



CHAPTER 16

Configuring HSRP

This chapter describes how to configure the Hot Standby Router Protocol (HSRP) on the Cisco NX-OS switch.

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Information About HSRP

HSRP is a first-hop redundancy protocol (FHRP) that allows a transparent failover of the first-hop IP router. HSRP provides first-hop routing redundancy for IP hosts on Ethernet networks configured with a default router IP address. You use HSRP in a group of routers for selecting an active router and a standby router. In a group of routers, the active router is the router that routes packets; the standby router is the router that takes over when the active router fails or when preset conditions are met.

Many host implementations do not support any dynamic router discovery mechanisms but can be configured with a default router. Running a dynamic router discovery mechanism on every host is not feasible for a number of reasons, including administrative overhead, processing overhead, and security issues. HSRP provides failover services to these hosts.

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HSRP Overview

When you use HSRP, you configure the HSRP virtual IP address as the host's default router (instead of the IP address of the actual router). The virtual IP address is an IPv4 or IPv6 address that is shared among a group of routers that run HSRP.

When you configure HSRP on a network segment, you provide a virtual MAC address and a virtual IP address for the HSRP group. You configure the same virtual address on each HSRP-enabled interface in the group. You also configure a unique IP address and MAC address on each interface that acts as the real address. HSRP selects one of these interfaces to be the active router. The active router receives and routes packets destined for the virtual MAC address of the group.

HSRP detects when the designated active router fails. At that point, a selected standby router assumes control of the virtual MAC and IP addresses of the HSRP group. HSRP also selects a new standby router at that time.

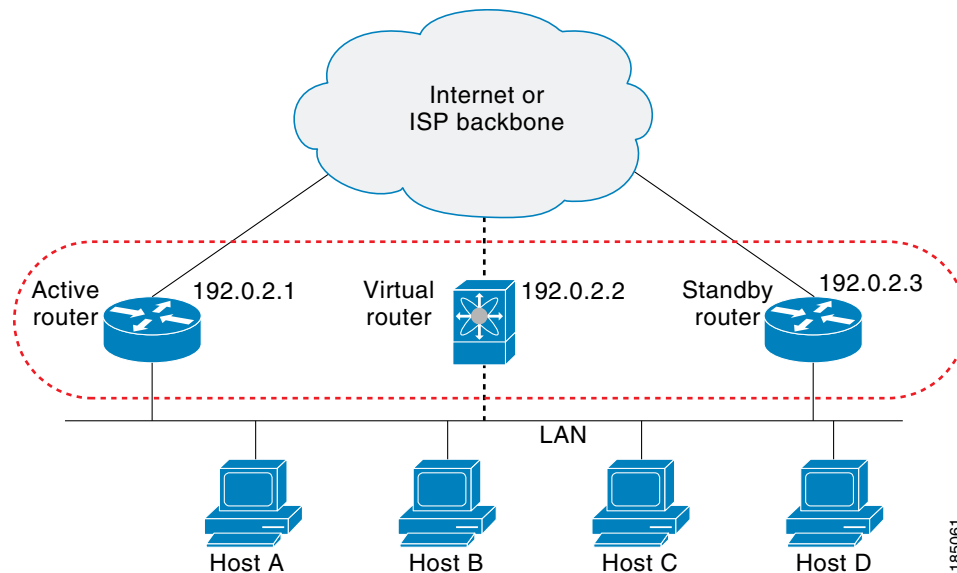
HSRP uses a priority mechanism to determine which HSRP-configured interface becomes the default active router. To configure an interface as the active router, you assign it with a priority that is higher than the priority of all the other HSRP-configured interfaces in the group. The default priority is 100, so if you configure just one interface with a higher priority, that interface becomes the default active router.

Interfaces that run HSRP send and receive multicast User Datagram Protocol (UDP)-based hello messages to detect a failure and to designate active and standby routers. 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 the active and standby router is completely transparent to all hosts on the network.

You can configure multiple HSRP groups on an interface.

[Figure 16-1](#) shows a network configured for HSRP. By sharing a virtual MAC address and a virtual IP address, two or more interfaces can act as a single virtual router.

Figure 16-1 HSRP Topology with Two Enabled Routers



The virtual router does not physically exist but represents the common default router for interfaces that are configured to provide backup to each other. You do not need to configure the hosts on the LAN with the IP address of the active router. Instead, you configure them with the IP address (virtual IP address) of the virtual router as their default router. If the active router fails to send a hello message within the configurable period of time, the standby router takes over, responds to the virtual addresses, and becomes the active router, assuming the active router duties. From the host perspective, the virtual router remains the same.

**Note**

Packets received on a routed port destined for the HSRP virtual IP address will terminate on the local router, regardless of whether that router is the active HSRP router or the standby HSRP router. This includes ping and Telnet traffic. Packets received on a Layer 2 (VLAN) interface destined for the HSRP virtual IP address will terminate on the active router.

HSRP for IPv4

HSRP routers communicate with each other by exchanging HSRP hello packets. These packets are sent to the destination IP multicast address 224.0.0.2 (reserved multicast address used to communicate to all routers) on UDP port 1985. The active router sources hello packets from its configured IP address and the HSRP virtual MAC address while the standby router sources hellos from its configured IP address and the interface MAC address, which may or may not be the burned-in address (BIA). The BIA is the last six bytes of the MAC address that is assigned by the manufacturer of the network interface card (NIC).

Because hosts are configured with their default router as the HSRP virtual IP address, hosts must communicate with the MAC address associated with the HSRP virtual IP address. This MAC address is a virtual MAC address, 0000.0C07.ACxy, where xy is the HSRP group number in hexadecimal based on the respective interface. For example, HSRP group 1 uses the HSRP virtual MAC address of 0000.0C07.AC01. Hosts on the adjoining LAN segment use the normal Address Resolution Protocol (ARP) process to resolve the associated MAC addresses.

HSRP version 2 uses the new IP multicast address 224.0.0.102 to send hello packets instead of the multicast address of 224.0.0.2, which is used by version 1. HSRP version 2 permits an expanded group number range of 0 to 4095 and uses a new MAC address range of 0000.0C9F.F000 to 0000.0C9F.FFFF.

HSRP for IPv6

IPv6 hosts learn of available IPv6 routers through IPv6 neighbor discovery (ND) router advertisement (RA) messages. These messages are multicast periodically, or may be solicited by hosts, but the time delay for detecting when a default route is down may be 30 seconds or more. HSRP for IPv6 provides a much faster switchover to an alternate default router than the IPv6 ND protocol provides, less than a second if the milliseconds timers are used. HSRP for IPv6 provides a virtual first hop for IPv6 hosts.

When you configure an IPv6 interface for HSRP, the periodic RAs for the interface link-local address stop after IPv6 ND sends a final RA with a router lifetime of zero. No restrictions occur for the interface IPv6 link-local address. Other protocols continue to receive and send packets to this address.

IPv6 ND sends periodic RAs for the HSRP virtual IPv6 link-local address when the HSRP group is active. These RAs stop after a final RA is sent with a router lifetime of 0 when the HSRP group leaves the active state. HSRP uses the virtual MAC address for active HSRP group messages only (hello, coup, and redesign).

HSRP for IPv6 uses the following parameters:

- HSRP version 2
- UDP port 2029
- Virtual MAC address range from 0005.73A0.0000 through 0005.73A0.0FFF
- Multicast link-local IP destination address of FF02::66
- Hop limit set to 255

HSRP IPv6 Addresses

An HSRP IPv6 group has a virtual MAC address that is derived from the HSRP group number and a virtual IPv6 link-local address that is derived, by default, from the HSRP virtual MAC address. The default virtual MAC address for an HSRP IPv6 group will always be used to form the virtual IPv6 link-local address, regardless of the actual virtual MAC address used by the group.

Table 16-1 shows the MAC and IP addresses used for IPv6 neighbor discovery packets and HSRP packets.

Table 16-1 HSRP and IPv6 ND Addresses

Packet	MAC Source Address	IPv6 Source Address	IPv6 Destination Address	Link-layer Address Option
Neighbor solicitation (NS)	Interface MAC address	Interface IPv6 address	—	Interface MAC address
Router solicitation (RS)	Interface MAC address	Interface IPv6 address	—	Interface MAC address
Neighbor advertisement (NA)	Interface MAC address	Interface IPv6 address	Virtual IPv6 address	HSRP virtual MAC address
Route advertisement (RA)	Interface MAC address	Virtual IPv6 address	—	HSRP virtual MAC address

Table 16-1 HSRP and IPv6 ND Addresses (continued)

Packet	MAC Source Address	IPv6 Source Address	IPv6 Destination Address	Link-layer Address Option
HSRP (inactive)	Interface MAC address	Interface IPv6 address	—	—
HSRP (active)	Virtual MAC address	Interface IPv6 address	—	—

HSRP does not add IPv6 link-local addresses to the Unicast Routing Information Base (URIB). There are also no secondary virtual IP addresses for link-local addresses.

For global unicast addresses, HSRP will add the virtual IPv6 address to the URIB and IPv6 but will not register the virtual IPv6 addresses to ICMPv6. ICMPv6 redirects are not supported for HSRP IPv6 groups.

HSRP Versions

Cisco NX-OS supports HSRP version 1 by default. You can configure an interface to use HSRP version 2.

HSRP version 2 has the following enhancements to HSRP version 1:

- Expands the group number range. HSRP version 1 supports group numbers from 0 to 255. HSRP version 2 supports group numbers from 0 to 4095.
- For IPv4, uses the IPv4 multicast address 224.0.0.102 or the IPv6 multicast address FF02::66 to send hello packets instead of the multicast address of 224.0.0.2, which is used by HSRP version 1.
- Uses the MAC address range from 0000.0C9F.F000 to 0000.0C9F.FFFF for IPv4 and 0005.73A0.0000 through 0005.73A0.0FFF for IPv6 addresses. HSRP version 1 uses the MAC address range 0000.0C07.AC00 to 0000.0C07.ACFE.
- Adds support for MD5 authentication.

When you change the HSRP version, Cisco NX-OS reinitializes the group because it now has a new virtual MAC address.

HSRP version 2 has a different packet format than HSRP version 1. The packet format uses a type-length-value (TLV) format. HSRP version 2 packets received by an HSRP version 1 router are ignored.

HSRP Authentication

HSRP message digest 5 (MD5) algorithm authentication protects against HSRP-spoofing software and uses the industry-standard MD5 algorithm for improved reliability and security. HSRP includes the IPv4 or IPv6 address in the authentication TLVs.

HSRP Messages

Routers that are configured with HSRP exchange the following three types of multicast messages:

- Hello—The hello message conveys the HSRP priority and state information of the router to other HSRP routers.

- Coup—When a standby router wants to assume the function of the active router, it sends a coup message.
- Resign—A router that is the active router sends this message when it is about to shut down or when a router that has a higher priority sends a hello or coup message.

HSRP Load Sharing

HSRP allows you to configure multiple groups on an interface. You can configure two overlapping IPv4 HSRP groups to load share traffic from the connected hosts while providing the default router redundancy expected from HSRP. Figure 16-2 shows an example of a load-sharing HSRP IPv4 configuration.

Figure 16-2 HSRP Load Sharing

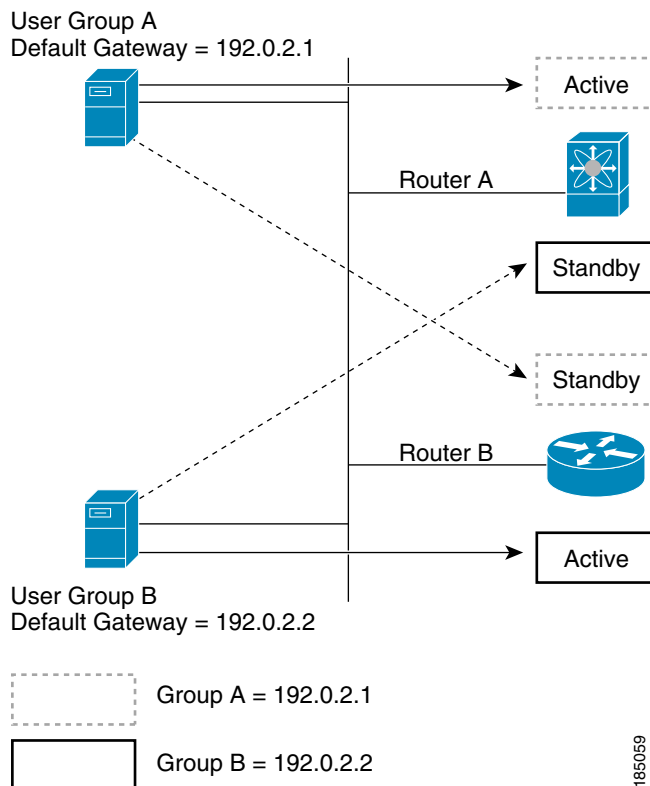


Figure 16-2 shows two routers (A and B) and two HSRP groups. Router A is the active router for group A but is the standby router for group B. Similarly, router B is the active router for group B and the standby router for group A. If both routers remain active, HSRP load balances the traffic from the hosts across both routers. If either router fails, the remaining router continues to process traffic for both hosts.



Note

HSRP for IPv6 load-balances by default. If there are two HSRP IPv6 groups on the subnet, then hosts will learn of both from their router advertisements and choose to use one so that the load is shared between the advertised routers.

Object Tracking and HSRP

You can use object tracking to modify the priority of an HSRP interface based on the operational state of another interface. Object tracking allows you to route to a standby router if the interface to the main network fails.

Two objects that you can track are the line protocol state of an interface or the reachability of an IP route. If the specified object goes down, Cisco NX-OS reduces the HSRP priority by the configured amount. For more information, see the [“Configuring HSRP Object Tracking” section on page 16-18](#).

BFD

This feature supports bidirectional forwarding detection (BFD). BFD is a detection protocol designed to provide fast forwarding-path failure detection times. BFD provides subsecond failure detection between two adjacent devices and can be less CPU-intensive than protocol hello messages because some of the BFD load can be distributed onto the data plane on supported modules. See the *Cisco Nexus 7000 Series NX-OS Interfaces Configuration Guide, Release 5.x* for more information.

High Availability and Extended Nonstop Forwarding

HSRP supports stateful restarts and stateful switchovers. A stateful restart occurs when the HSRP process fails and is restarted. A stateful switchover occurs when the active supervisor switches to the standby supervisor. Cisco NX-OS applies the run-time configuration after the switchover.

If HSRP hold timers are configured for short time periods, these timers may expire during a controlled switchover or in-service software upgrade (ISSU). HSRP supports extended nonstop forwarding (NSF) to temporarily extend these HSRP hold timers during a controlled switchover or in-service software upgrade (ISSU).

With extended NSF configured, HSRP sends hello messages with the extended timers. HSRP peers update their hold timers with these new values. The extended timers prevent unnecessary HSRP state changes during the switchover or ISSU. After the switchover or ISSU event, HSRP restores the hold timers to their original configured values. If the switchover fails, HSRP restores the hold timers after the extended hold timer values expire.

See the [“Configuring Extended Hold Timers for HSRP” section on page 16-22](#) for more information.

Virtualization Support

HSRP supports Virtual Routing and Forwarding instances (VRFs). VRFs exist within virtual device contexts (VDCs). By default, Cisco NX-OS places you in the default VDC and default VRF unless you specifically configure another VDC and VRF.

If you change the VRF membership of an interface, Cisco NX-OS removes all Layer 3 configuration, including HSRP.

For more information, see the *Cisco Nexus 7000 Series NX-OS Virtual Device Context Configuration Guide, Release 5.x*, and see [Chapter 12, “Configuring Layer 3 Virtualization.”](#)

Licensing Requirements for HSRP

The following table shows the licensing requirements for this feature:

Product	License Requirement
Cisco NX-OS	<p>HSRP requires no license. Any feature not included in a license package is bundled with the Cisco NX-OS system images and is provided at no extra charge to you. For a complete explanation of the Cisco NX-OS licensing scheme, see the <i>Cisco NX-OS Licensing Guide</i>.</p> <p>Note Make sure the LAN Base Services license is installed on the switch to enable Layer 3 interfaces.</p>

Prerequisites for HSRP

HSRP has the following prerequisites:

- You must enable the HSRP feature in a switch before you can configure and enable any HSRP groups.
- If you configure VDCs, install the Advanced Services license and enter the desired VDC (see the *Cisco Nexus 7000 Series NX-OS Virtual Device Context Configuration Guide, Release 5.x*).

Guidelines and Limitations

HSRP has the following configuration guidelines and limitations:

- The minimum hello timer value is 250 milliseconds.
- The minimum hold timer value is 750 milliseconds.
- You must configure an IP address for the interface that you configure HSRP on and enable that interface before HSRP becomes active.
- You must configure HSRP version 2 when you configure an IPv6 interface for HSRP.
- For IPv4, the virtual IP address must be in the same subnet as the interface IP address.
- We recommend that you do not configure more than one first-hop redundancy protocol on the same interface.
- HSRP version 2 does not interoperate with HSRP version 1. An interface cannot operate both version 1 and version 2 because both versions are mutually exclusive. However, the different versions can be run on different physical interfaces of the same router.
- You cannot change from version 2 to version 1 if you have configured groups above the group number range allowed for version 1 (0 to 255).
- Cisco NX-OS removes all Layer 3 configuration on an interface when you change the interface VRF membership, port channel membership, or when you change the port mode to Layer 2.

Default Settings

Table 16-2 lists the default settings for HSRP parameters.

Table 16-2 Default HSRP Parameters

Parameters	Default
HSRP	Disabled
Authentication	Enabled as text for version 1, with cisco as the password
HSRP version	Version 1
Preemption	disabled
Priority	100
virtual MAC address	Derived from HSRP group number

Configuring HSRP

This section includes the following topics:

- [Enabling the HSRP Feature, page 16-9](#)
- [Configuring the HSRP Version, page 16-10](#)
- [Configuring an HSRP Group for IPv4, page 16-10](#)
- [Configuring an HSRP Group for IPv6, page 13-15](#)
- [Configuring the HSRP Virtual MAC Address, page 16-15](#)
- [Authenticating HSRP, page 16-16](#)
- [Configuring HSRP Object Tracking, page 16-18](#)
- [Configuring the HSRP Priority, page 16-20](#)
- [Customizing HSRP, page 16-21](#)
- [Configuring Extended Hold Timers for HSRP, page 12-17](#)



Note

If you are familiar with the Cisco IOS CLI, be aware that the Cisco NX-OS commands for this feature might differ from the Cisco IOS commands that you would use.

Enabling the HSRP Feature

You must globally enable the HSRP feature before you can configure and enable any HSRP groups.

DETAILED STEPS

To enable the HSRP feature, use the following command in global configuration mode:

Command	Purpose
<code>feature hsrp</code>	Enables HSRP.
Example: <code>switch(config)# feature hsrp</code>	

To disable the HSRP feature in a VDC and remove all associated configuration, use the following command in global configuration mode:

Command	Purpose
<code>no feature hsrp</code>	Disables HSRP for all groups.
Example: <code>switch(config)# no feature hsrp</code>	

Configuring the HSRP Version

You can configure the HSRP version. If you change the version for existing groups, Cisco NX-OS reinitializes HSRP for those groups because the virtual MAC address changes. The HSRP version applies to all groups on the interface.



Note IPv6 HSRP groups must be configured as HSRP version 2.

To configure the HSRP version, follow these steps:

- Step 1** From the Feature Selector pane, choose **Routing > Gateway Redundancy > HSRP**.
The available devices appear in the Summary pane.
- Step 2** From the Summary pane, click the device that you want to configure HSRP on.
The system highlights the HSRP row in the Summary pane, and tabs update in the Details pane.
- Step 3** From the highlighted Interface field, select the interface that you want to configure an HSRP group on from the drop-down list.
- Step 4** From the Details pane, click the **Interface Settings** tab.
The Interface Settings tab appears.
- Step 5** From the Interface Settings tab, in the HSRP Version field, enter **1** for HSRP version 1 or enter **2** for HSRP version 2.
- Step 6** From the menu bar, choose **File > Deploy** to apply your changes to the device.

To configure the HSRP version, use the following command in interface configuration mode:

Command	Purpose
<code>hsrp version {1 2}</code>	Configures the HSRP version. Version 1 is the default.
Example: <code>switch(config-if)# hsrp version 2</code>	

Configuring an HSRP Group for IPv4

You can configure an HSRP group on an IPv4 interface and configure the virtual IP address and virtual MAC address for the HSRP group.

BEFORE YOU BEGIN

Ensure that you have enabled the HSRP feature (see the “[Enabling the HSRP Feature](#)” section on page 16-9).

Cisco NX-OS enables an HSRP group once you configure the virtual IP address on any member interface in the group. You should configure HSRP attributes such as authentication, timers, and priority before you enable the HSRP group.

SUMMARY STEPS

1. **configure terminal**
2. **interface** *type number*
3. **no switchport**
4. **ip** *ip-address/length*
5. **hsrp** *group-number* [**ipv4**]
6. **ip** [*ip-address* [**secondary**]]
7. **exit**
8. **no shutdown**
9. (Optional) **show hsrp** [**group** *group-number*] [**ipv4**]
10. (Optional) **copy running-config startup-config**

DETAILED STEPS

To create an IPv4 HSRP group on an interface, follow these steps:

-
- Step 1** From the Feature Selector pane, choose **Routing > Gateway Redundancy > HSRP**.
The available devices appear in the Summary pane.
 - Step 2** From the Summary pane, click the device that you want to configure HSRP on.
 - Step 3** Right-click and choose **New IPv4 GroupSetting**.
 - Step 4** From the Interface drop-down list, select the interface or group of interfaces that you want to configure an HSRP group on.
 - Step 5** From the Group ID field, enter the group number for this group.
The range is from 0 to 255.
 - Step 6** From the Details pane, click the **Group Details** tab.
The Group Details tab appears.
 - Step 7** From the Group Details tab, expand the **Group Details** section.
The basic group information appears in the Details pane.
 - Step 8** (Optional) From the Group Name field, enter a name for this HSRP group member.
 - Step 9** (Optional) From the Virtual IP Address Settings Area, check **Learn Virtual IP from Members of Group** to learn the virtual IP address from another HSRP group member.
 - Step 10** (Optional) From the Virtual IP Address Settings Area, in the Virtual IP Address field, enter an IPv4 address.

- Step 11** (Optional) From the Virtual IP Address Settings Area, in the Secondary IP Address field, enter an IPv4 address for the secondary IP address.
- Step 12** From the menu bar, choose **File > Deploy** to apply your changes to the device.

	Command	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	interface type number Example: switch(config)# interface ethernet 1/2 switch(config-if)#	Enters interface configuration mode.
Step 3	no switchport Example: switch(config-if)# no switchport	Configures the interface as a Layer 3 routed interface.
Step 4	ip ip-address/length Example: switch(config-if)# ip 192.0.2.2/8	Configures the IPv4 address of the interface.
Step 5	hsrp group-number [ipv4] Example: switch(config-if)# hsrp 2 switch(config-if-hsrp)#	Creates an HSRP group and enters hsrp configuration mode. The range for HSRP version 1 is from 0 to 255. The range is for HSRP version 2 is from 0 to 4095. The default value is 0.
Step 6	ip [ip-address [secondary]] Example: switch(config-if-hsrp)# ip 192.0.2.1	Configures the virtual IP address for the HSRP group and enables the group. This address should be in the same subnet as the IPv4 address of the interface.
Step 7	exit Example: switch(config-if-hsrp)# exit	Exits HSRP configuration mode.
Step 8	no shutdown Example: switch(config-if)# no shutdown	Enables the interface.
Step 9	show hsrp [group group-number] [ipv4] Example: switch(config-if)# show hsrp group 2	(Optional) Displays HSRP information.
Step 10	copy running-config startup-config Example: switch(config-if)# copy running-config startup-config	(Optional) Saves this configuration change.

**Note**

You should use the **no shutdown** command to enable the interface after you finish the configuration.

This example shows how to configure an HSRP group on Ethernet 1/2:

```
switch# configure terminal
switch(config)# interface ethernet 1/2
switch(config-if)# no switchport
switch(config-if)# ip 192.0.2.2/8
switch(config-if)# hsrp 2
switch(config-if-hsrp)# ip 192.0.2.1
switch(config-if-hsrp)# exit
switch(config-if)# no shutdown
switch(config-if)# copy running-config startup-config
```

Configuring an HSRP Group for IPv6

You can configure an HSRP group on an IPv6 interface and configure the virtual MAC address for the HSRP group.

When you configure an HSRP group for IPv6, HSRP generates a link-local address from the link-local prefix. HSRP also generates a modified EUI-64 format interface identifier in which the EUI-64 interface identifier is created from the relevant HSRP virtual MAC address.

There are no HSRP IPv6 secondary addresses.

BEFORE YOU BEGIN

Ensure that you have enabled the HSRP feature (see the [“Enabling the HSRP Feature”](#) section on page 16-9).

Ensure that you have enabled HSRP version 2 on the interface that you want to configure an IPv6 HSRP group on.

Ensure that you have configured HSRP attributes such as authentication, timers, and priority before you enable the HSRP group.

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

SUMMARY STEPS

1. **configure terminal**
2. **interface** *type number*
3. **ipv6** *ipv6-address/length*
4. **hsrp version 2**
5. **hsrp** *group-number* **ipv6**
6. **ip** *ipv6-address*
or
ip autoconfig
7. **no shutdown**
8. **show hsrp** [**group** *group-number*] [**ipv6**]
9. **copy running-config startup-config**

DETAILED STEPS

To create an IPv6 HSRP group on an interface, follow these steps:

-
- Step 1** From the Feature Selector pane, choose **Routing > Gateway Redundancy > HSRP**.
The available devices appear in the Summary pane.
- Step 2** From the Summary pane, click the device that you want to configure HSRP on.
- Step 3** Right-click and choose **New IPv6 GroupSetting**.
- Step 4** From the Interface drop-down list, select the interface or group of interfaces that you want to configure an HSRP group on.
- Step 5** From the Group ID field, enter the group number for this group.
- Step 6** From the Details pane, click the **Group Details** tab.
The Group Details tab appears.
- Step 7** From the Group Details tab, expand the **Interfaces** section.
The HSRP interface information appears in the Details pane.
- Step 8** From the HSRP Version field, enter **2** for HSRP version 2.
- Step 9** From the Group Details tab, expand the **Group Details** section.
The basic group information appears in the Details pane.
- Step 10** (Optional) From the Group Name field, enter a name for this HSRP group member.
- Step 11** (Optional) From the Virtual IP Address Settings Area, check **Autoconfigure IP address** to configure the virtual IPv6 address from the link-local address and the HSRP virtual MAC address.
- Step 12** (Optional) From the Virtual IP Address Settings Area, check **Learn Virtual IP from Members of Group** to learn the virtual IP address from another HSRP group member.
- Step 13** (Optional) From the Virtual IP Address Settings Area, in the Virtual IPv6 Address field, enter an IPv6 address.
- Step 14** From the menu bar, choose **File > Deploy** to apply your changes to the device.
-

RELATED TOPICS

- [Configuring an HSRP Group for IPv4, page 16-10](#)

	Command	Purpose
Step 1	<code>configure terminal</code> Example: switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	<code>interface type number</code> Example: switch(config)# interface ethernet 3/2 switch(config-if)#	Enters interface configuration mode.

	Command	Purpose
Step 3	ipv6 <i>ipv6-address/length</i> Example: switch(config-if)# ipv6 2001:0DB8:0001:0001:/64	Configures the IPv6 address of the interface.
Step 4	hsrp version 2 Example: switch(config-if-hsrp)# hsrp version 2	Configures this group for HSRP version 2.
Step 5	hsrp group-number ipv6 Example: switch(config-if)# hsrp 10 ipv6 switch(config-if-hsrp)#	Creates an IPv6 HSRP group and enters hsrp configuration mode. The range for HSRP version 2 is from 0 to 4095. The default value is 0.
Step 6	ip [<i>ipv6-address</i> [secondary]] Example: switch(config-if-hsrp)# ip 2001:DB8::1	Configures the virtual IPv6 address for the HSRP group and enables the group.
Step 7	ip autoconfig Example: switch(config-if-hsrp)# ip autoconfig	Autoconfigures the virtual IPv6 address for the HSRP group from the calculated link-local virtual IPv6 address and enables the group.
Step 8	no shutdown Example: switch(config-if-hsrp)# no shutdown	Enables the interface
Step 9	show hsrp [group <i>group-number</i>] [ipv6] Example: switch(config-if-hsrp)# show hsrp group 10	(Optional) Displays HSRP information.
Step 10	copy running-config startup-config Example: switch(config-if-hsrp)# copy running-config startup-config	(Optional) Saves this configuration change.

**Note**

You should use the **no shutdown** command to enable the interface after you finish the configuration.

The following example shows how to configure an IPv6 HSRP group on Ethernet 3/2:

```
switch# configure terminal
switch(config)# interface ethernet 3/2
switch(config-if)# ip 12001:0DB8:0001:0001:/64
switch(config-if)# hsrp 2 ipv6
switch(config-if-hsrp)# exit
switch(config-if)# no shutdown
switch(config-if)# copy running-config startup-config
```

Configuring the HSRP Virtual MAC Address

You can override the default virtual MAC address that HSRP derives from the configured group number.

To manually configure the virtual MAC address for an HSRP group, use the following command in hsrp configuration mode:

Command	Purpose
mac-address <i>string</i> Example: switch(config-if-hsrp)# mac-address 5000.1000.1060	Configures the virtual MAC address for an HSRP group. The string uses the standard MAC address format (xxxx.xxxx.xxxx).

To configure HSRP to use the burned-in MAC address of the interface for the virtual MAC address, use the following command in interface configuration mode:

Command	Purpose
hsrp use-bia [scope interface] Example: switch(config-if)# hsrp use-bia	Configures HSRP to use the burned-in MAC address of the interface for the HSRP virtual MAC address. You can optionally configure HSRP to use the burned-in MAC address for all groups on this interface by using the scope interface keywords.

Authenticating HSRP

You can configure HSRP to authenticate the protocol using cleartext or MD5 digest authentication. MD5 authentication uses a key chain (see the *Cisco Nexus 7000 Series NX-OS Security Configuration Guide, Release 5.x*).

BEFORE YOU BEGIN

Ensure that you have enabled the HSRP feature (see the [“Enabling the HSRP Feature” section on page 16-9](#)).

You must configure the same authentication and keys on all members of the HSRP group.

Ensure that you have created the key chain if you are using MD5 authentication.

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

SUMMARY STEPS

1. **configure terminal**
2. **interface** *interface-type slot/port*
3. **no switchport**
4. **hsrp** *group-number* [**ipv4** | **ipv6**]
5. **authentication text** *string*
or
authentication md5 {**key-chain** *key-chain* | **key-string** {**0** | **7**} *text* [**timeout** *seconds*]}
6. (Optional) **show hsrp** [**group** *group-number*]
7. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	interface <i>interface-type slot/port</i> Example: switch(config)# interface ethernet 1/2 switch(config-if)#	Enters interface configuration mode.
Step 3	no switchport Example: switch(config-if)# no switchport	Configures the interface as a Layer 3 routed interface.
Step 4	hsrp group-number [ipv4 ipv6] Example: switch(config-if)# hsrp 2 switch(config-if-hsrp)#	Creates an HSRP group and enters HSRP configuration mode.
Step 5	authentication text <i>string</i> Example: switch(config-if-hsrp)# authentication text mypassword authentication md5 { key-chain <i>key-chain</i> key-string {0 7} <i>text</i> [timeout <i>seconds</i>]}	Configures cleartext authentication for HSRP on this interface. Configures MD5 authentication for HSRP on this interface. You can use a key chain or key string. If you use a key string, you can optionally set the timeout for when HSRP will only accept a new key. The range is from 0 to 32767 seconds.
Step 6	show hsrp [group <i>group-number</i>] Example: switch(config-if-hsrp)# show hsrp group 2	(Optional) Displays HSRP information.
Step 7	copy running-config startup-config Example: switch(config-if-hsrp)# copy running-config startup-config	(Optional) Saves this configuration change.

This example shows how to configure MD5 authentication for HSRP on Ethernet 1/2 after creating the key chain:

```
switch# configure terminal
switch(config)# key chain hsrp-keys
switch(config-keychain)# key 0
switch(config-keychain-key)# key-string 7 zqdest
switch(config-keychain-key) accept-lifetime 00:00:00 Jun 01 2008 23:59:59 Sep 12 2008
switch(config-keychain-key) send-lifetime 00:00:00 Jun 01 2008 23:59:59 Aug 12 2008
switch(config-keychain-key) key 1
switch(config-keychain-key) key-string 7 uaeqdyito
switch(config-keychain-key) accept-lifetime 00:00:00 Aug 12 2008 23:59:59 Dec 12 2008
switch(config-keychain-key) send-lifetime 00:00:00 Sep 12 2008 23:59:59 Nov 12 2008
```

```

switch(config-keychain-key) # interface ethernet 1/2
switch(config-if) # no switchport
switch(config-if) # hsrp 2
switch(config-if-hsrp) # authenticate md5 key-chain hsrp-keys
switch(config-if-hsrp) # copy running-config startup-config

```

Configuring HSRP Object Tracking

You can configure an HSRP group to adjust its priority based on the availability of other interfaces or routes. The priority of a switch can change dynamically if it has been configured for object tracking and the object that is being tracked goes down. The tracking process periodically polls the tracked objects and notes any value change. The value change triggers HSRP to recalculate the priority. The HSRP interface with the higher priority becomes the active router if you configure the HSRP interface for preemption.

HSRP supports tracked objects and track lists. See [Chapter 18, “Configuring Object Tracking”](#) for more information on track lists.

BEFORE YOU BEGIN

Ensure that you have enabled the HSRP feature (see the [“Enabling the HSRP Feature”](#) section on [page 16-9](#)).

Ensure that you are in the correct VDC (or use the `switchto vdc` command).

SUMMARY STEPS

1. **configure terminal**
2. **track** *object-id* **interface** *interface-type number* **{ip | ipv6} routing | line-protocol**
or
track *object-id* **{ip | ipv6} route** *ip-prefix/length* **reachability**
3. **interface** *interface-type slot/port*
4. **no switchport**
5. **hsrp** *group-number* **[ipv4 | ipv6]**
6. **priority** [*value*]
7. **track** *object-number* **[decrement value]**
8. **preempt** **[delay [minimum seconds] [reload seconds] [sync seconds]]**
9. (Optional) **show hsrp interface** *interface-type number*
10. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters configuration mode.
Step 2	track object-id interface <i>interface-type number</i> {{ip ipv6} routing line-protocol Example: switch(config)# track 1 interface ethernet 2/2 line-protocol switch(config-track)#	Configures the interface that this HSRP interface tracks. Changes in the state of the interface affect the priority of this HSRP interface as follows: <ul style="list-style-type: none"> You configure the interface and corresponding object number that you use with the track command in hsrp configuration mode. The line-protocol keyword tracks whether the interface is up. The ip keyword also checks that IP routing is enabled on the interface and an IP address is configured.
	track object-id {ip ipv6} route <i>ip-prefix/length reachability</i> Example: switch(config)# track 2 ip route 192.0.2.0/8 reachability switch(config-track)#	Creates a tracked object for a route and enters tracking configuration mode. The <i>object-id</i> range is from 1 to 500.
Step 3	interface <i>interface-type slot/port</i> Example: switch(config)# interface ethernet 1/2 switch(config-if)#	Enters interface configuration mode.
Step 4	no switchport Example: switch(config-if)# no switchport	Configures the interface as a Layer 3 routed interface.
Step 5	hsrp group-number [ipv4 ipv6] Example: switch(config-if)# hsrp 2 switch(config-if-hsrp)#	Creates an HSRP group and enters hsrp configuration mode.
Step 6	priority [value] Example: switch(config-if-hsrp)# priority 254	Sets the priority level used to select the active router in an HSRP group. The range is from 0 to 255. The default is 100.
Step 7	track object-number [decrement <i>value</i>] Example: switch(config-if-hsrp)# track 1 decrement 20	Specifies an object to be tracked that affects the weighting of an HSRP interface. The <i>value</i> argument specifies a reduction in the priority of an HSRP interface when a tracked object fails. The range is from 1 to 255. The default is 10.

	Command	Purpose
Step 8	<pre>preempt [delay [minimum seconds] [reload seconds] [sync seconds]]</pre> <p>Example: switch(config-if-hsrp)# preempt delay minimum 60</p>	Configures the router to take over as the active router for an HSRP group if it has a higher priority than the current active router. This command is disabled by default. The range is from 0 to 3600 seconds.
Step 9	<pre>show hsrp interface interface-type number</pre> <p>Example: switch(config-if-hsrp)# show hsrp interface ethernet 1/2</p>	(Optional) Displays HSRP information for an interface.
Step 10	<pre>copy running-config startup-config</pre> <p>Example: switch(config-if-hsrp)# copy running-config startup-config</p>	(Optional) Saves this configuration change.

This example shows how to configure HSRP object tracking on Ethernet 1/2:

```
switch# configure terminal
switch(config)# track 1 interface ethernet 2/2 line-protocol
switch(config)# interface ethernet 1/2
switch(config-if)# no switchport
switch(config-if)# hsrp 2
switch(config-if-hsrp)# track 1 decrement 20
switch(config-if-hsrp)# copy running-config startup-config
```

Configuring the HSRP Priority

You can configure the HSRP priority on an interface. HSRP uses the priority to determine which HSRP group member acts as the active router.

For IPv6 HSRP groups, if all group members have the same priority, HSRP selects the active router based on the IPv6 link-local address.

To configure the HSRP priority, use the following command in interface configuration mode:

Command	Purpose
<pre>priority level [forwarding-threshold lower lower-value upper upper-value]</pre> <p>Example: switch(config-if-hsrp)# priority 60 forwarding-threshold lower 40 upper 50</p>	Sets the priority level used to select the active router in an HSRP group. The <i>level</i> range is from 0 to 255. The default is 100.

Customizing HSRP

You can optionally customize the behavior of HSRP. Be aware that as soon as you enable an HSRP group by configuring a virtual IP address, that group is now operational. If you first enable an HSRP group before customizing HSRP, the router could take control over the group and become the active router before you finish customizing the feature. If you plan to customize HSRP, you should do so before you enable the HSRP group.

To customize HSRP, use the following commands in `hsrp` configuration mode:

Command	Purpose
name <i>string</i> Example: <pre>switch(config-if-hsrp)# name HSRP-1</pre>	Specifies the IP redundancy name for an HSRP group. The <i>string</i> is from 1 to 255 characters. The default string has the following format: <code>hsrp-<interface-short-name>-<group-id></code> . For example, <code>hsrp-Eth2/1-1</code> .
preempt [delay [<i>minimum seconds</i>] [reload <i>seconds</i>] [sync <i>seconds</i>]] Example: <pre>switch(config-if-hsrp)# preempt delay minimum 60</pre>	Configures the router to take over as an active router for an HSRP group if it has a higher priority than the current active router. This command is disabled by default. The range is from 0 to 3600 seconds.
timers [msec] <i>hellotime</i> [msec] <i>holdtime</i> Example: <pre>switch(config-if-hsrp)# timers 5 18</pre>	Configures the hello and hold time for this HSRP member as follows: <ul style="list-style-type: none"> • <i>hellotime</i>—The interval between successive hello packets sent. The range is from 1 to 254 seconds. • <i>holdtime</i>—The interval before the information in the hello packet is considered invalid. The range is from 3 to 255. The optional msec keyword specifies that the argument is expressed in milliseconds, instead of the default seconds. The timer ranges for milliseconds are as follows: <ul style="list-style-type: none"> • <i>hellotime</i>—The interval between successive hello packets sent. The range is from 255 to 999 milliseconds. • <i>holdtime</i>—The interval before the information in the hello packet is considered invalid. The range is from 750 to 3000 milliseconds.

To customize HSRP, use the following commands in interface configuration mode:

Command or Action	Purpose
hsrp delay minimum <i>seconds</i> Example: switch(config-if)# hsrp delay minimum 30	Specifies the minimum amount of time that HSRP waits after a group is enabled before participating in the group. The range is from 0 to 10000 seconds. The default is 0.
hsrp delay reload <i>seconds</i> Example: switch(config-if)# hsrp delay reload 30	Specifies the minimum amount of time that HSRP waits after reload before participating in the group. The range is from 0 to 10000 seconds. The default is 0.

Configuring Extended Hold Timers for HSRP

You can configure HSRP to use extended hold timers to support extended NSF during a controlled (graceful) switchover or ISSU, including software upgrades and supervisor switchovers. You should configure extended hold timers on all HSRP routers (see the “[High Availability and Extended Nonstop Forwarding](#)” section on page 16-7).



Note

You must configure extended hold timers on all HSRP routers if you configure extended hold timers. If you configure a nondefault hold timer, you should configure the same value on all HSRP routers when you configure HSRP extended hold timers.



Note

HSRP extended hold timers are not applied if you configure millisecond HSRP hello and hold timers.

To configure HSRP extended hold timers, use the following command in global configuration mode:

Command	Purpose
hsrp timers extended-hold [<i>timer</i>] Example: switch(config)# hsrp timers extended-hold	Sets the HSRP extended hold timer, in seconds. The timer range is from 10 to 255. The default is 10.

Use the **show hsrp** command or the **show running-config hsrp** command to display the extended hold time.

Verifying the HSRP Configuration

To display the HSRP configuration information, perform one of the following tasks:

Command	Purpose
<code>show hsrp [group group-number]</code>	Displays the HSRP status for all groups or one group.
<code>show hsrp delay [interface interface-type slot/port]</code>	Displays the HSRP delay value for all interfaces or one interface.
<code>show hsrp [interface interface-type slot/port]</code>	Displays the HSRP status for an interface.
<code>show hsrp [group group-number] [interface interface-type slot/port] [active] [all] [init] [learn] [listen] [speak] [standby]</code>	Displays the HSRP status for a group or interface for virtual forwarders in the active, init, learn, listen, or standby state. Use the all keyword to see all states, including disabled.
<code>show hsrp [group group-number] [interface interface-type slot/port] active [all] [init] [learn] [listen] [speak] [standby] brief</code>	Displays a brief summary of the HSRP status for a group or interface for virtual forwarders in the active, init, learn, listen, or standby state. Use the all keyword to see all states, including disabled.

Configuration Examples for HSRP

This example shows how to enable HSRP on an interface with MD5 authentication and interface tracking:

```
key chain hsrp-keys
key 0
  key-string 7 zqdest
  accept-lifetime 00:00:00 Jun 01 2008 23:59:59 Sep 12 2008
  send-lifetime 00:00:00 Jun 01 2008 23:59:59 Aug 12 2008
key 1
  key-string 7 uaegdyito
  accept-lifetime 00:00:00 Aug 12 2008 23:59:59 Dec 12 2008
  send-lifetime 00:00:00 Sep 12 2008 23:59:59 Nov 12 2008
feature hsrp
track 2 interface ethernet 2/2 ip
interface ethernet 1/2
  no switchport
  ip address 192.0.2.2/8
  hsrp 1
    authenticate md5 key-chain hsrp-keys
    priority 90
    track 2 decrement 20
    ip-address 192.0.2.10
  no shutdown
```

Additional References

For additional information related to implementing HSRP, see the following sections:

- [Related Documents, page 16-24](#)

- [MIBs, page 16-24](#)

Related Documents

Related Topic	Document Title
Configuring the Gateway Load Balancing Protocol	Chapter 18, “Configuring GLBP”
Configuring the Virtual Router Redundancy Protocol	Chapter 17, “Configuring VRRP”
HSRP CLI commands	<i>Cisco Nexus 3000 Series Command Reference</i>
Configuring high availability	<i>Cisco Nexus 7000 Series NX-OS High Availability and Redundancy Guide, Release 5.x</i>

MIBs

MIBs	MIBs Link
CISCO-HSRP-MIB	To locate and download MIBs, go to the following URL: http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

Feature History for HSRP

[Table 16-3](#) lists the release history for this feature.

Table 16-3 Feature History for HSRP

Feature Name	Releases	Feature Information
HSRP	5.0(3)U1(1)	This feature was introduced.
IPv6	5.0(3)U3(1)	Added support for IPv6.