



# Configuring HSRP Aware PIM

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## HSRP Aware PIM

This module describes how to configure the HSRP Aware PIM feature for enabling multicast traffic to be forwarded through the Hot Standby Router Protocol (HSRP) active router (AR), allowing Protocol Independent Multicast (PIM) to leverage HSRP redundancy, avoid potential duplicate traffic, and enable failover.

## Restrictions for HSRP Aware PIM

- HSRP IPv6 is not supported.
- Stateful failover is not supported. During PIM stateless failover, the HSRP group's virtual IP address transfers to the standby router but no mroute state information is transferred. PIM listens and responds to state change events and creates mroute states upon failover.
- The maximum number of HSRP groups that can be tracked by PIM on each interface is 16.
- The redundancy priority for a PIM DR must be greater than the configured or default value (1) of the PIM DR priority on any device for which the same HSRP group is enabled or the HSRP Active will fail to win the DR election.
- Dense mode is not supported.
- HSRP address as PIM RP is not supported. HSRP aware PIM is for coordinating PIM DR election and HSRP primary election.

## Information About HSRP Aware PIM

### HSRP

Hot Standby Router Protocol (HSRP) is a Cisco proprietary redundancy protocol for establishing a fault-tolerant default gateway.

The protocol establishes a framework between network devices in order to achieve default gateway failover if the primary gateway becomes inaccessible. By sharing an IP address and a MAC (Layer 2) address, two or more devices can act as a single virtual router. The members of a virtual router group continually exchange

status messages and one device can assume the routing responsibility of another, should it go out of commission for either planned or unplanned reasons. Hosts continue to forward IP packets to a consistent IP and MAC address, and the changeover of devices doing the routing is transparent.

HSRP is useful for hosts that do not support a router discovery protocol and cannot switch to a new device when their selected device reloads or loses power. Because existing TCP sessions can survive the failover, this protocol also provides a more transparent recovery for hosts that dynamically choose a next hop for routing IP traffic.

When HSRP is configured on a network segment, it provides a virtual MAC address and an IP address that is shared among a group of devices running HSRP. The address of this HSRP group is referred to as the virtual IP address. One of these devices is selected by the protocol to be the active router (AR). The AR receives and routes packets destined for the MAC address of the group.

HSRP uses a priority mechanism to determine which HSRP configured device is to be the default AR. To configure a device as the AR, you assign it a priority that is higher than the priority of all the other HSRP-configured devices. The default priority is 100, so if you configure just one device to have a higher priority, that device will be the default AR.

Devices that are running HSRP send and receive multicast User Datagram Protocol (UDP)-based hello messages to detect device failure and to designate active and standby devices. When the AR fails to send a hello message within a configurable period of time, the standby device with the highest priority becomes the AR. The transition of packet forwarding functions between devices is completely transparent to all hosts on the network.

You can configure multiple Hot Standby groups on an interface, thereby making fuller use of redundant devices and load sharing.

HSRP is not a routing protocol as it does not advertise IP routes or affect the routing table in any way.

HSRP has the ability to trigger a failover if one or more interfaces on the device fail. This can be useful for dual branch devices each with a single serial link back to the head end. If the serial link of the primary device goes down, the backup device takes over the primary functionality and thus retains connectivity to the head end.

## HSRP Aware PIM

Protocol Independent Multicast (PIM) has no inherent redundancy capabilities and its operation is completely independent of Hot Standby Router Protocol (HSRP) group states. As a result, IP multicast traffic is forwarded not necessarily by the same device as is elected by HSRP. The HSRP Aware PIM feature provides consistent IP multicast forwarding in a redundant network with virtual routing groups enabled.

HSRP Aware PIM enables multicast traffic to be forwarded through the HSRP active router (AR), allowing PIM to leverage HSRP redundancy, avoid potential duplicate traffic, and enable failover, depending on the HSRP states in the device. The PIM designated router (DR) runs on the same gateway as the HSRP AR and maintains mroute states.

In a multiaccess segment (such as LAN), PIM DR election is unaware of the redundancy configuration, and the elected DR and HSRP AR may not be the same router. In order to ensure that the PIM DR is always able to forward PIM Join/Prune message towards RP or FHR, the HSRP AR becomes the PIM DR (if there is only one HSRP group). PIM is responsible for adjusting DR priority based on the group state. When a failover occurs, multicast states are created on the new AR elected by the HSRP group and the AR assumes responsibility for the routing and forwarding of all the traffic addressed to the HSRP virtual IP address.

With HSRP Aware PIM enabled, PIM sends an additional PIM Hello message using the HSRP virtual IP addresses as the source address for each active HSRP group when a device becomes HSRP Active. The PIM

Hello will carry a new GenID in order to trigger other routers to respond to the failover. When a downstream device receives this PIM Hello, it will add the virtual address to its PIM neighbor list. The new GenID carried in the PIM Hello will trigger downstream routers to resend PIM Join messages towards the virtual address. Upstream routers will process PIM Join/Prunes (J/P) based on HSRP group state.

If the J/P destination matches the HSRP group virtual address and if the destination device is in HSRP active state, the new AR processes the PIM Join because it is now the acting PIM DR. This allows all PIM Join/Prunes to reach the HSRP group virtual address and minimizes changes and configurations at the downstream routers side.

The IP routing service utilizes the existing virtual routing protocol to provide basic stateless failover services to client applications, such as PIM. Changes in the local HSRP group state and standby router responsibility are communicated to interested client applications. Client applications may build on top of IRS to provide stateful or stateless failover. PIM, as an HSRP client, listens to the state change notifications from HSRP and automatically adjusts the priority of the PIM DR based on the HSRP state. The PIM client also triggers communication between upstream and downstream devices upon failover in order to create an mroute state on the new AR.

## How to Configure HSRP Aware PIM

### Configuring an HSRP Group on an Interface

#### Before you begin

- IP multicast must already be configured on the device.
- PIM must already be configured on the interface.

#### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b> Device> enable	Enables privileged EXEC mode.  • Enter your password if prompted.
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>interface</b> <i>type number</i> [ <i>name-tag</i> ]  <b>Example:</b> Device(config)# interface ethernet 0/0	Specifies an interface to be configured and enters interface configuration mode.
<b>Step 4</b>	<b>ip address</b> <i>ip-address mask</i>  <b>Example:</b> Device(config-if)# ip address 10.0.0.2 255.255.255.0	Sets a primary or secondary IP address for an interface.

	Command or Action	Purpose
<b>Step 5</b>	<b>standby</b> [ <i>group-number</i> ] <b>ip</b> [ <i>ip-address</i> [ <i>secondary</i> ]]  <b>Example:</b> Device(config-if)# standby 1 ip 192.0.2.99	Activates HSRP and defines an HSRP group.
<b>Step 6</b>	<b>standby</b> [ <i>group-number</i> ] <b>timers</b> [ <i>msec</i> ] <i>hellotime</i> [ <i>msec</i> ] <i>holdtime</i>  <b>Example:</b> Device(config-if)# standby 1 timers 5 15	(Optional) Configures the time between hello packets and the time before other devices declare an HSRP active or standby router to be down.
<b>Step 7</b>	<b>standby</b> [ <i>group-number</i> ] <b>priority</b> <i>priority</i>  <b>Example:</b> Device(config-if)# standby 1 priority 120	(Optional) Assigns the HSRP priority to be used to help select the HSRP active and standby routers.
<b>Step 8</b>	<b>standby</b> [ <i>group-number</i> ] <b>name</b> <i>group-name</i>  <b>Example:</b> Device(config-if)# standby 1 name HSRP1	(Optional) Defines a name for the HSRP group.  <b>Note</b> We recommend that you always configure the <b>standby ip name</b> command when configuring an HSRP group to be used for HSRP Aware PIM.
<b>Step 9</b>	<b>end</b>  <b>Example:</b> Device(config-if)# end	Returns to privileged EXEC mode.
<b>Step 10</b>	<b>show standby</b> [ <i>type number</i> [ <i>group</i> ]] [ <i>all</i>   <i>brief</i> ]  <b>Example:</b> Device# show standby	Displays HSRP group information for verifying the configuration.

## Configuring PIM Redundancy

### Before you begin

The HSRP group must already be configured on the interface. See the “Configuring an HSRP Group on an Interface” section.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>	Enables privileged EXEC mode.

	Command or Action	Purpose
	<b>Example:</b> Device> enable	<ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>interface <i>type number</i> [<i>name-tag</i>]</b>  <b>Example:</b> Device(config)# interface ethernet 0/0	Specifies an interface to be configured and enters interface configuration mode.
<b>Step 4</b>	<b>ip address <i>ip-address mask</i></b>  <b>Example:</b> Device(config-if)# ip address 10.0.0.2 255.255.255.0	Sets a primary or secondary IP address for an interface.
<b>Step 5</b>	<b>ip pim redundancy <i>group dr-priority priority</i></b>  <b>Example:</b> Device(config-if)# ip pim redundancy HSRP1 dr-priority 60	<p>Enables PIM redundancy and assigns a redundancy priority value to the active PIM designated router (DR).</p> <ul style="list-style-type: none"> <li>• Because HSRP group names are case sensitive, the value of the <i>group</i> argument must match the group name configured by using the <b>standby ip name</b> command.</li> <li>• The redundancy priority for a PIM DR must be greater than the configured or default value (1) of the PIM DR priority on any device for which the same HSRP group is enabled.</li> </ul>
<b>Step 6</b>	<b>end</b>  <b>Example:</b> Device(config-if)# end	Returns to privileged EXEC mode.

## Configuration Examples for HSRP Aware PIM

### Example: Configuring an HSRP Group on an Interface

```

interface ethernet 0/0
 ip address 10.0.0.2 255.255.255.0
 standby 1 ip 192.0.2.99
 standby 1 timers 5 15
 standby 1 priority 120
 standby 1 name HSRP1
!
```

## Example: Configuring PIM Redundancy

```
interface ethernet 0/0
ip address 10.0.0.2 255.255.255.0
ip pim redundancy HSRP1 dr-priority 60
!
```