FHRP—HSRP BFD Peering

The FHRP—HSRP BFD Peering feature introduces Bidirectional Forwarding Detection (BFD) in the Hot Standby Router Protocol (HSRP) group member health monitoring system. Before the introduction of this feature, group member monitoring relied exclusively on HSRP multicast messages, which are relatively large and consume CPU memory. In architectures where a single interface hosts a large number of groups, there is a need for a protocol with low CPU memory consumption and processing overhead. BFD addresses this issue and offers second health monitoring (failure detection in milliseconds) at a relatively low CPU impact.

IPv6 and IPv4 HSRP groups support BFD. If BFD is configured on an interface, all IPv4 and IPv6 HSRP groups will automatically support BFD.

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and 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 module.

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.
Restrictions for FHRP—HSRP BFD Peering

Hot Standby Router Protocol (HSRP) support for Bidirectional Forwarding Detection (BFD) is not available for all platforms and interfaces.

Information About FHRP—HSRP BFD Peering

HSRP BFD Peering

The HSRP BFD Peering feature introduces Bidirectional Forwarding Detection (BFD) in the Hot Standby Router Protocol (HSRP) group member health monitoring system. HSRP supports BFD as a part of the HSRP group member health monitoring system. Without BFD, HSRP runs as a process in a multiprocess system and cannot be guaranteed to be scheduled in time to service large numbers of groups with hello and hold timers, in milliseconds. BFD runs as a pseudopreemptive process and can therefore be guaranteed to run when required. Only one BFD session between two devices can provide early failover notification for multiple HSRP groups.

This feature is enabled by default. The HSRP standby device learns the real IP address of the HSRP active device from the HSRP hello messages. The standby device registers as a BFD client and asks to be notified if the active device becomes unavailable. When BFD determines that the connections between standby and active devices has failed, it will notify HSRP on the standby device which will immediately take over as the active device.

BFD provides a low-overhead, short-duration method of detecting failures in the forwarding path between two adjacent devices, including the interfaces, data links, and forwarding planes. BFD is a detection protocol that you enable at the interface and routing protocol levels. Cisco supports the BFD asynchronous mode, which depends on the sending of BFD control packets between two systems to activate and maintain BFD neighbor sessions between devices. Therefore, to create a BFD session, you must configure BFD on both systems (or BFD peers). When BFD is enabled on the interfaces and at the device level for HSRP, a BFD session is created, BFD timers are negotiated, and the BFD peers will begin to send BFD control packets to each other at the negotiated interval.

BFD provides fast BFD peer failure detection times independently of all media types, encapsulations, topologies, and routing protocols such as, Border Gateway Protocol (BGP), Enhanced Interior Gateway Routing Protocol (EIGRP), Hot Standby Router Protocol (HSRP), Intermediate System To Intermediate System (IS-IS), and Open Shortest Path First (OSPF). By sending rapid failure detection notices to the routing protocols in the local device to initiate the routing table recalculation process, BFD contributes to greatly reduce overall
network convergence time. The figure below shows a simple network with two devices running HSRP and BFD.

![HSRP BFD Peering](image)

For more information about BFD, see the *IP Routing: BFD Configuration Guide*.

### How to Configure FHRP—HSRP BFD Peering

#### Configuring BFD Session Parameters on an Interface

Perform this task to configure Bidirectional Forwarding Detection (BFD) on an interface by setting the baseline BFD session parameters on the interface. Repeat the steps in this task for each interface on which you want to run BFD sessions to BFD neighbors.

**SUMMARY STEPS**

1. `enable`
2. `configure terminal`
3. `interface type number`
4. `bfd interval milliseconds min_rx milliseconds multiplier interval-multiplier`
5. `end`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>enable</code></td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Device&gt; enable</code></td>
<td>- Enter your password if prompted.</td>
</tr>
<tr>
<td>Command or Action</td>
<td>Purpose</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>----------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Enters global configuration mode.</td>
<td></td>
</tr>
<tr>
<td><code>configure terminal</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><code>Device# configure terminal</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Enters interface configuration mode.</td>
<td></td>
</tr>
<tr>
<td><code>interface type number</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><code>Device(config)# interface FastEthernet 6/0</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>Enables BFD on the interface.</td>
<td></td>
</tr>
<tr>
<td><code>bfd interval milliseconds min_rx milliseconds multiplier interval-multiplier</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><code>Device(config-if)# bfd interval 50 min_rx 50 multiplier 5</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>Exits interface configuration mode.</td>
<td></td>
</tr>
<tr>
<td><code>end</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><code>Device(config-if)# end</code></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Configuring HSRP BFD Peering

Perform this task to enable Hot Standby Router Protocol (HSRP) Bidirectional Forwarding Detection (BFD) peering. Repeat the steps in this task for each interface over which you want to run BFD sessions to HSRP peers.

HSRP supports BFD peering by default. If HSRP BFD peering is disabled, you can reenable it at the device level to enable BFD support globally for all interfaces or you can reenable it on a per-interface basis at the interface level.

### Before You Begin

Before you proceed with this task:

- HSRP must be running on all participating devices.
- Cisco Express Forwarding must be enabled.
SUMMARY STEPS

1. enable
2. configure terminal
3. ip cef [distributed]
4. interface type number
5. ip address ip-address mask
6. standby [group-number] ip [ip-address [secondary]]
7. standby bfd
8. exit
9. standby bfd all-interfaces
10. exit
11. show standby [neighbors]

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td>Example: Device&gt; enable</td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example: Device# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> ip cef [distributed]</td>
<td>Enables Cisco Express Forwarding or distributed</td>
</tr>
<tr>
<td>Example: Device(config)# ip cef</td>
<td>Cisco Express Forwarding.</td>
</tr>
<tr>
<td><strong>Step 4</strong> interface type number</td>
<td>Enters interface configuration mode.</td>
</tr>
<tr>
<td>Example: Device(config)# interface FastEthernet 6/0</td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong> ip address ip-address mask</td>
<td>Configures an IP address for the interface.</td>
</tr>
<tr>
<td>Example: Device(config-if)# ip address 10.0.0.11 255.255.255.0</td>
<td></td>
</tr>
<tr>
<td>Command or Action</td>
<td>Purpose</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>Step 6</strong> standby [group-number] ip [ip-address [secondary]]</td>
<td>Activates HSRP.</td>
</tr>
<tr>
<td>Example: Device(config-if)# standby 1 ip 10.0.0.11</td>
<td></td>
</tr>
<tr>
<td><strong>Step 7</strong> standby bfd</td>
<td>(Optional) Enables HSRP support for BFD on the interface.</td>
</tr>
<tr>
<td>Example: Device(config-if)# standby bfd</td>
<td></td>
</tr>
<tr>
<td><strong>Step 8</strong> exit</td>
<td>Exits interface configuration mode.</td>
</tr>
<tr>
<td>Example: Device(config-if)# exit</td>
<td></td>
</tr>
<tr>
<td><strong>Step 9</strong> standby bfd all-interfaces</td>
<td>(Optional) Enables HSRP support for BFD on all interfaces.</td>
</tr>
<tr>
<td>Example: Device(config)# standby bfd all-interfaces</td>
<td></td>
</tr>
<tr>
<td><strong>Step 10</strong> exit</td>
<td>Exits global configuration mode.</td>
</tr>
<tr>
<td>Example: Device(config)# exit</td>
<td></td>
</tr>
<tr>
<td><strong>Step 11</strong> show standby [neighbors]</td>
<td>(Optional) Displays information about HSRP support for BFD.</td>
</tr>
<tr>
<td>Example: Device# show standby neighbors</td>
<td></td>
</tr>
</tbody>
</table>

### Verifying HSRP BFD Peering

To verify Hot Standby Router Protocol (HSRP) Bidirectional Forwarding Detection (BFD) peering, use any of the following optional commands.
SUMMARY STEPS

1. show standby
2. show standby brief
3. show standby neighbors [type number]
4. show bfd neighbors
5. show bfd neighbors details

DETAILED STEPS

Step 1 show standby
Use the **show standby** command to display HSRP information.

Example:

```
Device# show standby
FastEthernet2/0 - Group 1
  State is Active
  2 state changes, last state change 00:08:06
  Virtual IP address is 10.0.0.11
  Active virtual MAC address is 0000.0c07.ac01
  Local virtual MAC address is 0000.0c07.ac01 (v1 default)
  Hello time 3 sec, hold time 10 sec
  Next hello sent in 2.772 secs
  Preemption enabled
  Active router is local
  Standby router is 10.0.0.2, priority 90 (expires in 8.268 sec)
  BFD enabled !
  Priority 110 (configured 110)
  Group name is "hsrp-Fa2/0-1" (default)
```

Step 2 show standby brief
Use the **show standby brief** command to display HSRP standby device information in brief.

Example:

```
Device# show standby brief
Interface Grp Pri P State Active Standby Virtual IP
Et0/0 4 120 P Active local 172.24.1.2 172.24.1.254
Et1/0 6 120 P Active local FE80::A8BB:CCFF:FE00:3401 FE80::5:73FF:FEA0:6
```

Step 3 show standby neighbors [type number]
Use the **show standby neighbors** command to display information about HSRP peer devices on an interface.

Example:

```
Device1# show standby neighbors
HSRP neighbors on FastEthernet2/0
  10.1.0.22
  No active groups
  Standby groups: 1
  BFD enabled !
```
Device2# show standby neighbors

HSRP neighbors on FastEthernet2/0
  10.0.0.2
  Active groups: 1
  No standby groups
  BFD enabled!

Step 4 show bfd neighbors
Use the show bfd neighbors command to display a line-by-line listing of existing Bidirectional Forwarding Detection (BFD) adjacencies.

Example:
Device# show bfd neighbors

IPv6 Sessions

<table>
<thead>
<tr>
<th>NeighAddr</th>
<th>LD/RD</th>
<th>RH/RS</th>
<th>State</th>
<th>Int</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE80::A8BB:CCFF:FE00:3401</td>
<td>4/3</td>
<td>Up</td>
<td>Up</td>
<td>Et1/0</td>
</tr>
<tr>
<td>FE80::A8BB:CCFF:FE00:3401</td>
<td>4/3</td>
<td>Up</td>
<td>Up</td>
<td>Et1/0</td>
</tr>
</tbody>
</table>

Step 5 show bfd neighbors details
Use the details keyword to display BFD protocol parameters and timers for each neighbor.

Example:
Device# show bfd neighbors details

OurAddr  NeighAddr  LD/RD  RH/RS  Holdown(mult)  State  Int
10.0.0.2  FE80::A8BB:CCFF:FE00:3401  5/0  Down  0  (0)  Down  Fa2/0
Local Diag: 0, Demand mode: 0, Poll bit: 0
MinTxInt: 1000000, MinRxInt: 1000000, Multiplier: 3
Received MinRxInt: 0, Received Multiplier: 0
Holdown (hits): 0(0), Hello (hits): 1000(55)
Rx Count: 0, Rx Interval (ms) min/max/avg: 0/0/0 last: 3314120 ms ago
Tx Count: 55, Tx Interval (ms) min/max/avg: 760/1000/872 last: 412 ms ago
Registered protocols: HSRP
Last packet: Version: 1  - Diagnostic: 0
  State bit: AdminDown  - Demand bit: 0
  Poll bit: 0           - Final bit: 0
  Multiplier: 0         - Length: 0
  My Discr.: 0          - Your Discr.: 0
  Min tx interval: 0    - Min rx interval: 0
  Min Echo interval: 0

Configuration Examples for FHRP—HSRP BFD Peering

Example: HSRP BFD Peering

Hot Standby Router Protocol (HSRP) supports Bidirectional Forwarding Detection (BFD) as a part of the HSRP group member health monitoring system. Without BFD, HSRP runs as a process in a multiprocess system and cannot be guaranteed to be scheduled in time to service large numbers of groups with millisecond
hello and hold timers. BFD runs as a pseudo-preemptive process and can therefore, be guaranteed to run when required. Only one BFD session between two devices can provide early failover notification for multiple HSRP groups.

In the following example, the `standby bfd` and the `standby bfd all-interfaces` commands are not displayed. HSRP support for BFD is enabled by default when BFD is configured on a device or an interface by using the `bfd interval` command. The `standby bfd` and `standby bfd all-interfaces` commands are needed only if BFD has been manually disabled on a device or an interface.

**Device A**

```
DeviceA(config)# ip cef
DeviceA(config)# interface FastEthernet2/0
DeviceA(config-if)# no shutdown
DeviceA(config-if)# ip address 10.0.0.2 255.0.0.0
DeviceA(config-if)# ip router-cache cef
DeviceA(config-if)# bfd interval 200 min_rx 200 multiplier 3
DeviceA(config-if)# standby 1 ip 10.0.0.11
DeviceA(config-if)# standby 1 preempt
DeviceA(config-if)# standby 1 priority 110
DeviceA(config-if)# standby 2 ip 10.0.0.12
DeviceA(config-if)# standby 2 preempt
DeviceA(config-if)# standby 2 priority 110
```

**Device B**

```
DeviceB(config)# interface FastEthernet2/0
DeviceB(config-if)# ip address 10.1.0.22 255.255.0.0
DeviceB(config-if)# no shutdown
DeviceB(config-if)# bfd interval 200 min_rx 200 multiplier 3
DeviceB(config-if)# standby 1 ip 10.0.0.11
DeviceB(config-if)# standby 1 preempt
DeviceB(config-if)# standby 1 priority 90
DeviceB(config-if)# standby 2 ip 10.0.0.12
DeviceB(config-if)# standby 2 preempt
DeviceB(config-if)# standby 2 priority 80
```

### Additional References for FHRP—HSRP BFD Peering

#### Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
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<tbody>
<tr>
<td>Cisco IOS commands</td>
<td>Cisco IOS Master Command List, All Releases</td>
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<tr>
<td>BFD</td>
<td>“Bidirectional Forwarding Detection” module in the IP Routing: BFD Configuration Guide</td>
</tr>
<tr>
<td>HSRP commands</td>
<td>Cisco IOS IP Application Services Command Reference</td>
</tr>
<tr>
<td>Troubleshooting HSRP</td>
<td>Hot Standby Router Protocol: Frequently Asked Questions</td>
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</tbody>
</table>
RFCs

<table>
<thead>
<tr>
<th>RFCs</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFC 2281</td>
<td>Cisco Hot Standby Router Protocol</td>
</tr>
</tbody>
</table>

Technical Assistance

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td><a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a></td>
</tr>
</tbody>
</table>

Feature Information for FHRP—HSRP BFD Peering

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.
The FHRP-HSRP BFD Peering feature introduces Bidirectional Forwarding Detection (BFD) in the Hot Standby Router Protocol (HSRP) group member health monitoring system. Before the introduction of this feature, group member monitoring relied exclusively on HSRP multicast messages, which are relatively large and consume CPU memory. In architectures where a single interface hosts a large number of groups, there is a need for a protocol with low CPU memory consumption and processing overhead. BFD addresses this issue and offers second health monitoring (failure detection in milliseconds) at a relatively low CPU impact.

The following commands were introduced or modified by this feature: `debug standby events neighbor`, `show standby`, `show standby neighbors`, `standby bfd`, `standby bfd all-interfaces`.

---

### Table 1: Feature Information for FHRP—HSRP BFD Peering

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>FHRP—HSRP BFD Peering</td>
<td>15.3(1)S</td>
<td>The FHRP-HSRP BFD Peering feature introduces Bidirectional Forwarding Detection (BFD) in the Hot Standby Router Protocol (HSRP) group member health monitoring system. Before the introduction of this feature, group member monitoring relied exclusively on HSRP multicast messages, which are relatively large and consume CPU memory. In architectures where a single interface hosts a large number of groups, there is a need for a protocol with low CPU memory consumption and processing overhead. BFD addresses this issue and offers second health monitoring (failure detection in milliseconds) at a relatively low CPU impact. The following commands were introduced or modified by this feature: <code>debug standby events neighbor</code>, <code>show standby</code>, <code>show standby neighbors</code>, <code>standby bfd</code>, <code>standby bfd all-interfaces</code>.</td>
</tr>
<tr>
<td>FHRP—HSRP IPv6 BFD Peering</td>
<td></td>
<td>The FHRP—HSRP IPv6 BFD Peering feature implements BFD support for IPv6 and IPv4 HSRP groups.</td>
</tr>
</tbody>
</table>