Implement HSRP

This module describes the concepts and tasks you will use to configure Hot Standby Router Protocol (HSRP).

Implement HSRP

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.)

General Restrictions for HSRP Configuration

These are some restrictions to consider before you implement HSRP on supported interfaces on the Cisco 8000 platform.

- Either HSRP or VRRP redundancy protocol is supported at a time on a particular interface and its sub-interfaces. For example, VRRP on Bundle-Ether 1 and HSRP on Bundle-Ether 1.1 is not supported. Similarly VRRP on GigabitEthernet0/0/0/0.1 and HSRP on GigabitEthernet0/0/0/0.2 is also not supported.

Information About Implementing HSRP

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

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.

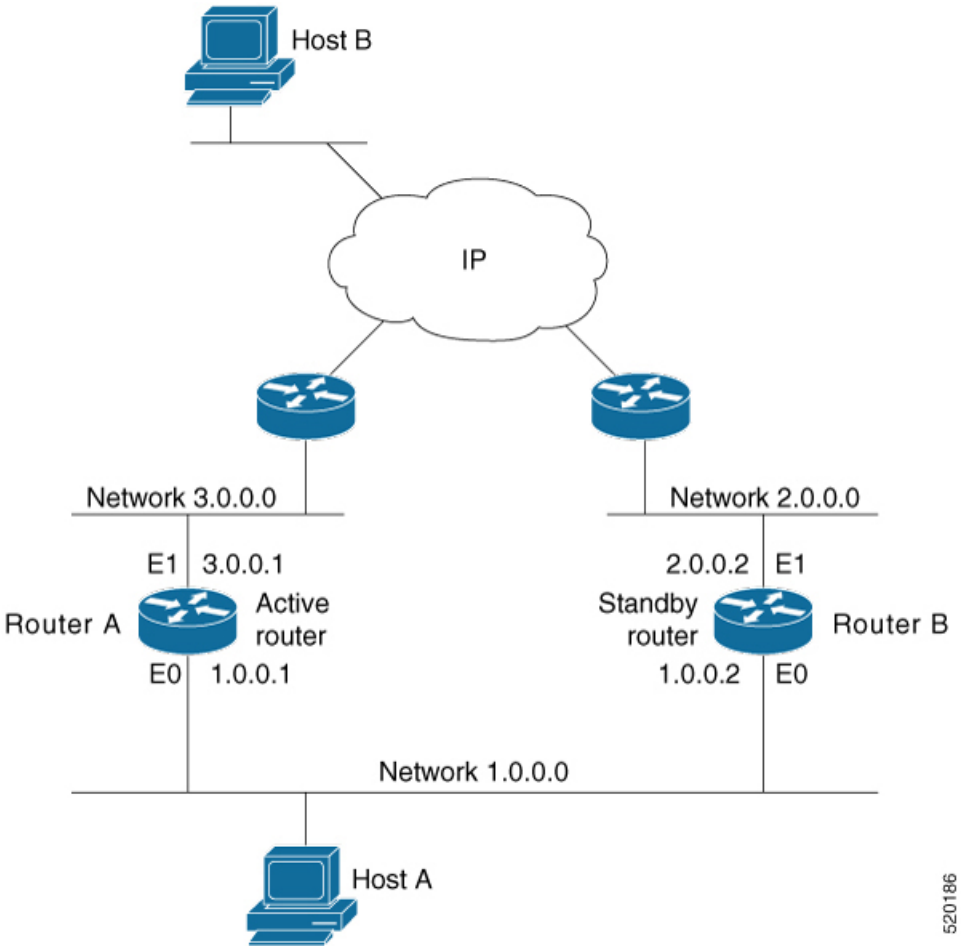
HSRP Groups

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.

The following figure shows routers configured as members of a single HSRP group.

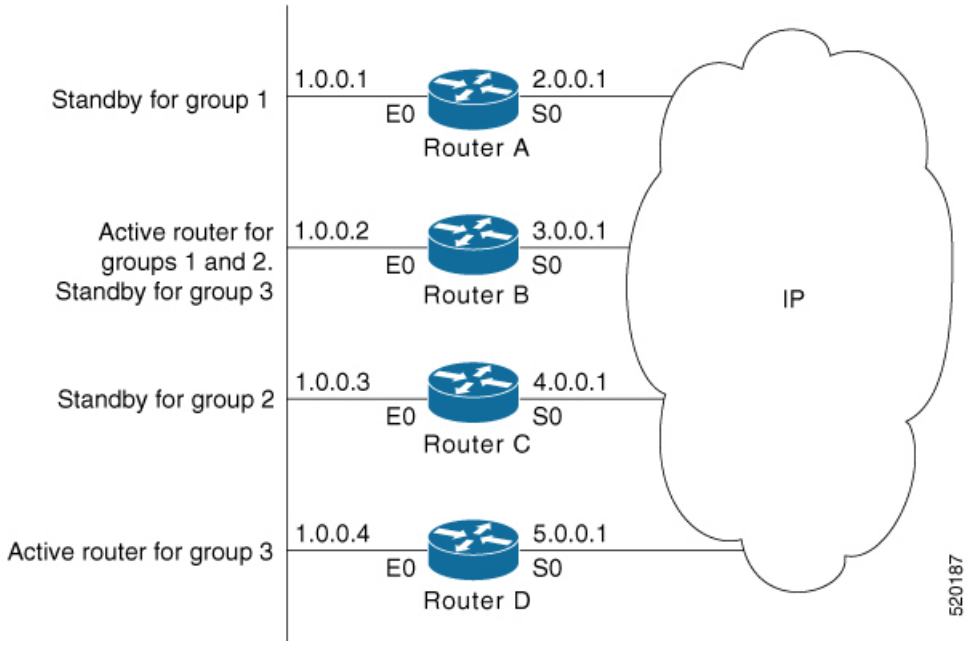
Figure 1: Routers Configured as an HSRP Group



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. The following figure shows routers configured as members of multiple HSRP groups.

Figure 2: Routers Configured as Members of Multiple HSRP Groups



In the figure above, 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.

Note 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.

Note We recommend that you disable Spanning Tree Protocol (STP) on switch ports to which the virtual routers are connected. Enable RSTP or rapid-PVST on the switch interfaces if the switch supports these protocols.

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.

HSRP over BVI

Table 1: Feature History Table

Feature Name	Release Information	Feature Description
HSRP over BVI	Release 7.5.2	Hot Standby Router Protocol (HSRP) runs on top of interfaces of multiple routers in the same home network that has only Cisco routers. It allows a group of routers to behave as a single virtual default gateway router, thereby providing default gateway redundancy and minimizing traffic loss. HSRP now supports Bridge-Group Virtual Interface (BVI) on Cisco Silicon One Q100 systems, which means that HSRP sessions can run between BVI interfaces of multiple routers.

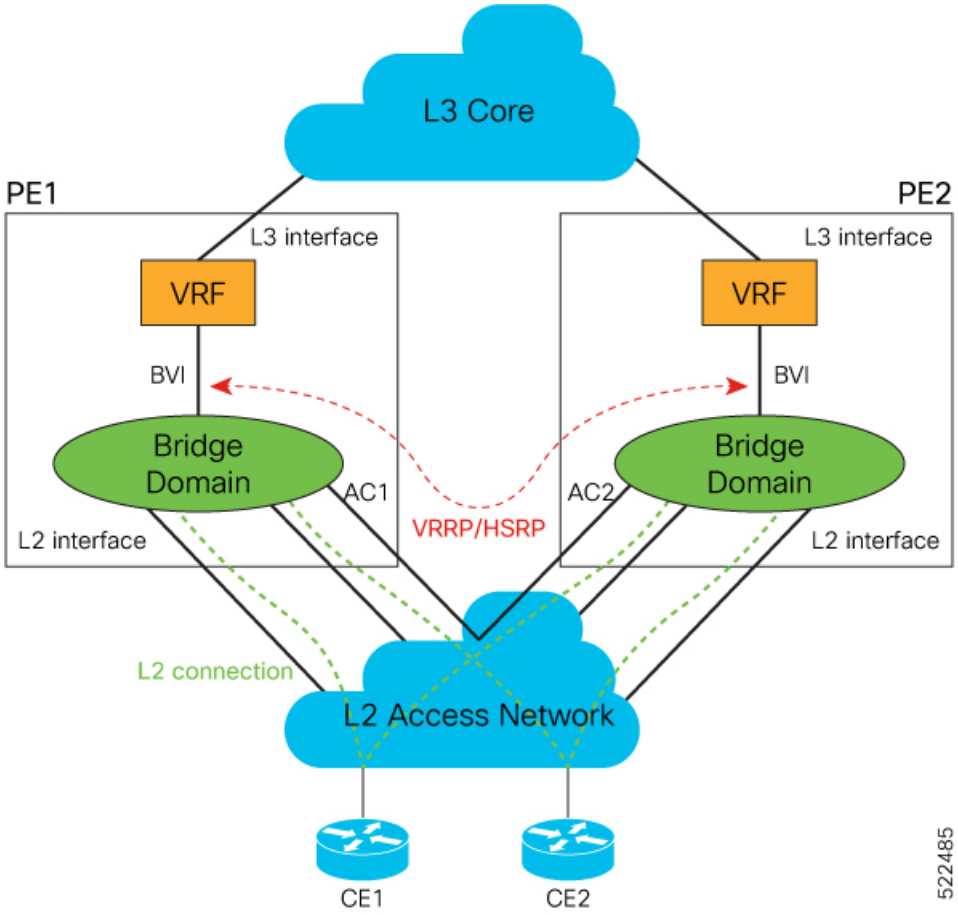
The Hot Standby Router Protocol (HSRP) allows multiple routers to act as a single virtual router in a LAN which is resilient to the failure of any single one of them. The participating routers share a virtual IP address and associated virtual MAC address, used by the hosts as the default first-hop. The protocol ensures that one

and only one router in the group, which is the active router is forwarding packets on behalf of the virtual router. A second router, which is the standby router is elected to replace the active router should it fail.

Bridge Group Virtual Interface (BVI) is a virtual interface which provides Layer 3 or routed functionality to a bridge group. Layer 2 functionality is applicable to the interfaces which are part of a bridge group and BVI is the routed interface for that bridge group.

Topology

This topology showcases how HSRP functions over BVI.



In this topology, PE1 and PE2 are paired in a redundant group. This group provides Layer 3 gateway service to CE1 and CE2. HSRP is configured over BVI interfaces on PE1 and PE2. HSRP ensures one BVI is the active gateway. The other is the standby gateway.

You can configure one of the BVIs to be active and the other BVI as standby by setting the HSRP priority value. The active BVI is programmed with the virtual MAC address chosen by HSRP. Hosts, CE1 and CE2 send the traffic to the virtual destination MAC address and the active BVI forwards the traffic.

During failover, the standby BVI becomes active and is programmed with the virtual MAC address. The traffic from the hosts is forwarded through this active BVI.

Supported Scale and Systems

HSRP over Bridge Virtual Interfaces (BVIs) is supported:

- On the Cisco Silicon One Q100 ASIC-based systems and Cisco Silicon One Q200 ASIC-based systems. You can configure upto 512 HSRP groups (IPv4 and IPv6 combined) over BVIs on both the Cisco Silicon One Q100 systems and Cisco Silicon One Q200 systems.
- Where the underlay IRB bridge domains consist of bridge members on L2 main or subinterfaces. Only physical and bundle interfaces are supported for L2 bridging in IRB.
- For IPv4 and IPv6 configurations, in both the default and VRF tables.
- On both the fixed and distributed systems.

Restrictions

Consider these restrictions before you configure HSRP over BVI.

- The minimum supported HSRP Hello timer is 100 ms. At the minimum timer, a total of 50 sessions are supported. Above 100 ms timers, the sessions scale goes up proportionately. A maximum of 1024 HSRP groups and 1024 HSRP sessions are supported.
- HSRP on BVI is not supported on the 88-LC1-12TH24FH-E line card in Cisco IOS XR Release 24.3.1.

Configure HSRP over BVI

To configure HSRP sessions over BVI, you must complete the following configurations on PE1 and PE2:

1. Configure a set of interfaces as Layer 2 interfaces and a set of VLAN sub-interfaces.
2. Configure a bridge group.
3. Configure a BVI.
4. Configure HSRP over BVI.

Configuration Example

```
/* Enter the global configuration mode and configure a set of interfaces as Layer 2 interfaces
 and a set of VLAN sub-interfaces */
Router# configure
Router(config)# interface HundredGigE0/0/1/0.1 l2transport
Router(config-subif)# encapsulation dot1q 1
Router(config-subif)# rewrite ingress tag pop 1 symmetric
Router(config-subif)# commit
Router(config-subif)# exit
Router(config)# interface HundredGigE0/0/1/1.1 l2transport
Router(config-subif)# encapsulation dot1q 1
Router(config-subif)# rewrite ingress tag pop 1 symmetric
Router(config-subif)# commit
Router(config-subif)# exit

/* Enter the Layer 2 VPN configuration mode and configure a bridge group */
Router(config)# l2vpn
Router(config-l2vpn)# bridge group 5
Router(config-l2vpn-bg)# bridge-domain 5
Router(config-l2vpn-bg-bd)# interface HundredGigE0/0/1/0.1
```

```
Router(config-l2vpn-bg-bd-ac)# exit
Router(config-l2vpn-bg-bd)# interface HundredGigE0/0/1/1.1
Router(config-l2vpn-bg-bd-ac)# exit
Router(config-l2vpn-bg-bd)# routed interface BVI 10
Router(config-l2vpn-bg-bd-bvi)# commit
Router(config-l2vpn-bg-bd-bvi)# exit

/* Configure a BVI in the global configuration mode */
Router(config)# interface BVI 10

Router(config-if)# ipv4 address 209.165.200.225 255.255.255.0
Router(config-if)# ipv6 address 2001:DB8:A:B::1/64
Router(config-if)# commit

/* Configure HSRP over BVI in the global configuration mode for IPv4 address */
Router(config)# router HSRP
Router(config-hsrp)# interface BVI 10
Router(config-hsrp-if)# address-family ipv4
Router(config-hsrp-ipv4)# HSRP 10
Router(config-hsrp-gp)# priority 101
Router(config-hsrp-gp)# address 209.165.200.226
Router(config-hsrp-gp)# commit


/* Configure HSRP over BVI in the global configuration mode for IPv6 address */
Router(config)# router HSRP
Router(config-hsrp)# interface BVI 10
Router(config-hsrp-if)# address-family ipv6
Router(config-hsrp-ipv6)# HSRP 11
Router(config-hsrp-gp)# address global 2001:DB8:A:B::2
Router(config-hsrp-gp)# address linklocal autoconfig
Router(config-hsrp-gp)# commit
```

Verification

Use the following command to verify the bridge domain details:

```
Router# show l2vpn bridge-domain detail

Legend: pp = Partially Programmed.
Bridge group: 5, bridge-domain: 5, id: 1, state: up, ShgId: 0, MSTi: 0
Coupled state: disabled
VINE state: BVI Resolved
MAC learning: enabled
MAC withdraw: enabled
MAC withdraw for Access PW: enabled
MAC withdraw sent on: bridge port up
MAC withdraw relaying (access to access): disabled
Flooding:
Broadcast & Multicast: enabled
Unknown unicast: enabled
MAC aging time: 300 s, Type: inactivity
MAC limit: 32768, Action: none, Notification: syslog
MAC limit reached: no, threshold: 75%
MAC port down flush: enabled
MAC Secure: disabled, Logging: disabled
Split Horizon Group: none
Dynamic ARP Inspection: disabled, Logging: disabled
IP Source Guard: disabled, Logging: disabled
DHCPv4 Snooping: disabled
DHCPv4 Snooping profile: none
IGMP Snooping: disabled
IGMP Snooping profile: none
```

```
MLD Snooping profile: none
Storm Control: disabled
Bridge MTU: 1500
MIB cvplsConfigIndex: 2
Filter MAC addresses:
P2MP PW: disabled
Multicast Source: Not Set
Create time: 26/05/2020 17:08:54 (00:11:30 ago)
No status change since creation
ACs: 3 (3 up), VFIs: 0, PWs: 0 (0 up), PBBs: 0 (0 up), VNIs: 0 (0 up)
List of ACs:
AC: BVI10, state is up
Type Routed-Interface
MTU 1514; XC ID 0x80000001; interworking none
BVI MAC address:
c472.95a6.8b90
Virtual MAC addresses:
0000.5e00.010a
0000.5e00.020b
Split Horizon Group: Access
AC: HundredGigE0/0/1/0.1, state is up
Type VLAN; Num Ranges: 1
Rewrite Tags: []
VLAN ranges: [1, 1]
MTU 1500; XC ID 0x1; interworking none
MAC learning: enabled
```

Use the following command to show the hsrp details:

```
Router# show hsrp ipv4 detail

BVI10 - IPv4 vrID 10
State is Master
2 state changes, last state change 00:11:57
State change history:
May 26 17:08:59.470 UTC Init -> Backup Delay timer expired
May 26 17:09:03.075 UTC Backup -> Master Master down timer expired
Last resign sent: Never
Last resign received: Never
Virtual IP address is 209.165.200.226
Virtual MAC address is 0000.5E00.010a, state is active
Master router is local
Version is 2
Advertise time 1 secs
Master Down Timer 3.605 (3 x 1 + (155 x 1/256))
Minimum delay 1 sec, reload delay 5 sec
Current priority 101
Configured priority 101, may preempt
minimum delay 0 secs

Router# show hsrp ipv6 detail

BVI10 - IPv6 vrID 11
State is Master
2 state changes, last state change 00:04:29
State change history:
May 26 17:16:43.476 UTC Init -> Backup Virtual IP configured
May 26 17:16:47.085 UTC Backup -> Master Master down timer expired
Last resign sent: Never
Last resign received: Never
Virtual IP address is fe80::200:5eff:fe00:20b
Secondary Virtual IP address is 2001:db8:a:b::2
Virtual MAC address is 0000.5E00.020b, state is active
Master router is local
```

```
Version is 3
Advertise time 1 secs
Master Down Timer 3.609 (3 x 1 + (156 x 1/256))
Minimum delay 1 sec, reload delay 5 sec
Current priority 100
Configured priority 100, may preempt
minimum delay 0 secs
```

```
Router# show hsrp interface BVI10 detail
BVI10 - IPv4 vrID 10
State is Master
2 state changes, last state change 00:12:35
State change history:
May 26 17:08:59.470 UTC Init -> Backup Delay timer expired
May 26 17:09:03.075 UTC Backup -> Master Master down timer expired
Last resign sent: Never
Last resign received: Never
Virtual IP address is 209.165.200.226
Virtual MAC address is 0000.5E00.010a, state is active
Master router is local
Version is 2
Advertise time 1 secs
Master Down Timer 3.605 (3 x 1 + (155 x 1/256))
Minimum delay 1 sec, reload delay 5 sec
Current priority 101
Configured priority 101, may preempt
minimum delay 0 secs

BVI10 - IPv6 vrID 11
State is Master
2 state changes, last state change 00:04:51
State change history:
May 26 17:16:43.476 UTC Init -> Backup Virtual IP configured
May 26 17:16:47.085 UTC Backup -> Master Master down timer expired
Last resign sent: Never
Last resign received: Never
Virtual IP address is fe80::200:5eff:fe00:20b
Secondary Virtual IP address is 2001:db8:a:b::2
Virtual MAC address is 0000.5E00.020b, state is active
Master router is local
Version is 3
Advertise time 1 secs
Master Down Timer 3.609 (3 x 1 + (156 x 1/256))
Minimum delay 1 sec, reload delay 5 sec
Current priority 100
Configured priority 100, may preempt
minimum delay 0 secs
```

HSRP over Physical Interfaces and Bundle Interfaces

Table 2: Feature History Table

Feature Name	Release Information	Feature Description

HSRP over Physical interfaces and Bundle interfaces	Release 24.2.11	This feature provides first-hop redundancy and enables failover to a standby interface within a group of physical or bundle interfaces or sub-interfaces in a network in the event of any failure in the active interface or sub-interface in that group. The feature allows you to configure HSRP for IPv4 and IPv6 networks on the physical and bundle interfaces and sub-interfaces.

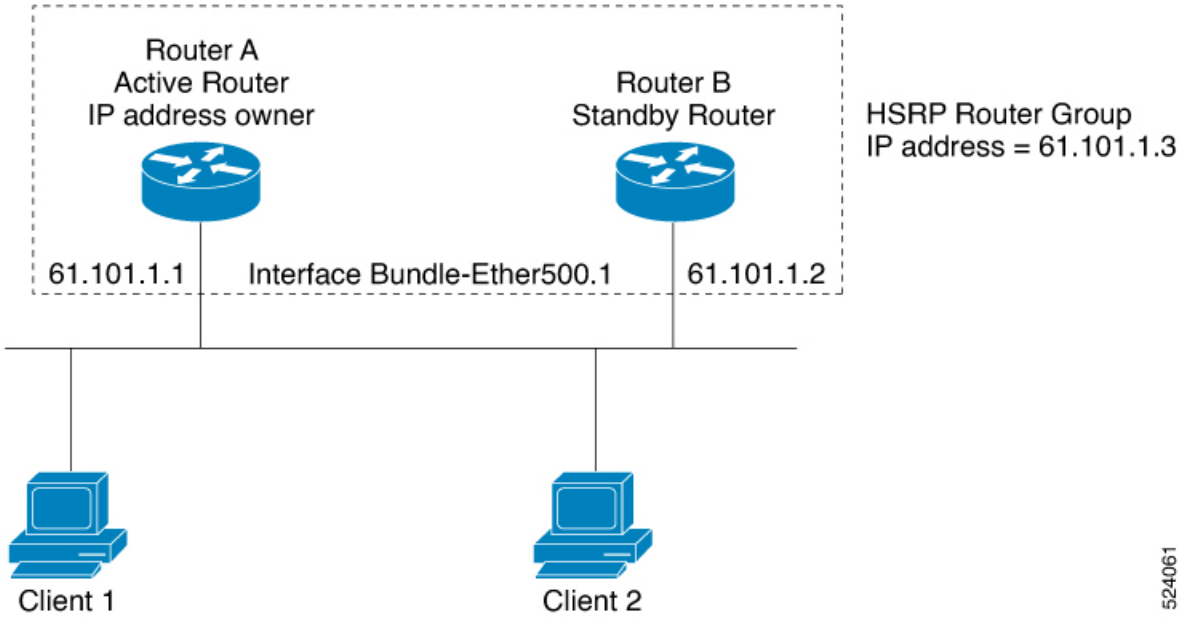
You can configure up to:

- 510 HSRP groups (IPv4 and IPv6 combined) on the Cisco Silicon One Q200 ASIC-based systems.
- 1020 HSRP groups (IPv4 and IPv6 combined) on the Cisco Silicon One P100 ASIC-based systems.

HSRP sessions run on top of interfaces of the multiple routers which are in the same home network.

Topology

This topology provides the HSRP implementation over a Bundle sub-interface on a network segment.



HSRP Topology and underlying network elements:

- **Interface Bundle-Ether500.1:** This is the Bundle sub-interface which is configured on the active router (IP Address: 61.101.1.1) and the standby router (IP Address: 61.101.1.2).
- **HSRP Router Group:** The HSRP router group consists of two or more routers configured with HSRP. This group provides backup services to the standby router (Router B) in the event of the active router (Router A) failure. The virtual IP address of the HSRP router group in this topology is 61.101.1.3.

- **Router A:** Router A is the active router on which the Bundle sub-interface **Bundle-Ether500.1** is configured. This router receives and routes packets destined for the MAC address of the group. This router is known as the IP address owner of the HSRP router group.
- **Router B:** When the designated active router fails, HSRP detects it and selects another router with the highest priority in the HSRP router group as the standby router. This standby router with the Bundle sub-interface **Bundle-Ether500.1** configuration takes over the job of Router A and assumes control of the MAC and IP Addresses of the HSRP router group.
- **Client 1 and Client 2:** These are source hosts from which traffic is forwarded through the active router or standby router to the destination hosts.

Guidelines for HSRP Configuration

This section provides the usage guidelines for HSRP configuration.

- Group ID value must be within the 0-255 range. However, RFC indicates 0-4095 as the id range.
- For a higher scale of HSRP IPv6 group sessions, set the LPTS default UDP entry policer rate to 3000 or higher if you see LPTS drops when running the **show lpts pifib hardware police location 0/0/CPU0** command. For information about this configuration, see the *Usage Guidelines* section in the **lpts pifib hardware police** command.
- When setting up HSRP for both IPv4 and IPv6 groups with more than 510 sessions, or when using aggressive timer intervals below 1 second, it is crucial to adjust the LPTS flow parameters accordingly. Specifically, increase the LPTS policer rate to a minimum of 3000 pps.This ensures optimal performance and avoids any LPTS drops for HSRP traffic to maintain network stability and efficiency. For detailed instructions on configuring these settings, refer to the *Usage Guidelines* section within the **lpts pifib hardware police** command documentation.

Configure HSRP for IPv4 Networks on Physical Interfaces and Bundle Interfaces

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.

Configuration Steps

1. Enable HSRP interface configuration mode on a specific interface.
2. Enable HSRP address-family configuration mode on a specific interface.
3. Enable HSRP group submode.

Note The **version** keyword is available only if IPv4 address-family is selected.

4. Activate HSRP on the configured interface.

Note 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.

Active Router Configuration

Perform the following configuration once you have configured the main bundle interface, *Bundle-Ether500* on an active router and added the member links to *Bundle-Ether500*.

This example provides the HSRP configuration for IPv4 networks on an active router.

```
/* Enter the interface configuration mode and configure an IPv4 address for the interface.
 */
Router(config)# interface Bundle-Ether500.1
Router(config-if)# ipv4 address 61.101.1.1/24
Router(config-if)# encapsulation dot1q 1
Router(config-if)# no shut
Router(config-if)# commit
Fri Feb  23 13:49:24.142 IST
Router:Feb  23 13:49:24.285 : ifmgr[402]: %PKT_INFRA-LINK-3-UPDOWN : Interface
Bundle-Ether500.1, changed state to Down
Router:Feb  23 13:49:24.711 : ifmgr[402]: %PKT_INFRA-LINK-3-UPDOWN : Interface
Bundle-Ether500.1, changed state to Up

Router(config-if)# exit
Router(config)# do show ip int brief
Fri Feb  23 13:50:05.505 IST

Interface                      IP-Address      Status          Protocol     Vrf-Name
Bundle-Ether500.1              61.101.1.1      Up                Up         default
Bundle-Ether500.2              unassigned      Shutdown          Down       default
Bundle-Ether500.3              unassigned      Shutdown          Down       default
Bundle-Ether500.4              unassigned      Shutdown          Down       default
Bundle-Ether500.5              unassigned      Shutdown          Down       default


/* Enter the HSRP configuration mode and add the configured interface. */
Router(config)# router hsrp
Router(config-hsrp)# interface Bundle-Ether500.1

/* Configure HSRP for IPv4 */
Router(config-hsrp-if)# address-family ipv4 hsrp version 2
Router(config-hsrp-virtual-router)# address 61.101.1.3

/* CUSTOMIZATION: Set a priority for the virtual Router. */
Router(config-hsrp-virtual-Router)# priority 100

/* CUSTOMIZATION: Configure a preempt delay value that controls the selection of the IP
address owner virtual Router. */
Router(config-hsrp-virtual-Router)# preempt delay 30

 /* Commit the configuration */
Router(config-hsrp-virtual-Router)# commit
```

Standby Router Configuration

Perform the following configuration once you have configured the main bundle interface, *Bundle-Ether500* on a standby router and added the member links to *Bundle-Ether500*.

This example provides the HSRP configuration for IPv4 networks on a standby router.

```
/* Enter the interface configuration mode and configure an IPv4 address for the interface.
 */
Router(config)# interface Bundle-Ether500.1
Router(config-if)# ipv4 address 61.101.1.2/24
Router(config-if)# encapsulation dot1q 1
Router(config-if)# no shut
Router(config-if)# commit
Fri Feb  23 13:49:24.142 IST
Router:Feb  23 13:49:24.285 : ifmgr[402]: %PKT_INFRA-LINK-3-UPDOWN : Interface
Bundle-Ether500.1, changed state to Down
Router:Feb  23 13:49:24.711 : ifmgr[402]: %PKT_INFRA-LINK-3-UPDOWN : Interface
Bundle-Ether500.1, changed state to Up

Router(config-if)# exit
Router(config)# do show ip int brief
Fri Feb  23 13:50:05.505 IST

Interface                      IP-Address      Status          Protocol     Vrf-Name
Bundle-Ether500.1              61.101.1.2      Up                Up         default
Bundle-Ether500.2              unassigned      Shutdown          Down       default
Bundle-Ether500.3              unassigned      Shutdown          Down       default
Bundle-Ether500.4              unassigned      Shutdown          Down       default
Bundle-Ether500.5              unassigned      Shutdown          Down       default


/* Enter the HSRP configuration mode and add the configured interface. */
Router(config)# router hsrp
Router(config-hsrp)# interface Bundle-Ether500.1

/* Configure HSRP for IPv4 */
Router(config-hsrp-if)# address-family ipv4 hsrp version 2
Router(config-hsrp-virtual-router)# address 61.101.1.3

/* CUSTOMIZATION: Set a priority for the virtual Router. */
Router(config-hsrp-virtual-Router)# priority 100

/* CUSTOMIZATION: Configure a preempt delay value that controls the selection of the IP
address owner virtual Router. */
Router(config-hsrp-virtual-Router)# preempt delay 30

 /* Commit the configuration */
Router(config-hsrp-virtual-Router)# commit
```

You have successfully configured HSRP for IPv4 networks on an active and standby routers.

Verification

This example verifies the HSRP configuration for IPv4 networks on an active router.

```
/* Verify the configuration */
Router(config-hsrp-virtual-router)# do show run interface Bundle-Ether500.1
Fri Feb  23 15:04:38.140 IST
interface Bundle-Ether500.1
 ipv4 address 61.101.1.1/24
 encapsulation dot1q 1
!

Router(config)# show running-configuration router hsrp
 router hsrp
interface Bundle-Ether500.1
  address-family ipv4
```

```
   encapsulation dot1q
    hsrp 1 version 2
     preempt
     priority 100
     address 61.101.1.3
   !
  !
```

```
Router# show hsrp detail
Fri Feb  16 04:44:48.322 IST

Bundle-Ether500.1 - IPv4 Group 1 (version 1)
  Local state is Active, priority 100, may preempt
  Hellotime 3000 msec holdtime 10000 msec
  Next hello sent in 2.373
  Minimum delay 1 sec, reload delay 5 sec
  Hot standby IP address is 61.101.1.3 configured
  Active router is local
  Standby router is 61.101.1.2 expires in 00:00:08
  Standby virtual mac address is 0000.0c07.ac01, state is active
    15 state changes, last state change 00:01:17
    State change history:
    Feb 16 04:56:48.724 UTC  Listen   -> Active   Lower priority active received
Feb 16 05:00:29.439 UTC  Active   -> Init     Interface Down update
Feb 17 05:27:13.516 UTC  Init     -> Listen   Delay timer expired
Feb 17 05:27:14.643 UTC  Listen   -> Active   Lower priority active received
Feb 17 05:53:53.500 UTC  Active   -> Init     Interface Down update
Feb 17 05:58:49.641 UTC  Init     -> Listen   Delay timer expired
Feb 17 05:58:51.031 UTC  Listen   -> Active   Lower priority active received
Feb 17 06:25:20.589 UTC  Active   -> Init     Interface Down update
Feb 17 06:31:13.783 UTC  Init     -> Listen   Delay timer expired
Feb 17 06:31:14.954 UTC  Listen   -> Active   Lower priority active received
 Last coup sent:       Feb 17 06:31:14.954 UTC
 Last coup received:   Never
```

You have successfully verified the HSRP configuration for IPv4 networks.

Configure HSRP for IPv6 Networks on Physical Interfaces and Bundle Interfaces

Use the following steps to enable HSRP for IPv6 networks.

1. Enable HSRP interface configuration mode on a specific interface.
2. Enable HSRP address-family configuration mode on a specific interface.
3. Enable HSRP group submode.

Note The **version** keyword is available only if IPv6 address-family is selected. By default, version is set to 2 for IPv6 address families.

4. Activate HSRP on the configured interface and assign a linklocal IPv6 address.

Note

- The virtual linklocal address must not match any other virtual linklocal address that is already configured for a different group.
- The virtual linklocal address must not match the interface linklocal IPv6 address.
- If you use the **autoconfig** keyword, the linklocal address is calculated using the EUI-64 format.
- Use the **legacy-compatible** keyword to be compatible with Cisco IOS and other legacy Cisco devices.

5. Activate HSRP on the configured interface and assign a global IPv6 address.

Note

- 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.
- If you configure HSRP for IPv6, you must configure a link local IPv6 address or enable it using the **autoconfig** keyword. If you do not configure a linklocal IPv6 address, the router does not accept the configuration when you commit your changes using the **commit** keyword.

Active Router Configuration

Perform the following configuration once you have configured the main bundle interface, *Bundle-Ether500* on an active router and added the member links to *Bundle-Ether500*.

This example provides the HSRP configuration for IPv6 networks on an active router.

```
/* Enter the interface configuration mode and configure an IPv6 address for the interface.
 */
Router(config)# interface Bundle-Ether500.1
Router(config-if)# ipv6 address 61:101:1:1::1:1/64
Router(config-if)# encapsulation dot1q 1
Router(config-if)# no shut
Router(config-if)# commit
Fri Feb  23 13:49:24.142 IST
Router:Feb  23 13:49:24.285 : ifmgr[402]: %PKT_INFRA-LINK-3-UPDOWN : Interface
Bundle-Ether500.1, changed state to Down
Router:Feb  23 13:49:24.711 : ifmgr[402]: %PKT_INFRA-LINK-3-UPDOWN : Interface
Bundle-Ether500.1, changed state to Up
Router(config-if)# exit

/* Enter the HSRP configuration mode and add the configured interface. */
Router(config)# router hsrp
Router(config-hsrp)# interface Bundle-Ether500.1

/* Configure HSRP for IPv6 */
Router(config-hsrp-if)# address-family ipv6 hsrp version 2
Router(config-vrrp-virtual-Router)#address global 61:101:1:1::1:3
Router(config-vrrp-virtual-Router)# address linklocal autoconfig

/* CUSTOMIZATION: Set a priority for the virtual Router. */
Router(config-hsrp-virtual-Router)# priority 100

/* CUSTOMIZATION: Configure a preempt delay value that controls the selection of the IP
address owner virtual Router. */
Router(config-hsrp-virtual-Router)# preempt delay 30
```

```
 /* Commit the configuration */
Router(config-hsrp-virtual-Router)# commit
```

Standby Router Configuration

Perform the following configuration once you have configured the main bundle interface, *Bundle-Ether500* on a standby router and added the member links to *Bundle-Ether500*.

This example provides the HSRP configuration for IPv6 networks on a standby router.

```
/* Enter the interface configuration mode and configure an IPv6 address for the interface.
 */
Router(config)# interface Bundle-Ether500.1
Router(config-if)# ipv6 address 61:101:1:1::1:2/64
Router(config-if)# encapsulation dot1q 1
Router(config-if)# no shut
Router(config-if)# commit
Fri Feb  23 13:49:24.142 IST
Router:Feb  23 13:49:24.285 : ifmgr[402]: %PKT_INFRA-LINK-3-UPDOWN : Interface
Bundle-Ether500.1, changed state to Down
Router:Feb  23 13:49:24.711 : ifmgr[402]: %PKT_INFRA-LINK-3-UPDOWN : Interface
Bundle-Ether500.1, changed state to Up

Router(config-if)# exit

/* Enter the HSRP configuration mode and add the configured interface. */
Router(config)# router hsrp
Router(config-hsrp)# interface Bundle-Ether500.1

/* Configure HSRP for IPv6 */
Router(config-hsrp-if)# address-family ipv6 hsrp version 2

Router(config-vrrp-virtual-Router)#address global 61:101:1:1::1:3
Router(config-vrrp-virtual-Router)# address linklocal autoconfig

/* CUSTOMIZATION: Set a priority for the virtual Router. */
Router(config-hsrp-virtual-Router)# priority 100

/* CUSTOMIZATION: Configure a preempt delay value that controls the selection of the IP
address owner virtual Router. */
Router(config-hsrp-virtual-Router)# preempt delay 30

 /* Commit the configuration */
Router(config-hsrp-virtual-Router)# commit
```

You have successfully configured HSRP for IPv6 networks on active and standby routers.

Verification

This example verifies the HSRP configuration for IPv6 networks on an active router.

```
/* Verify the configuration */
Router(config-hsrp-virtual-router)# do show run interface Bundle-Ether500.1
Fri Feb  23 15:04:38.140 IST
interface Bundle-Ether500.1
 ipv6 address 61:101:1:1::1:1/64
 encapsulation dot1q 1
!
```

```
Router(config)# show running-configuration router hsrp
```

```
 router hsrp
interface Bundle-Ether500.1
  address-family ipv6
   encapsulation dot1q
    hsrp 1 version 2
     preempt
     priority 100
     address 61:101:1:1::1:3
   !
  !
```

```
Router#
Router# show hsrp detail
Fri Feb  16 03:25:50.165 UTC

Bundle-Ether500.1 - IPv6 Group 1 (version 2)
  Local state is Active, priority 100, may preempt
  Hellotime 3000 msec holdtime 10000 msec
  Next hello sent in 0.132
  Minimum delay 1 sec, reload delay 5 sec
  Hot standby IP address is 61:101:1:1::1:3 configured
  Active router is local
  Standby router is 61:101:1:1::1:2 expires in 00:00:08
  Standby virtual mac address is 0005.73a0.0001, state is active
    15 state changes, last state change 00:01:17
    State change history:
    Feb 16 04:56:50.094 UTC  Listen   -> Active   Lower priority active received
    Feb 16 05:00:29.464 UTC  Active   -> Init     Interface Down update
    Feb 17 05:27:13.530 UTC  Init     -> Listen   Delay timer expired
    Feb 17 05:27:13.897 UTC  Listen   -> Active   Lower priority active received
    Feb 17 05:53:53.520 UTC  Active   -> Init     Interface Down update
    Feb 17 05:58:49.616 UTC  Init     -> Listen   Delay timer expired
    Feb 17 05:58:52.112 UTC  Listen   -> Active   Lower priority active received
    Feb 17 06:25:20.614 UTC  Active   -> Init     Interface Down update
    Feb 17 06:31:13.902 UTC  Init     -> Listen   Delay timer expired
    Feb 17 06:31:14.985 UTC  Listen   -> Active   Lower priority active received
Last coup sent:       Feb 17 06:31:14.985 UTC
Last coup received:   Never
Last resign sent:     Feb 17 06:25:20.614 UTC
Last resign received: Never
```

You have successfully verified the HSRP configuration for IPv6 networks.