



Configuring First Hop Redundancy Protocols in IPv6

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IPv6 routing protocols ensure router-to-router resilience and failover. However, in situations in which the path between a host and the first-hop router fails, or the first-hop router itself fails, first hop redundancy protocols (FHRPs) ensure host-to-router resilience and failover.

The Hot Standby Router Protocol (HSRP) protects data traffic in case of a gateway failure.

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for First Hop Redundancy Protocols in IPv6

HSRP version 2 must be enabled on an interface before HSRP IPv6 can be configured.



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Information About First Hop Redundancy Protocols in IPv6

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HSRP for IPv6

IPv6 routing protocols ensure router-to-router resilience and failover. However, in situations in which the path between a host and the first-hop router fails, or the first-hop router itself fails, first hop redundancy protocols (FHRPs) ensure host-to-router resilience and failover.

The Hot Standby Router Protocol (HSRP) protects data traffic in case of a gateway failure.

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HSRP for IPv6 Overview

The HSRP is an FHRP designed to allow for transparent failover of the first-hop IP router. HSRP provides high network availability by providing first-hop routing redundancy for IP hosts on GigabitEthernet configured with a default gateway IP address. HSRP is used in a group of routers for selecting an active router and a standby router. In a group of router interfaces, the active router is the router of choice for routing packets; the standby router is the router that takes over when the active router fails or when preset conditions are met.

IPv6 hosts learn of available IPv6 routers through IPv6 neighbor discovery RA messages. These are multicast periodically, or may be solicited by hosts. HSRP is designed to provide only a virtual first hop for IPv6 hosts.

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, by default, derived from the HSRP virtual MAC address. Periodic RAs are sent for the HSRP virtual IPv6 link-local address when the HSRP group is active. These RAs stop after a final RA is sent when the group leaves the active state.

Periodic RAs for the interface link-local address stop after a final RA is sent while at least one virtual IPv6 link-local address is configured on the interface. No restrictions occur for the interface IPv6 link-local address other than that mentioned for the RAs. Other protocols continue to receive and send packets to this address.

HSRP uses a priority mechanism 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 IPv6 Virtual MAC Address Range

HSRP IPv6 uses a different virtual MAC address block than does HSRP for IP:

0005.73A0.0000 through 0005.73A0.0FFF (4096 addresses)

HSRP IPv6 UDP Port Number

Port number 2029 has been assigned to HSRP IPv6.

NSF and SSO-HSRP for IPv6 on VRF Interfaces

Cisco Nonstop Forwarding (NSF) and stateful switchover (SSO) are supported on HSRP for IPv6 on VRF interfaces, which makes HSRP for IPv6 VRF-aware.

For further information about SSO and NSF, see " Stateful Switchover " and " Cisco Nonstop Forwarding " in the *Cisco IOS XE High Availability Configuration Guide* .

How to Configure First Hop Redundancy Protocols in IPv6

- [Enabling an HSRP Group for IPv6 Operation, page 3](#)

Enabling an HSRP Group for IPv6 Operation

- [Prerequisites, page 3](#)
- [Enabling HSRP Version 2, page 3](#)
- [Enabling and Verifying an HSRP Group for IPv6 Operation, page 4](#)

Prerequisites

HSRP version 2 must be enabled on an interface before HSRP IPv6 can be configured.

If an IPv6 address is entered, it must be link local. There are no HSRP IPv6 secondary addresses.

Enabling HSRP Version 2

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **standby version** {1|2}

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable	Enables privileged EXEC mode.
	Example:	
	Router> enable	<ul style="list-style-type: none"> • Enter your password if prompted.

Command or Action	Purpose
Step 2 <code>configure terminal</code> Example: <pre>Router# configure terminal</pre>	Enters global configuration mode.
Step 3 <code>interface type number</code> Example: <pre>Router(config)# interface GigabitEthernet 0/0/0</pre>	Specifies an interface type and number, and places the router in interface configuration mode.
Step 4 <code>standby version {1 2}</code> Example: <pre>Router(config-if)# standby version 2</pre>	Changes the version of the HSRP. <ul style="list-style-type: none"> • Version 1 is the default.

Enabling and Verifying an HSRP Group for IPv6 Operation

In this task, when you enter the **standby ipv6** command, a link-local address is generated from the link-local prefix, and a modified EUI-64 format interface identifier is generated in which the EUI-64 interface identifier is created from the relevant HSRP virtual MAC address.

A link-local address is an IPv6 unicast address that can be automatically configured on any interface using the link-local prefix FE80::/10 (1111 1110 10) and the interface identifier in the modified EUI-64 format. Link-local addresses are used in the stateless autoconfiguration process. Nodes on a local link can use link-local addresses to communicate; the nodes do not need site-local or globally unique addresses to communicate.

In IPv6, a router on the link advertises in RA messages any site-local and global prefixes, and its willingness to function as a default router for the link. RA messages are sent periodically and in response to router solicitation messages, which are sent by hosts at system startup.

A node on the link can automatically configure site-local and global IPv6 addresses by appending its interface identifier (64 bits) to the prefixes (64 bits) included in the RA messages. The resulting 128-bit IPv6 addresses configured by the node are then subjected to duplicate address detection to ensure their uniqueness on the link. If the prefixes advertised in the RA messages are globally unique, then the IPv6 addresses configured by the node are also guaranteed to be globally unique. Router solicitation messages, which have a value of 133 in the Type field of the ICMP packet header, are sent by hosts at system startup so that the host can immediately autoconfigure without needing to wait for the next scheduled RA message.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ipv6 unicast-routing**
4. **interface** *type number*
5. **standby** [*group-number*] **ipv6** {*link-local-address* | **autoconfig**}
6. **standby** [*group-number*] **preempt** [**delay minimum** *seconds* | **reload** *seconds* | **sync** *seconds*]
7. **standby** [*group-number*] **priority** *priority*
8. **exit**
9. **show standby** [*type number* [*group*]] [**all** | **brief**]
10. **show ipv6 interface** [**brief**] [*interface-type interface-number*] [**prefix**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	ipv6 unicast-routing Example: Router(config)# ipv6 unicast-routing	Enables the forwarding of IPv6 unicast datagrams. <ul style="list-style-type: none"> • The ipv6 unicast-routing command must be enabled for HSRP for IPv6 to work.
Step 4	interface <i>type number</i> Example: Router(config)# interface GigabitEthernet 0/0/0	Specifies an interface type and number, and places the router in interface configuration mode.
Step 5	standby [<i>group-number</i>] ipv6 { <i>link-local-address</i> autoconfig }	Activates the HSRP in IPv6.
	Example: Router(config-if)# standby 1 ipv6 autoconfig	

	Command or Action	Purpose
Step 6	standby [<i>group-number</i>] preempt [delay minimum seconds reload seconds sync seconds] Example: Router(config-if)# standby 1 preempt	Configures HSRP preemption and preemption delay.
Step 7	standby [<i>group-number</i>] priority <i>priority</i> Example: Router(config-if)# standby 1 priority 110	Configures HSRP priority.
Step 8	exit Example: Router(config-if)# exit	Returns the router to privileged EXEC mode.
Step 9	show standby [<i>type number</i> [<i>group</i>]] [all brief] Example: Router# show standby	Displays HSRP information.
Step 10	show ipv6 interface [brief] [<i>interface-type interface-number</i>] [prefix] Example: Router# show ipv6 interface GigabitEthernet 0/0/0	Displays the usability status of interfaces configured for IPv6.

Configuration Examples for First Hop Redundancy Protocols in IPv6

- [Example Enabling and Verifying an HSRP Group for IPv6 Operation, page 6](#)

Example Enabling and Verifying an HSRP Group for IPv6 Operation

The following example shows configuration verification for an HSRP group for IPv6 that consists of Router1 and Router2. The **show standby** command is issued for each router to verify the router's configuration.

Router 1 Configuration

```

interface GigabitEthernet0/0/0
description DATA VLAN for PCs
encapsulation dot1Q 100
ipv6 address 2001:DB8:CAFE:2100::BAD1:1010/64
standby version 2
standby 101 priority 120
standby 101 preempt delay minimum 30
standby 101 authentication ese
standby 101 track Serial0/1/0.17 90
standby 201 ipv6 autoconfig
standby 201 priority 120
standby 201 preempt delay minimum 30
standby 201 authentication ese
standby 201 track Serial0/1/0.17 90
Router1# show standby
GigabitFastEthernet0/0/0 - Group 101 (version 2)
State is Active
2 state changes, last state change 5w5d
Active virtual MAC address is 0000.0c9f.f065
Local virtual MAC address is 0000.0c9f.f065 (v2 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 2.296 secs
Authentication text "ese"
Preemption enabled, delay min 30 secs
Active router is local
Priority 120 (configured 120)
Track interface Serial0/1/0.17 state Up decrement 90
IP redundancy name is "hsrp-Fa0/0.100-101" (default)
GigabitEthernet0/0/0 - Group 201 (version 2)
State is Active
2 state changes, last state change 5w5d
Virtual IP address is FE80::5:73FF:FEA0:C9
Active virtual MAC address is 0005.73a0.00c9
Local virtual MAC address is 0005.73a0.00c9 (v2 IPv6 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 2.428 secs
Authentication text "ese"
Preemption enabled, delay min 30 secs
Active router is local
Standby router is FE80::20F:8FFF:FE37:3B70, priority 100 (expires in 7.856 sec)
Priority 120 (configured 120)
Track interface Serial0/1/0.17 state Up decrement 90
IP redundancy name is "hsrp-Fa0/0.100-201" (default)

```

Router 2 Configuration

```

interface GigabitEthernet0/0/0
description DATA VLAN for Computers
encapsulation dot1Q 100
ipv6 address 2001:DB8:CAFE:2100::BAD1:1020/64
standby version 2
standby 101 preempt
standby 101 authentication ese
standby 201 ipv6 autoconfig
standby 201 preempt
standby 201 authentication ese
Router2# show standby
GigabitEthernet0/0/0 - Group 101 (version 2)
State is Standby
7 state changes, last state change 5w5d
Active virtual MAC address is 0000.0c9f.f065
Local virtual MAC address is 0000.0c9f.f065 (v2 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 0.936 secs
Authentication text "ese"
Preemption enabled
MAC address is 0012.7fc6.8f0c
Standby router is local
Priority 100 (default 100)

```

```

IP redundancy name is "hsrp-Fa0/0.100-101" (default)
GigabitEthernet0/0/0 - Group 201 (version 2)
State is Standby
7 state changes, last state change 5w5d
Virtual IP address is FE80::5:73FF:FEA0:C9
Active virtual MAC address is 0005.73a0.00c9
Local virtual MAC address is 0005.73a0.00c9 (v2 IPv6 default)
Hello time 3 sec, hold time 10 sec
Next hello sent in 0.936 secs
Authentication text "ese"
Preemption enabled
Active router is FE80::212:7FFF:FEC6:8F0C, priority 120 (expires in 7.548 sec)
MAC address is 0012.7fc6.8f0c
Standby router is local
Priority 100 (default 100)
IP redundancy name is "hsrp-Fa0/0.100-201" (default)

```

Additional References

Related Documents

Related Topic	Document Title
IPv6 link-local addresses and stateless autoconfiguration	" Implementing IPv6 Addressing and Basic Connectivity ," <i>Cisco IOS XE IPv6 Configuration Guide</i>
SSO and NSF	" Stateful Switchover " and " Cisco Nonstop Forwarding, " <i>Cisco IOS XE High Availability Configuration Guide</i> .
IPv6 supported feature list	" Start Here: Cisco IOS XE Software Release Specifics for IPv6 Features ," <i>Cisco IOS XE IPv6 Configuration Guide</i>
IPv6 commands: complete command syntax, command mode, command history, defaults, usage guidelines, and examples	<i>Cisco IOS IPv6 Command Reference</i>
Cisco IOS master command list, all releases	Cisco IOS Master Command List, All Releases

Standards

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

MIBs

MIB	MIBs Link
None	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

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

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for First Hop Redundancy Protocols in IPv6

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1 Feature Information for First Hop Redundancy Protocols for IPv6

Feature Name	Releases	Feature Configuration Information
IPv6 services: HSRP for IPv6	Cisco IOS XE Release 3.1S Cisco IOS XE Release 3.3SG	The HSRP is an FHRP designed to allow for transparent failover of the first-hop IPv6 router. The following commands were modified for this release: show ipv6 interface , show standby , standby ipv6 , standby preempt , standby priority , standby version .
NSF/SSO - HSRPv6 on VRF interfaces	Cisco IOS XE Release 3.1S	The NSF/SSO - HSRPv6 on VRF interfaces feature is supported in Cisco IOS XE Release 3.1S.
ISSU - HSRPv6 on VRF interfaces	Cisco IOS XE Release 3.1S	The ISSU - HSRPv6 on VRF interfaces feature is supported in Cisco IOS XE Release 3.1S.

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