



# Implementing HSRP on Cisco ASR 9000 Series Router

The Hot Standby Router Protocol (HSRP) is an IP routing redundancy protocol designed to allow for transparent failover at the first-hop IP router. HSRP provides high network availability, because it routes IP traffic from hosts on networks without relying on the availability of any single router. HSRP is used in a group of routers for selecting an active router and a standby router. (An active router is the router of choice for routing packets; a standby router is a router that takes over the routing duties when an active router fails, or when preset conditions are met.)

## Feature History for Implementing HSRP on Cisco ASR 9000 Series Router

| Release       | Modification   |
|---------------|--|
| Release 3.7.2 | This feature was introduced on Cisco ASR 9000 Series Routers.  |
| Release 3.9.0 | <ul style="list-style-type: none"><li>• BFD for HSRP feature was added.</li><li>• Hot restartability for HSRP feature was added.</li></ul> |

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## Prerequisites for Implementing HSRP

- You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

# Restrictions for Implementing HSRP

HSRP is supported on Ethernet interfaces, Ethernet sub-interfaces and Ethernet link bundles.

## Information About Implementing HSRP

To implement HSRP on Cisco IOS XR software, you need to understand the following concepts:

- [HSRP Overview, page IC-116](#)
- [HSRP Groups, page IC-116](#)
- [HSRP and ARP, page IC-118](#)
- [Preemption, page IC-118](#)
- [ICMP Redirect Messages, page IC-118](#)

## HSRP Overview

HSRP is useful for hosts that do not support a router discovery protocol (such as Internet Control Message Protocol [ICMP] Router Discovery Protocol [IRDP]) and cannot switch to a new router when their selected router 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 routers 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*. The active router receives and routes packets destined for the MAC address of the group. For  $n$  routers running HSRP,  $n + 1$  IP and MAC addresses are assigned.

HSRP detects when the designated active router fails, at which point a selected standby router assumes control of the MAC and IP addresses of the HSRP group. A new *standby router* is also selected at that time.

Devices that are running HSRP send and receive multicast User Datagram Protocol (UDP) based hello packets to detect router failure and to designate active and standby routers.

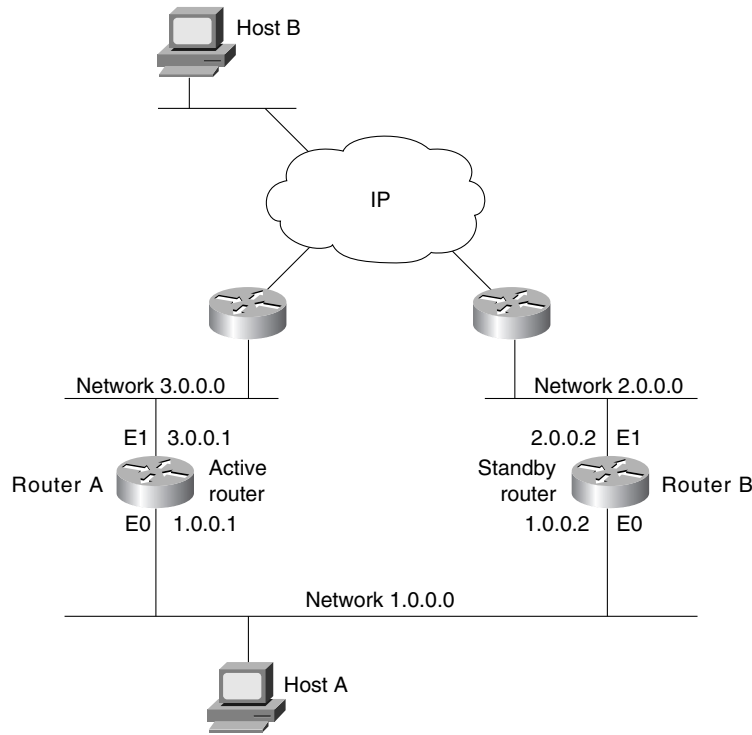
## HSRP Groups

An HSRP group consists of two or more routers running HSRP that are configured to provide hot standby services for one another. HSRP uses a priority scheme to determine which HSRP-configured router is to be the default active router. To configure a router as the active router, you assign it a priority that is higher than the priority of all the other HSRP-configured routers. The default priority is 100, so if you configure just one router to have a higher priority, that router will be the default active router.

HSRP works by the exchange of multicast messages that advertise priority among the HSRP group. When the active router fails to send a hello message within a configurable period of time, the standby router with the highest priority becomes the active router. The transition of packet-forwarding functions between routers is completely transparent to all hosts on the network.

[Figure 3](#) shows routers configured as members of a single HSRP group.

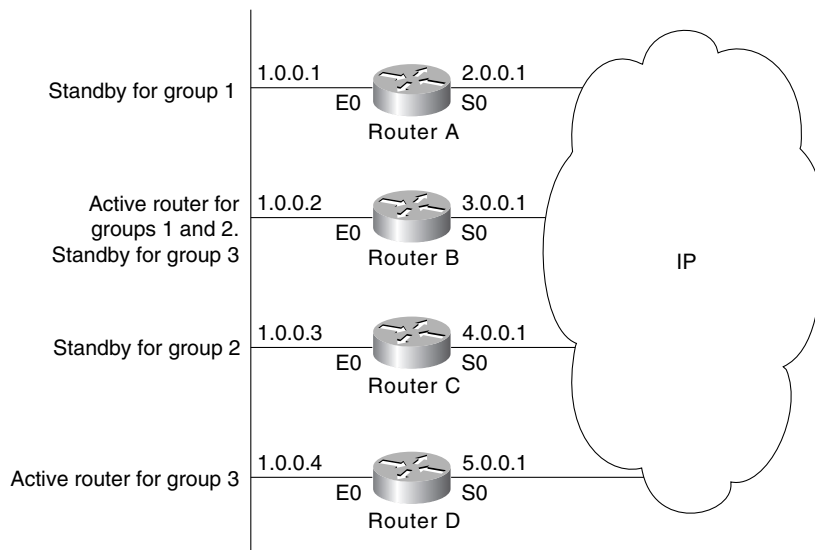
**Figure 3 Routers Configured as an HSRP Group**



All hosts on the network are configured to use the IP address of the virtual router (in this case, 1.0.0.3) as the default gateway.

A single router interface can also be configured to belong to more than one HSRP group. Figure 4 shows routers configured as members of multiple HSRP groups.

**Figure 4 Routers Configured as Members of Multiple HSRP Groups**



In [Figure 4](#), the Ethernet interface 0 of Router A belongs to group 1. Ethernet interface 0 of Router B belongs to groups 1, 2, and 3. The Ethernet interface 0 of Router C belongs to group 2, and the Ethernet interface 0 of Router D belongs to group 3. When you establish groups, you might want to align them along departmental organizations. In this case, group 1 might support the Engineering Department, group 2 might support the Manufacturing Department, and group 3 might support the Finance Department.

Router B is configured as the active router for groups 1 and 2 and as the standby router for group 3. Router D is configured as the active router for group 3. If Router D fails for any reason, Router B assumes the packet-transfer functions of Router D and maintains the ability of users in the Finance Department to access data on other subnets.

The HSRP group identifier has to be different for different sub-interfaces, for a given physical interface.



#### Note

- The number of HSRP sessions supported per system can be scaled up to 2000. To achieve this, the hello timers in HSRP must be configured to twice their default value. The maximum number of HSRP sessions that are supported with default timers are 1000.
- A different virtual MAC address (VMAC) is required for each sub interface. VMAC is determined from the group ID. Therefore, a unique group ID is required for each sub interface configured, unless the VMAC is configured explicitly.

## HSRP and ARP

When a router in an HSRP group goes active, it sends a number of ARP responses containing its virtual IP address and the virtual MAC address. These ARP responses help switches and learning bridges update their port-to-MAC maps. These ARP responses also provide routers configured to use the burned-in address of the interface as its virtual MAC address (instead of the preassigned MAC address or the functional address) with a means to update the ARP entries for the virtual IP address. Unlike the gratuitous ARP responses sent to identify the interface IP address when an interface comes up, the HSRP router ARP response packet carries the virtual MAC address in the packet header. The ARP data fields for IP address and media address contain the virtual IP and virtual MAC addresses.

## Preemption

The HSRP preemption feature enables the router with highest priority to immediately become the active router. Priority is determined first by the priority value that you configure, and then by the IP address. In each case, a higher value is of greater priority.

When a higher-priority router preempts a lower-priority router, it sends a coup message. When a lower-priority active router receives a coup message or hello message from a higher-priority active router, it changes to the speak state and sends a resign message.

## ICMP Redirect Messages

Internet Control Message Protocol (ICMP) is a network layer Internet protocol that provides message packets to report errors and other information relevant to IP processing. ICMP provides many diagnostic functions and can send and redirect error packets to the host. When running HSRP, it is important to prevent hosts from discovering the interface (or real) MAC addresses of routers in the HSRP group. If a host is redirected by ICMP to the real MAC address of a router, and that router later fails, then packets from the host are lost.

ICMP redirect messages are automatically enabled on interfaces configured with HSRP. This functionality works by filtering outgoing ICMP redirect messages through HSRP, where the next-hop IP address may be changed to an HSRP virtual IP address.

To support ICMP redirects, redirect messages are filtered through HSRP, where the next-hop IP address is changed to an HSRP virtual address. When HSRP redirects are turned on, ICMP interfaces with HSRP do this filtering. HSRP keeps track of all HSRP routers by sending advertisements and maintaining a real IP address to virtual IP address mapping to perform the redirect filtering.

## How to Implement HSRP

This section contains instructions for the following tasks:

- [Enabling HSRP, page IC-119](#)
- [Configuring HSRP Group Attributes, page IC-121](#)
- [Enabling HSRP Support for ICMP Redirect Messages, page IC-129](#)

### Enabling HSRP

The **hsrp ipv4** command activates HSRP on the configured interface. If an IP address is specified, that address is used as the designated address for the Hot Standby group. If no IP address is specified, the virtual address is learned from the active router. For HSRP to elect a designated router, at least one router in the Hot Standby group must have been configured with, or learned, the designated address. Configuring the designated address on the active router always overrides a designated address that is currently in use.

#### SUMMARY STEPS

1. **configure**
2. **router hsrp**
3. **interface** *type interface-path-id*
4. **hsrp** [*group-number*] **ipv4** [*ip-address* [*secondary*]]
5. **end**  
or  
**commit**

## DETAILED STEPS

|        | Command or Action   | Purpose   |
|--------|---|---|
| Step 1 | <b>configure</b><br><br><b>Example:</b><br>RP/0//CPU0:router# configure   | Enters global configuration mode.   |
| Step 2 | <b>router hsrp</b><br><br><b>Example:</b><br>RP/0//CPU0:router(config)# router hsrp   | Enables HSRP configuration mode.  |
| Step 3 | <b>interface</b> <i>type interface-path-id</i><br><br><b>Example:</b><br>RP/0//CPU0:router(config-hsrp)# interface<br>TenGigE 0/2/0/1                           | Enables HSRP interface configuration mode on a specific interface.  |
| Step 4 | <b>hsrp</b> [ <i>group-number</i> ] <b>ipv4</b> [ <i>ip-address</i> [ <i>secondary</i> ]]<br><br><b>Example:</b><br>RP/0//CPU0:router(config-hsrp)# hsrp 1 ipv4 | Activates HSRP on the configured interface. <ul style="list-style-type: none"> <li>If an IP address is specified, that address is used as the designated address for the Hot Standby group. If no IP address is specified, the virtual address is learned from the active router.</li> </ul>  |
| Step 5 | <b>end</b><br>OR<br><b>commit</b><br><br><b>Example:</b><br>RP/0/RSP0/CPU0:router(config-hsrp)# end<br>OR<br>RP/0//CPU0:router(config-hsrp)# commit             | Saves configuration changes. <ul style="list-style-type: none"> <li>When you issue the <b>end</b> command, the system prompts you to commit changes: <pre>Uncommitted changes found, commit them before exiting (yes/no/cancel)? [cancel]:</pre> <ul style="list-style-type: none"> <li>Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |

## Configuring HSRP Group Attributes

To configure other Hot Standby group attributes that affect how the local router participates in HSRP, use the following procedure in interface configuration mode as needed:

### SUMMARY STEPS

1. **configure**
2. **router hsrp**
3. **interface** *type interface-path-id*
4. **hsrp** [*group-number*] **ipv4** [*ip-address* [**secondary**]]
5. **hsrp** [*group-number*] **timers** {*hello-seconds* | **msec** *hello-milliseconds*} {*hold-seconds* | **msec** *hold-milliseconds*}
6. **hsrp** [*group-number*] **priority** *priority*
7. **hsrp** [*group-number*] **track** *type instance* [*priority-decrement*]
8. **hsrp** [*group-number*] **preempt** [**delay** *seconds*]
9. **hsrp** [*group-number*] **authentication** *string*
10. **hsrp use-bia**
11. **hsrp** [*group-number*] **mac-address** *address*
12. **end**  
or  
**commit**

### DETAILED STEPS

|        | Command or Action   | Purpose  |
|--------|---|--|
| Step 1 | <b>configure</b><br><br><b>Example:</b><br>RP/0//CPU0:router# configure   | Enters global configuration mode.                                  |
| Step 2 | <b>router hsrp</b><br><br><b>Example:</b><br>RP/0//CPU0:router(config)# router hsrp   | Enables HSRP configuration mode.                                   |
| Step 3 | <b>interface</b> <i>type interface-path-id</i><br><br><b>Example:</b><br>RP/0//CPU0:router(config-hsrp)# interface<br>TenGigE 0/2/0/1 | Enables HSRP interface configuration mode on a specific interface. |

| Command or Action  | Purpose   |
|--|---|
| <p><b>Step 4</b></p> <pre>hsrp [group-number] ipv4 [ip-address [secondary]]</pre> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# hsrp 1<br/>ipv4</p>  | <p>Activates HSRP on the configured interface.</p> <ul style="list-style-type: none"> <li>If an IP address is specified, that address is used as the designated address for the Hot Standby group. If no IP address is specified, the virtual address is learned from the active router.</li> </ul>   |
| <p><b>Step 5</b></p> <pre>hsrp [group-number] timers {hello-seconds   msec hello-milliseconds} {hold-seconds   msec hold-milliseconds}</pre> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# hsrp 1<br/>timers 100 200</p> | <p>(Optional) Configures the time between hello packets and the time before other routers declare the active Hot Standby or standby router to be down.</p> <ul style="list-style-type: none"> <li>If you do not specify the <i>group-number</i>, the configuration applies to all HSRP groups on the router.</li> <li>Nonactive routers learn timer values from the active router, unless millisecond timer values are being used. If millisecond timer values are being used, all routers must be configured with the millisecond timer values. This rule applies if either the hello time or the hold time is specified in milliseconds.</li> <li>The timers configured on the active router always override any other timer settings. All routers in a Hot Standby group should use the same timer values. Normally, the hold time is greater than or equal to three times the hello time (<math>\text{holdtime} &gt; 3 * \text{hellotime}</math>).</li> <li>You must specify either the <i>hello-seconds</i> argument or the <b>msec</b> keyword and <i>hello-milliseconds</i> argument, depending on whether you want the hello time in seconds or milliseconds. You must also specify either the <i>hold-seconds</i> argument or <b>msec</b> keyword and <i>hold-milliseconds</i> argument, depending on whether you want the hold time in seconds or milliseconds.</li> <li>Enter the <b>no hsrp [group-number] timers</b> command to restore the timers to their default values.</li> </ul> |



| Command or Action   | Purpose  |
|---|--|
| <p><b>Step 6</b></p> <pre>hsrp [group-number] priority priority</pre> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# hsrp priority 100</p>                                 | <p>(Optional) Configures HSRP priority.</p> <ul style="list-style-type: none"> <li>If you do not specify the <i>group-number</i>, the configuration applies to all HSRP groups on the router.</li> <li>The assigned priority is used to help select the active and standby routers. Assuming that preemption is enabled, the router with the highest priority becomes the designated active router. In case of ties, the primary IP addresses are compared, and the higher IP address has priority.</li> <li>The priority of the device can change dynamically if an interface is configured with the <b>hsrp track</b> command and another interface on the device goes down.</li> <li>If preemption is not enabled using the <b>hsrp [group-number] preempt</b> command, the router may not become active even though it might have a higher priority than other HSRP routers.</li> <li>To restore the default HSRP priority values, use the <b>no hsrp</b> command.</li> </ul>  |
| <p><b>Step 7</b></p> <pre>hsrp [group-number] track type instance [priority-decrement]</pre> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# hsrp track TenGigE 0/3/0/1</p> | <p>(Optional) Configures an interface so that the Hot Standby priority changes on the basis of the availability of other interfaces.</p> <ul style="list-style-type: none"> <li>If you do not specify the <i>group-number</i>, the configuration applies to all HSRP groups on the router.</li> <li>When a tracked interface goes down, the Hot Standby priority decreases by 10. If an interface is not tracked, its state changes do not affect the Hot Standby priority. For each interface configured for Hot Standby, you can configure a separate list of interfaces to be tracked.</li> <li>The optional <i>priority-decrement</i> argument specifies by how much to decrement the Hot Standby priority when a tracked interface goes down. When the tracked interface comes back up, the priority is incrementally increased by the same amount.</li> <li>When multiple tracked interfaces are down and the <i>priority-decrement</i> argument has been configured, these configured priority decrements are cumulative. If tracked interfaces are down, but none of them were configured with priority decrements, the default decrement is 10 and it is cumulative.</li> <li>The <b>hsrp preempt</b> command must be used in conjunction with this command on all routers in the group whenever the best available router should be used to forward packets. If the <b>hsrp preempt</b> command is not used, the active router stays active, regardless of the current priorities of the other HSRP routers.</li> <li>To remove the tracking, use the <b>no hsrp</b> command.</li> </ul> |

| Command or Action  | Purpose  |
|--|--|
| <p><b>Step 8</b></p> <pre>hsrp [group-number] preempt [delay seconds]</pre> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# hsrp preempt</p>                 | <p>(Optional) Configures HSRP preemption and preemption delay.</p> <ul style="list-style-type: none"> <li>If you do not specify a value for <i>group-number</i>, the configuration applies to all HSRP groups on the router.</li> <li>When you configure preemption and preemption delay with the <b>hsrp preempt</b> command, the local router attempts to assume control as the active router when the local router has a Hot Standby priority higher than the current active router. If the <b>hsrp preempt</b> command is not configured, the local router assumes control as the active router only if it receives information indicating that no router is currently in the active state (acting as the designated router).</li> <li>When a router first comes up, it does not have a complete routing table. If it is configured to preempt, it becomes the active router, yet it is unable to provide adequate routing services. This problem can be solved by configuring a delay before the preempting router actually preempts the currently active router.</li> <li>The preempt <i>delay seconds</i> value does not apply if there is no router currently in the active state. In this case, the local router becomes active after the appropriate timeouts (see the <b>hsrp timers</b> command), regardless of the preempt delay seconds value.</li> <li>To restore the default HSRP preemption and preemption delay values, use the <b>no hsrp</b> command.</li> </ul> |
| <p><b>Step 9</b></p> <pre>hsrp [group-number] authentication string</pre> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# hsrp 1 authentication company1</p> | <p>(Optional) Configures an authentication string for the Hot Standby Router Protocol (HSRP).</p> <ul style="list-style-type: none"> <li>If you do not specify a value for <i>group-number</i>, the configuration applies to all HSRP groups on the router.</li> <li>The authentication string is sent unencrypted in all HSRP messages. The same authentication string must be configured on all routers and access servers on a LAN to ensure interoperation.</li> <li>Authentication mismatch prevents a device from learning the designated Hot Standby IP address and the Hot Standby timer values from other routers configured with HSRP.</li> <li>Authentication mismatch does not prevent protocol events such as one router taking over as the designated router.</li> <li>To delete an authentication string, use the <b>no hsrp</b> command.</li> </ul>  |

| Command or Action  | Purpose   |
|--|---|
| <p><b>Step 10</b> <code>hsrp use-bia</code></p> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# hsrp use-bia</p> | <p>(Optional) Configures the HSRP to use the burned-in address of the interface as its virtual MAC address, instead of the preassigned MAC address or the functional address.</p> <ul style="list-style-type: none"><li>• Enter the <b>use-bia</b> command on an interface when there are devices that reject Address Resolution Protocol (ARP) replies with source hardware addresses set to a functional address.</li><li>• To restore the default virtual MAC address, use the <b>no hsrp use-bia</b> command.</li></ul> |

| Command or Action  | Purpose   |
|--|---|
| <p><b>Step 11</b> <code>hsrp [group-number] mac-address address</code></p> <p><b>Example:</b><br/> RP/0//CPU0:router(config-hsrp-if)# hsrp 5<br/> mac-address 4000.1000.1060</p> | <p>(Optional) Specifies a virtual MAC address for the HSRP.</p> <ul style="list-style-type: none"> <li>• If you do not specify a value for the <i>group-number</i> argument, the configuration applies to all HSRP groups on the router.</li> <li>• We do not recommend this command, except for IBM networking environments in which first-hop redundancy is based on being able to use a virtual MAC address, and in which you cannot change the first-hop addresses in the PCs that are connected to an Ethernet switch.</li> <li>• HSRP is used to help end stations locate the first-hop gateway for IP routing. The end stations are configured with a default gateway. However, HSRP can provide first-hop redundancy for other protocols. Some protocols, such as Advanced Peer-to-Peer Networking (APPN), use the MAC address to identify the first-hop for routing purposes. In this case, it is often necessary to specify the virtual MAC address; the virtual IP address is unimportant for these protocols. Use the <b>hsrp mac-address</b> command to specify the virtual MAC address.</li> <li>• The MAC address specified is used as the virtual MAC address when the router is active.</li> <li>• The <b>hsrp mac-address</b> command is intended for certain APPN configurations.</li> <li>• In an APPN network, an end node is typically configured with the MAC address of the adjacent network node. Use the <b>hsrp mac-address</b> command in the routers to set the virtual MAC address to the value used in the end nodes.</li> <li>• Enter the <b>no hsrp [group-number] mac-address</b> command to revert to the standard virtual MAC address (0000.0C07.ACn).</li> </ul> |

|  | Command or Action   | Purpose |
|--|---|---------|
| <p><b>Step 12</b></p> <pre>end or commit</pre> <p><b>Example:</b></p> <pre>RP/0//CPU0:router(config-hsrp-if)# end or RP/0/RSP0/CPU0:router(config-hsrp-if)# commit</pre> | <p>Saves configuration changes.</p> <ul style="list-style-type: none"> <li>When you issue the <b>end</b> command, the system prompts you to commit changes: <pre>Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:</pre> <ul style="list-style-type: none"> <li>Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |         |

## Configuring the HSRP Activation Delay

The activation delay for HSRP is designed to delay the startup of the state machine when an interface comes up. This give the network time to settle and avoids unnecessary state changes early after the link comes up.

### SUMMARY STEPS

1. **configure**
2. **router hsrp**
3. **interface** *type interface-path-id*
4. **hsrp** [*group-number*] **ipv4** [*ip-address* [**secondary**]]
5. **hsrp delay** [**minimum** *seconds*] [**reload** *seconds*]
6. **end**  
or  
**commit**

## DETAILED STEPS

|        | Command or Action  | Purpose  |
|--------|--|--|
| Step 1 | <p><b>configure</b></p> <p><b>Example:</b><br/>RP/0//CPU0:router# configure</p>  | Enters global configuration mode.  |
| Step 2 | <p><b>router hsrp</b></p> <p><b>Example:</b><br/>RP/0//CPU0:router(config)# router hsrp</p>  | Enables HSRP configuration mode.   |
| Step 3 | <p><b>interface</b> <i>type interface-path-id</i></p> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp)# interface TenGigE 0/2/0/1</p>                             | Enables HSRP interface configuration mode on a specific interface.   |
| Step 4 | <p><b>hsrp</b> [<i>group-number</i>] <b>ipv4</b> [<i>ip-address</i> [<i>secondary</i>]]</p> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# hsrp 1 ipv4</p>  | <p>Activates HSRP on the configured interface.</p> <ul style="list-style-type: none"> <li>If an IP address is specified, that address is used as the designated address for the Hot Standby group. If no IP address is specified, the virtual address is learned from the active router.</li> </ul>  |
| Step 5 | <p><b>hsrp delay</b> [<i>minimum seconds</i>] [<b>reload</b> <i>seconds</i>]</p> <p><b>Example:</b><br/>RP/0//CPU0:(config-hsrp-if)#hsrp delay minimum 2 reload 10</p> | <p>Delays the startup of the state machine when an interface comes up, so that the network has time to settle and there are no unnecessary state changes early after the link comes up. The reload delay is the delay applied after the first interface up event. The minimum delay is the delay that is applied after any subsequent interface up event (if the interface flaps).</p>   |
| Step 6 | <p><b>end</b><br/>OR<br/><b>commit</b></p> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# end<br/>OR<br/>RP/0/RSP0/CPU0:router(config-hsrp-if)# commit</p>  | <p>Saves configuration changes.</p> <ul style="list-style-type: none"> <li>When you issue the <b>end</b> command, the system prompts you to commit changes:<br/>Uncommitted changes found, commit them before exiting(yes/no/cancel)?<br/>[cancel]: <ul style="list-style-type: none"> <li>Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |

## Enabling HSRP Support for ICMP Redirect Messages

By default, HSRP filtering of ICMP redirect messages is enabled on routers running HSRP.

To disable this feature, use the **hsrp redirects disable** command in interface configuration mode.

### SUMMARY STEPS

1. **configure**
2. **router hsrp**
3. **interface** *type interface-path-id*
4. **hsrp** [*group-number*] **ipv4** [*ip-address* [*secondary*]]
5. **hsrp redirects disable**
6. **end**  
or  
**commit**

### DETAILED STEPS

|        | Command or Action  | Purpose  |
|--------|--|--|
| Step 1 | <b>configure</b><br><br><b>Example:</b><br>RP/0//CPU0:router# configure  | Enters global configuration mode.  |
| Step 2 | <b>router hsrp</b><br><br><b>Example:</b><br>RP/0//CPU0:router(config)# router hsrp  | Enables HSRP configuration mode.   |
| Step 3 | <b>interface</b> <i>type interface-path-id</i><br><br><b>Example:</b><br>RP/0//CPU0:router(config-hsrp)# interface<br>TenGigE 0/2/0/1                              | Enables HSRP interface configuration mode on a specific interface.   |
| Step 4 | <b>hsrp</b> [ <i>group-number</i> ] <b>ipv4</b> [ <i>ip-address</i> [ <i>secondary</i> ]]<br><br><b>Example:</b><br>RP/0//CPU0:router(config-hsrp-if)# hsrp 1 ipv4 | Activates HSRP on the configured interface. <ul style="list-style-type: none"> <li>• If an IP address is specified, that address is used as the designated address for the Hot Standby group. If no IP address is specified, the virtual address is learned from the active router.</li> </ul> |

| Command or Action   | Purpose   |
|---|---|
| <p><b>Step 5</b></p> <pre>hsrp redirects disable</pre> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# hsrp<br/>redirects </p>                                      | <p>Configures Hot Standby Router Protocol (HSRP) support for ICMP redirect messages to be disabled.</p> <ul style="list-style-type: none"> <li>• The <b>hsrp redirects</b> command can be configured on a per-interface basis. When HSRP is first configured on an interface, the setting for that interface inherits the global value. If ICMP redirects have been explicitly disabled on an interface, then the global command cannot reenables the functionality.</li> <li>• With the <b>hsrp redirects</b> command enabled, ICMP redirect messages are filtered by replacing the real IP address in the next-hop address of the redirect packet with a virtual IP address, if it is known to HSRP.</li> <li>• To revert to the default, which is that ICMP messages are enabled, use the <b>no hsrp redirects</b> command.</li> </ul>   |
| <p><b>Step 6</b></p> <pre>end<br/>OR<br/>commit</pre> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# end<br/>OR<br/>RP/0//CPU0:router(config-hsrp-if)# commit </p> | <p>Saves configuration changes.</p> <ul style="list-style-type: none"> <li>• When you issue the <b>end</b> command, the system prompts you to commit changes:<br/>Uncommitted changes found, commit them before exiting (yes/no/cancel)?<br/>[cancel]: <ul style="list-style-type: none"> <li>– Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>– Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>– Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>• Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |

## BFD for HSRP

Bidirectional Forwarding Detection (BFD) is a network protocol used to detect faults between two forwarding engines. BFD sessions can operate in one of the two modes, namely, asynchronous mode or demand mode. In asynchronous mode, both endpoints periodically send hello packets to each other. If a number of those packets are not received, the session is considered down. In demand mode, it is not mandatory to exchange hello packets; either of the hosts can send hello messages, if needed. Cisco supports the BFD asynchronous mode.



## Advantages of BFD

- BFD provides failure detection in less than one second.
- BFD supports all types of encapsulation.
- BFD is not tied to any particular routing protocol, supports almost all routing protocols.

## BFD Process

HSRP uses BFD to detect link failure and facilitate fast failover times without excessive control packet overhead.

The HSRP process creates BFD sessions as required. When a BFD session goes down, each Standby group monitoring the session transitions to Active state.

**Note**

---

HSRP does not participate in any state elections for 10 seconds after a transition to Active state triggered by a BFD session going down.

---

## Configuring BFD

For HSRP, configuration is applied under the existing HSRP-interface sub-mode, with BFD fast failure configurable per HSRP group and the timers (minimum-interface and multiplier) configurable per interface. BFD fast failure detection is disabled by default.

## Enabling BFD

### SUMMARY STEPS

1. **configure**
2. **router hsrp**
3. **interface** *type interface-path-id*
4. **hsrp** [*group number*] **bfd fast-detect**
5. **end**  
or  
**commit**

## DETAILED STEPS

|        | Command or Action   | Purpose   |
|--------|---|---|
| Step 1 | <b>configure</b><br><br><b>Example:</b><br>RP/0//CPU0:router# configure   | Enters global configuration mode.   |
| Step 2 | <b>router hsrp</b><br><br><b>Example:</b><br>RP/0//CPU0:router(config)# router hsrp   | Enables HSRP configuration mode.  |
| Step 3 | <b>interface</b> <i>type interface-path-id</i><br><br><b>Example:</b><br>RP/0//CPU0:router(config-hsrp)# interface TenGigE 0/2/0/1                        | Enables HSRP interface configuration mode on a specific interface.  |
| Step 4 | <b>hsrp</b> [ <i>group number</i> ] <b>bfd fast-detect</b><br><br><b>Example:</b><br>RP/0//CPU0:router(config-hsrp-if)# hsrp <b>bfd fast-detect</b>       | Enables fast detection for a specific group.  |
| Step 5 | <b>end</b><br>OR<br><b>commit</b><br><br><b>Example:</b><br>RP/0//CPU0:router(config-hsrp-if)# end<br>OR<br>RP/0/RSP0/CPU0:router(config-hsrp-if)# commit | Saves configuration changes. <ul style="list-style-type: none"> <li>When you issue the <b>end</b> command, the system prompts you to commit changes:<br/>Uncommitted changes found, commit them before exiting(yes/no/cancel)?<br/>[cancel]: <ul style="list-style-type: none"> <li>Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |

## Modifying BFD timers (minimum interval)

Minimum interval determines the frequency of sending BFD packets to BFD peers (in milliseconds). The default minimum interval is 15ms.

### SUMMARY STEPS

1. **configure**
2. **router hsrp**
3. **interface** *type interface-path-id*
4. **hsrp bfd minimum-interval** *interval*
5. **end**  
or  
**commit**

### DETAILED STEPS

|        | Command or Action   | Purpose  |
|--------|---|--|
| Step 1 | <b>configure</b><br><br><b>Example:</b><br>RP/0//CPU0:router# configure   | Enters global configuration mode.                                  |
| Step 2 | <b>router hsrp</b><br><br><b>Example:</b><br>RP/0//CPU0:router(config)# router hsrp   | Enables HSRP configuration mode.                                   |
| Step 3 | <b>interface</b> <i>type interface-path-id</i><br><br><b>Example:</b><br>RP/0//CPU0:router(config-hsrp)# interface<br>TenGigE 0/2/0/1 | Enables HSRP interface configuration mode on a specific interface. |

|        | Command or Action  | Purpose   |
|--------|--|---|
| Step 4 | <pre>hsrp bfd minimum-interval interval</pre> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# hsrp <b>bfd</b><br/><b>minimum-interval</b></p>                | Sets the minimum interval to the specified period. The interval is in milliseconds; range is 15 to 30000 milliseconds.  |
| Step 5 | <pre>end</pre> <p>or</p> <pre>commit</pre> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# end<br/>or<br/>RP/0/RSP0/CPU0:router(config-hsrp-if)# commit </p> | <p>Saves configuration changes.</p> <ul style="list-style-type: none"> <li>When you issue the <b>end</b> command, the system prompts you to commit changes: <pre>Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:</pre> <ul style="list-style-type: none"> <li>Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |

## Modifying BFD timers (multiplier)

Multiplier is the number of consecutive BFD packets which must be missed from a BFD peer before declaring that peer unavailable. The default multiplier is 3.

### SUMMARY STEPS

1. **configure**
2. **router hsrp**
3. **interface** *type interface-path-id*
4. **hsrp bfd multiplier** *multiplier*
5. **end**  
or  
**commit**

### DETAILED STEPS

|        | Command or Action   | Purpose  |
|--------|---|--|
| Step 1 | <p><b>configure</b></p> <p><b>Example:</b><br/>RP/0//CPU0:router# configure</p>   | Enters global configuration mode.  |
| Step 2 | <p><b>router hsrp</b></p> <p><b>Example:</b><br/>RP/0//CPU0:router(config)# router hsrp</p>   | Enables HSRP configuration mode.   |
| Step 3 | <p><b>interface</b> <i>type interface-path-id</i></p> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp)# interface TenGigE 0/2/0/1</p>                            | Enables HSRP interface configuration mode on a specific interface.   |
| Step 4 | <p><b>hsrp bfd multiplier multiplier</b></p> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# hsrp <b>bfd multiplier</b></p>                                 | Sets the multiplier to the value. Range is 2 to 50.  |
| Step 5 | <p><b>end</b><br/>OR<br/><b>commit</b></p> <p><b>Example:</b><br/>RP/0//CPU0:router(config-hsrp-if)# end<br/>OR<br/>RP/0/RSP0/CPU0:router(config-hsrp-if)# commit</p> | <p>Saves configuration changes.</p> <ul style="list-style-type: none"> <li>When you issue the <b>end</b> command, the system prompts you to commit changes:<br/>Uncommitted changes found, commit them before exiting(yes/no/cancel)?<br/>[cancel]: <ul style="list-style-type: none"> <li>Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |

## Hot Restartability for HSRP

In the event of failure of a HSRP process in one active group, forced failovers in peer HSRP active router groups should be prevented. Hot restartability supports warm RP failover without incurring forced failovers to peer HSRP routers for active groups.

## Configuration Examples for HSRP Implementation

This section provides the following HSRP configuration examples:

- [Configuring an HSRP Group: Example, page IC-136](#)
- [Configuring a Router for Multiple HSRP Groups: Example, page IC-136](#)

### Configuring an HSRP Group: Example

The following is an example of enabling HSRP on an interface and configuring HSRP group attributes:

```
configure
router hsrp
interface TenGigE 0/2/0/1
hsrp 1 ipv4 1.0.0.5
commit
hsrp 1 timers 100 200
hsrp 1 preempt delay 500
hsrp priority 20
hsrp track TenGigE 0/2/0/2
hsrp 1 authentication company0
hsrp use-bia
commit
```

### Configuring a Router for Multiple HSRP Groups: Example

The following is an example of configuring a router for multiple HSRP groups:

```
configure
router hsrp
interface TenGigE 0/2/0/3
hsrp 1 ipv4 1.0.0.5
hsrp 1 priority 20
hsrp 1 preempt
hsrp 1 authentication sclara
hsrp 2 ipv4 1.0.0.6
hsrp 2 priority 110
hsrp 2 preempt
hsrp 2 authentication mtview
hsrp 3 ipv4 1.0.0.7
hsrp 3 preempt
hsrp 3 authentication svale
commit
```

# Additional References

The following sections provide references related to HSRP.

## Related Documents

| Related Topic  | Document Title  |
|--|---|
| Cisco IOS XR QoS commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples | <i>Quality of Service Commands on Cisco IOS XR Software</i> module in <i>Cisco IOS XR Modular Quality of Service Command Reference</i>                                    |
| Class-based traffic shaping, traffic policing, low latency queuing, and MDDR   | <i>Configuring Modular Quality of Service Congestion Management on Cisco IOS XR Software</i> module in <i>Cisco IOS XR Modular Quality of Service Configuration Guide</i> |
| WRED, RED, and tail drop   | <i>Configuring Modular QoS Congestion Avoidance on Cisco IOS XR Software</i> module in <i>Cisco IOS XR Modular Quality of Service Configuration Guide</i>                 |
| Cisco IOS XR HSRP commands   | <i>HSRP Commands on Cisco IOS XR Software</i> module in <i>Cisco ASR 9000 Series Aggregation Services Router IP Addresses and Services Command Reference</i>              |

## Standards

| Standards   | Title |
|---|-------|
| No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature. | —     |

## MIBs

| MIBs                                       | MIBs Link  |
|--|--|
| CISCO_HSRP_MIB.my<br>CISCO-HSRP-EXT-MIB.my | To locate and download MIBs using Cisco IOS XR software, use the Cisco MIB Locator found at the following URL and choose a platform under the Cisco Access Products menu:<br><a href="http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml">http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml</a> |

## RFCs

| RFCs     | Title   |
|----------|---|
| RFC 2281 | <i>Cisco Hot Standby Router Protocol (HSRP)</i> |

## Technical Assistance

| Description   | Link  |
|---|---|
| The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content. | <a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a> |