

# 在Cisco Catalyst 8540 MSR上設定ATM上的IP多點傳送路由(ARM)

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## 簡介

隨著網路規模的擴大，IP組播路由作為確定哪些網段需要組播流量和不需要組播流量的手段變得至關重要。IP多點傳送是一種路由技術，允許IP流量從一個來源傳播到多個目的地，或從多個來源傳播到多個目的地。一個資料包被傳送到由單個IP目標組地址標識的組播組，而不是傳送到每個目標。

本文顯示如何在Catalyst 8540 MSR上通過ATM路由器模組(ARM)設定IP多點傳送路由。此配置在ARM和增強型ARM (分別稱為ARM I和ARM II) 上均支援。

## 必要條件

### 需求

本文檔的讀者應瞭解思科路由器上的基本IP組播配置。如需背景資訊，請參閱以下檔案：

- [設定IP多點傳送路由](#)
- [IP多點傳送路由命令](#)
- [IP組播故障排除指南](#)

## 採用元件

本文中的資訊係根據以下軟體和硬體版本：

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

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](#)。

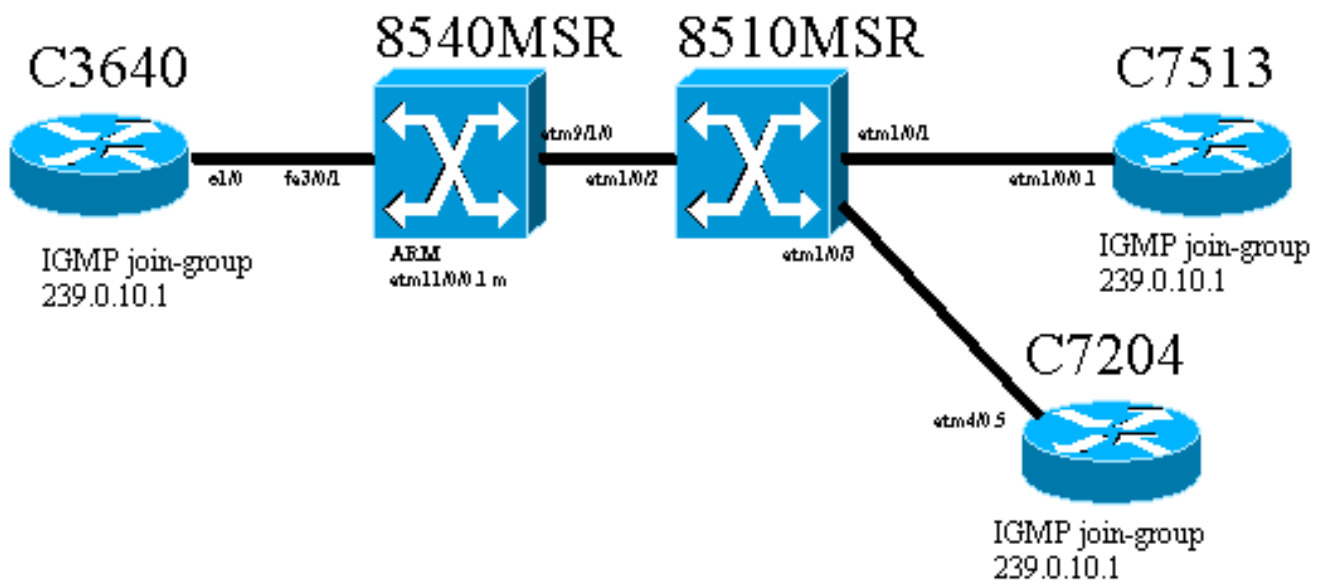
## 設定

本節提供用於設定本文件中所述功能的資訊。

**注意：**要查詢有關本文檔中使用的命令的其他資訊，請使用[命令查詢工具](#)（[僅限註冊客戶](#)）。

## 網路圖表

本檔案會使用下圖所示的網路設定：



Cisco 3640路由器（稱為C3640）通過快速乙太網埠3/0/1連線到Cisco Catalyst 8540 MSR（稱為8540MSR）。8540MSR在插槽11上有一個ARM。C8540MSR使用interface `atm 9/1/0`物理連線到8510MSR。8510MSR ATM交換器連線到ATM介面1/0/2上的8540MSR。

通過8510MSR構建有兩個永久虛擬電路(PVC)。一個從8540MSR ARM多點子介面到C7513路由器，另一個從同一個8540MSR ARM多點子介面到C7204路由器。使用的路由協定是開放最短路徑優先(OSPF)。路由器上已設定IP通訊協定無關多點傳送(PIM)密集模式。這包括8540MSR上的ARM模組。C3640、C7513和C7204有一個介面配置為加入組播組239.0.10.1。從C3640對組播地址

239.0.10.1執行ping操作會從C3640、C7513和C7204獲得響應。

## 組態

本節包含網路圖所述的路由器和交換器上的組態部分。以下是有關組態的一些特定資訊：

- 文中顯示的配置使用encapsulation aal5mux。
- 在ARM上建立多點子介面，同時將ATM PVC配置為遠端站點。
- PIM用於密集模式。就PIM而言，ARM並不區分多點介面上的各個VC。
- 組播流量轉發到所有配置了「廣播」的VC。
- **show ip mroute**輸出說明PIM只識別傳出介面，而不識別單個VC。

此處顯示使用PIM進行IP多點傳送路由的組態。IP組播路由的所有相關命令均以粗體顯示。

### 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
```

## 驗證

使用以下命令測試網路是否正常運行：

[輸出直譯器工具](#)支援某些show命令(僅限[註冊](#)客戶)。這麼做可以看出show指令輸出的分析。

- **show ip route** — 顯示IP路由表條目。
- **show ip pim neighbor** — 列出由Cisco IOS®軟體發現的PIM鄰居。
- **show ip mroute** — 顯示IP組播路由表的內容。
- **show ip igmp groups** — 顯示直接連線到路由器並通過IGMP獲知的組播組。

在網路圖所示的裝置上輸入這些show命令後，將顯示輸出。此輸出表明網路運行正常。

## C3640

在C3640上使用**show ip route**命令驗證此路由器是否到達所有網路IP地址。它具有通往75.75.75.1、75.75.75.2、75.75.75.3的路由。定義了環回介面。所有路由都通過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
```

此命令用於標識IP PIM鄰居。此案例中的鄰居是C8540MSR。

```
C3640#show ip pim neighbor
```

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

如果從C3640對組播組執行ping操作，則成功。這表示C3640與IP地址239.0.10.1定義的組播組通訊

o

```
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**命令顯示有關組播路由表的資訊。在本示例中，239.0.10.1和224.0.1.40有空路由。最後一個組播地址是由網際網路編號指派機構(IANA)為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**命令的幫助檢查IP IGMP組。同時發現cisco-rp-discovery組播ip地址和C3640加入的igmp組播組。

```
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交換器中使用的**show**命令與C3460中使用的命令相同。**show ip route**命令顯示C8540MSR可以到達網路的所有子網。

```
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**命令顯示組播鄰居。在C8540MSR中，IP PIM鄰居是C3640(10.10.200.1)、C7513(75.75.75.1)和C7204(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**命令會提供有關多點傳送路由表的資訊。此示例顯示239.0.10.1和224.0.1.40有空路由。最後一個組播地址是IANA為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](#)

此處顯示的命令說明和解釋與[C3640](#)和[C8540MSR](#)的說明和解釋相同。

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 Interface Uptime/Expires Ver DR
Address 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](#)

此處顯示的命令說明和解釋與[C3640](#)和[C8540MSR](#)提供的說明和解釋相同。

### 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

## [疑難排解](#)

目前尚無適用於此組態的具體疑難排解資訊。

## [相關資訊](#)

- [IP組播故障排除指南](#)
- [ATM交換器路由器軟體組態設定指南](#)
- [ATM技術支援頁面](#)