Why Doesn't PIM Sparse Mode Work with a Static Route to an HSRP Address?

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Introduction

This document explains why multicast packets are not forwarded when you configure a static route to the Hot Standby Router Protocol (HSRP) address of a Protocol Independent Multicast (PIM) sparse mode neighbor.

Prerequisites

Requirements

Readers of this document should have knowledge of these topics:

- HSRP
- PIM sparse mode

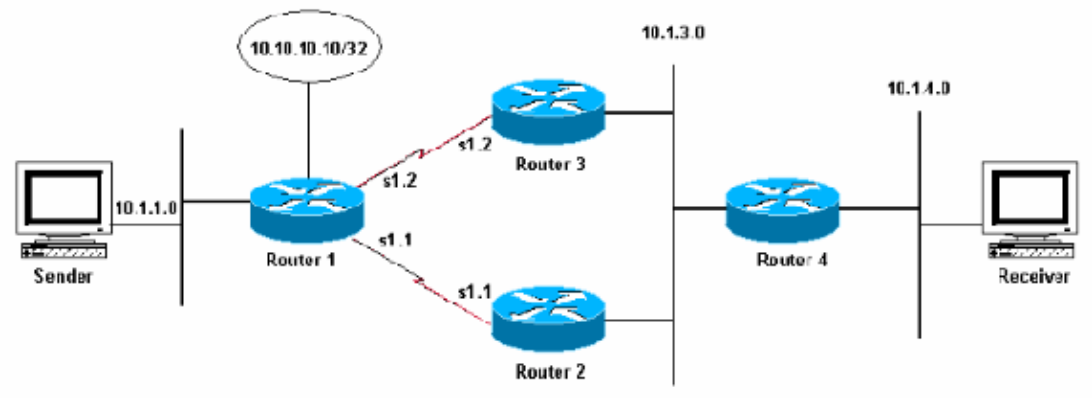
Components Used

This document is not restricted to specific software and hardware versions.

Conventions

For more information on document conventions, refer to Cisco Technical Tips Conventions.

Network Diagram



In the figure above, Routers 2 and 3 are talking HSRP on subnet 10.1.3.0, and Router 2 is the active router. Routers 1, 2, and 3 are talking Enhanced Interior Gateway Routing Protocol (EIGRP), and Router 4 has a static default route to the HSRP virtual address.

Configurations

Router 1

```
Current configuration:

!
ip multicast-routing
!
!
interface Loopback0
ip address 10.10.10.10 255.255.255.255
no ip directed-broadcast
!
interface Ethernet0
no ip address
no ip directed-broadcast
shutdown
!
interface Ethernet1
ip address 10.1.1.1 255.255.255.0
no ip directed-broadcast
ip pim sparse-mode
!
interface Serial1
no ip address
no ip directed-broadcast
encapsulation frame-relay
!
interface Serial1.1 point-to-point
ip address 10.1.2.1 255.255.255.252
no ip directed-broadcast
ip pim sparse-mode
frame-relay interface-dlci 612
!
!
interface Serial1.2 point-to-point
ip address 10.1.2.5 255.255.255.252
no ip directed-broadcast
ip pim sparse-mode
frame-relay interface-dlci 613
!
router eigrp 1
network 10.0.0.0
no auto-summary
!
ip classless
no ip http server
ip pim rp-address 10.10.10.10
!

end
```

Router 2

```
Current configuration:

!
ip multicast-routing
ip dvmrp route-limit 20000
!
!
interface Ethernet1
ip address 10.1.3.1 255.255.255.0
no ip redirects
ip pim sparse-mode
standby 1 priority 110 preempt
standby 1 ip 10.1.3.3
!
interface Serial1
no ip address
encapsulation frame-relay
!
interface Serial1.1 point-to-point
ip address 10.1.2.2 255.255.255.252
ip pim sparse-mode
frame-relay interface-dlci 621
!
router eigrp 1
network 10.0.0.0
no auto-summary
!
ip classless
```

Router 3

```
Current configuration:

!
ip multicast-routing
ip dvmrp route-limit 20000
!
```

Router 4

```
Current configuration:

!
ip multicast-routing
ip dvmrp route-limit 20000
!
router eigrp 1
network 10.0.0.0
no auto-summary
!
ip classless
```

```
interface Ethernet1
ip address 10.1.3.2 255.255.255.0
no ip redirects
ip pim sparse-mode
standby 1 priority 100 preempt
standby 1 ip 10.1.3.3
!
interface Serial1
no ip address
encapsulation frame-relay
!
interface Serial1.2 point-to-point
ip address 10.1.2.6 255.255.255.252
ip pim sparse-mode
frame-relay interface-dlci 631
!
router eigrp 1
network 10.0.0.0
no auto-summary
eigrp log-neighbor-changes
!
ip classless
no ip http server
ip pim rp-address 10.10.10.10
!

end
```

```
!
interface Ethernet0
ip address 10.1.4.1 255.255.255.0
no ip directed-broadcast
ip igmp join-group 239.1.2.3
!
interface Ethernet1
ip address 10.1.3.4 255.255.255.0
no ip directed-broadcast
ip pim sparse-mode
!
no ip http server
ip classless
ip route 0.0.0.0 0.0.0.0 10.1.3.3
ip pim rp-address 10.10.10.10
!

end
```

In order to simulate a host on Ethernet 0, the **ip igmp join-group** command was configured on this interface on Router 4:

```
router4# ip igmp join-group

IGMP Connected Group Membership
Group Address Interface Uptime Expires Last Reporter
224.0.1.40 Ethernet1 4d23h never 10.1.3.1
239.1.2.3 Ethernet0 4d23h never 10.1.4.1
```

Router 4 also can ping the rendezvous point (RP) address:

```
Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.10.10.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 60/61/68 ms
```

Look at the multicast route (mroute) table:

```
Router4# show ip mroute 239.1.2.3

IP Multicast Routing Table

Flags: D - Dense, S - Sparse, C - Connected, L - Local, P - Pruned
R - RP-bit set, F - Register flag, T - SPT-bit set, J - Join SPT
X - Proxy Join Timer Running

Timers: Uptime/Expires
Interface state: Interface, Next-Hop or VCD, State/Mode
(*, 239.1.2.3), 00:04:28/00:00:00, RP 10.10.10.10, flags: SJCL
Incoming interface: Ethernet1, RPF nbr 10.1.3.3
Outgoing interface list:
Ethernet0, Forward/Sparse, 00:02:12/00:02:53
```

Because there is a receiver for this group (due to the **ip igmp join−group** command used in Router 4), build a (*,G) entry in the mroute table. Note the Reverse Path Forwarding (RPF) neighbor for the (*,G) entry is 10.1.3.3, which is the HSRP standby address. However, there is not a (S,G) entry, which means traffic is not being received from the source.

Since Router 4 has an interested receiver for the group, it now should send a PIM Join/Prune message to its PIM neighbors. Use the **show ip pim neighbor** command to view Router 4's PIM neighbors, as seen below:

```
Router4# show ip pim neighbor

PIM Neighbor Table
Neighbor Address Interface Uptime Expires Ver Mode
10.1.3.1 Ethernet1 4d23h 00:01:41 v2
10.1.3.2 Ethernet1 4d23h 00:01:36 v2
```

If the **debug ip pim 239.1.2.3** command is enabled, Router 4 is building this PIM Join/Prune message, but it does not actually send it:

*Mar 6 18:32:48: PIM: Received RP−Reachable on Ethernet1 from 10.10.10.10 *Mar 6 18:32:48: for group 239.1.2.3 *Mar 6 18:33:14: PIM: Building Join/Prune message for 239.1.2.3 *Mar 6 18:34:13: PIM: Building Join/Prune message for 239.1.2.3

Why is the router not sending the Join/Prune message? RFC 2362 states that "a router sends a periodic Join/Prune message to each distinct RPF neighbor associated with each (S,G), (*,G) and (*,*,RP) entry. Join/Prune messages are sent only if the RPF neighbor is a PIM neighbor."

In the example, the RPF neighbor is 10.1.3.3, which is the HSRP standby address used by the default static route. However, this address is not listed as a PIM neighbor. The reason the HSRP standby address is not listed as a PIM neighbor is because the two routers running HSRP (Routers 2 and 3) will not source the PIM neighbor messages from the HSRP standby address.

To solve the problem, change Router 4's configuration so the RPF neighbor is also a PIM neighbor. Do this by including Router 4 in the EIGRP process so that it now learns the RP address through EIGRP.

Note: Since Router 4 has the capability to run a routing protocol it should not have to rely on an HSRP standby address for connectivity. The development of HSRP was intended to offer a way for hosts to gain quick and efficient redundancy or fail−over.

Below is the new configuration of Router 4 with EIGRP enabled.

```
ip multicast−routing
ip dvmrp route−limit 20000
!
!
!
interface Ethernet0
ip address 10.1.4.1 255.255.255.0
no ip directed−broadcast
ip igmp join−group 239.1.2.3
!
interface Ethernet1
ip address 10.1.3.4 255.255.255.0
no ip directed−broadcast
ip pim sparse−mode
!
router eigrp 1
network 10.0.0.0
no auto−summary
!
```

```
no ip http server
ip classless
ip route 0.0.0.0 0.0.0.0 10.1.3.3
ip pim rp−address 10.10.10.10
!
end
```

Note: Instead of including Router 4 in the EIGRP process (the preferred method), add static mroutes to Router 4 to make it RPF to the real routers' IP addresses because mroutes are preferred over the unicast routing table in RPF checks. For example, add **ip mroute 0.0.0.0 0.0.0.0 10.1.3.2**.

Related Information

- **HSRP Support Page**
- **IP Routed Protocols Support Page**
- **Technical Support − Cisco Systems**

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