00
```

### 7204#show ip igmp groups

IGMP Connected Group Membership

Group Address	Interface	Uptime	Expires	Last Reporter
224.0.1.40	ATM4/0.5	05:20:53	00:02:24	75.75.75.3
239.0.10.1	Loopback0	23:33:52	stopped	40.40.40.1

## [故障排除](#)

目前没有针对此配置的故障排除信息。

## [相关信息](#)

- [IP 组播故障排除指南](#)
- [ATM交换机路由器软件配置指南](#)
- [ATM技术支持页](#)