



# Cisco IOS Firewall Stateful Failover

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Stateful failover for the Cisco IOS firewall enables a router to continue processing and forwarding firewall session packets after a planned or unplanned outage occurs. You employ a backup (secondary) router that automatically takes over the tasks of the active (primary) router if the active router loses connectivity for any reason. This process is transparent and does not require adjustment or reconfiguration of any remote peer.

Stateful failover for the Cisco IOS firewall is designed to work in conjunction with stateful switchover (SSO) and Hot Standby Routing Protocol (HSRP). HSRP provides network redundancy for IP networks, ensuring that user traffic immediately and transparently recovers from failures in network edge devices or access circuits. That is, HSRP monitors both the inside and outside interfaces so that if either interface goes down, the whole router is deemed to be down and ownership of firewall sessions is passed to the standby router (which transitions to the HSRP active state). SSO allows the active and standby routers to share firewall session state information so that each router has enough information to become the active router at any time. To configure stateful failover for the Cisco IOS firewall, a network administrator should enable HSRP, assign a virtual IP address, and enable the SSO protocol.

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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](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.



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# Prerequisites for Stateful Failover

## Complete, Duplicate Cisco IOS Firewall Configuration on the Active and Standby Devices

This document assumes that you have a complete Cisco IOS firewall configuration.

The Cisco IOS firewall configuration that is set up on the active device must be duplicated on the standby device. That is, firewall protocols inspected, the interface ACL's, the global firewall settings and the interface firewall configuration.



### Note

None of the configuration information between the active and standby device is automatically transferred; the user is responsible for ensuring that the Cisco IOS firewall configurations match on both devices. If the Cisco IOS firewall configurations on both devices do not match, failover from the active device to the standby device will not be successful.

## Device Requirements

- The active and standby Cisco IOS routers must be running the same Cisco IOS software, Release 12.4(6)T or later.
- Stateful failover for the Cisco IOS firewall requires that your network contains two identical routers that are available to be either the primary or secondary device. Both routers should be the same type of device, have the same CPU and memory.
- This feature is currently supported only on a limited number of platforms. To check the latest platform support, go to Cisco Feature Navigator at <http://www.cisco.com/go/fn>.

# Restrictions for Stateful Failover

When configuring redundancy for a Cisco IOS firewall, the following restrictions exist:

- Both the active and standby devices must run the identical version of the Cisco IOS software, and both the active and standby devices must be connected via hub or switch.
- HSRP requires the inside interface to be connected via LANs.
- Load balancing is not supported; that is, no more than one device in a redundancy group can be active at any given time.
- Any restrictions that exist for intradevice SSO will also exist for the firewall High Availability (HA). The behavior of intra-device active where the Active device re-boots when the SSO state changes from Active to anything will be the same with firewall HA.
- No support for configuration synchronization and In-Service Software Upgrade (ISSU) which are not yet available for intra-box failover in Cisco IOS T releases.
- Stateful failover of the Cisco IOS firewall is not supported with Zone-Based Policy firewall configuration.
- This phase of the feature will not provide support for asymmetric routing and it is the responsibility of the user to configure the network to avoid this.
- The stateful failover feature does not synchronize any statistics or mib firewall information between the active and standby devices.

- The stateful failover feature does not support rate-limiting of firewall sessions on the standby router for the failed over sessions.
- Currently only Layer 4 TCP and UDP protocol failover is supported. Therefore, all TCP only sessions, UDP only sessions, and single channel granular protocols sessions for which L7 inspection is not supported are failed over.
- Layer 4 ICMP session will not be failed over to the standby
- Any session configured for Layer 7 inspection will NOT be failed over.
- CiscoIntrusion Prevention Services (IPS)/Intrusion Detection Services (IDS) feature will not be made HA aware in this release.

## Information About Stateful Failover

- [Supported Deployment Scenarios Stateful Failover for the Cisco IOS Firewall, page 3](#)
- [Stateful Failover Architecture, page 4](#)

## Supported Deployment Scenarios Stateful Failover for the Cisco IOS Firewall

It is recommended that you implement stateful failover in one of the following recommended deployment scenarios:

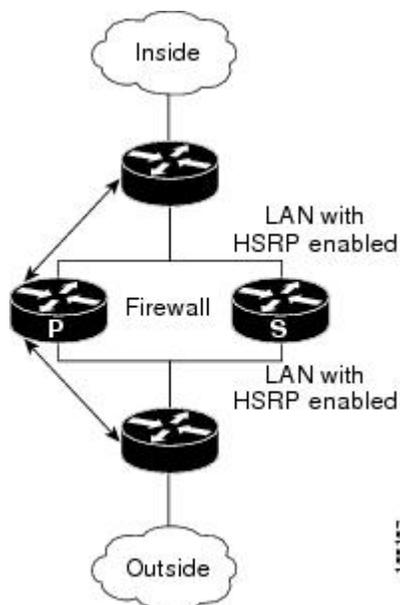
- Dual LAN Interface
- LAN WAN Interface

In a dual LAN interface scenario, the active and standby routers running the firewall are connected to each other via LAN interface on both the inside and the outside (see the figure below). HSRP is configured on both the inside and outside interface. The next hop routers in this scenario talk to the HA pair via the virtual IP address. In this scenario there are two virtual IP address, one on the inside and the other on the outside. Virtual IP addresses cannot be advertised using routing protocols. You need to create static routes on the next hops to get to the virtual IP address.

You need to configure HSRP tracking in order to track multiple pairs of interfaces. If you run HSRP on only one pair of interfaces, or run on both without mutual tracking of the pairs, each pair functions independently of each other and are unaware of each other's state changes. For example, if HSRP is run on only the two outside interfaces (as shown in the figure below), this could cause HSRP to failover on the outside interfaces, whilst the inside interfaces are unchanged. This causes the black holing of traffic, which continues to be directed to the primary from the inside. This introduces the possibility of problems arising from one interface on a primary router failing and triggering a move to the secondary, while the other interface on the ex-primary remains active. Mutual tracking means that if the outside interface does fail, the

inside interface on the same router will also be deemed down allowing for complete router failover to the secondary.

**Figure 1** Dual Interface Network Topology



In a LAN WAN scenario, the inside interface of the Active Standby pair running the firewall are connected via LAN interface on the inside and WAN interface on the outside (see the figure below). HSRP is configured on the inside interface. The inside network communicates with the HA pair using the inside virtual IP address.

HSRP tracking should be configured on the inside LAN interfaces to track the state of the outside WAN interface. If the outside WAN interface goes down on the active the LAN interface that is tracking it reduces the HSRP priority and initiates a failover to the standby. Traffic from the outside flowing into the HSRP pair should now be directed to the new active device.

In the scenario where the LAN interfaces track the WAN interfaces, the failover to the standby happens immediately. However, for traffic to start flowing on the new active router, routing convergence needs to happen. The net failover time is dictated by the routing protocol.

In this scenario the traffic flows from the inside to the outside through the Active due to the HSRP configuration on the inside LAN interfaces. The traffic from the outside to the inside should also flow through the active device. The configuration of the network so that the traffic always flows through the active is beyond the scope of this document. In this scenario, the network administrator is responsible to ensure that the traffic always flows through the active device.

## Stateful Failover Architecture

Firewall stateful failover is a client of Cisco IOS SSO. SSO is a method of providing redundancy and synchronization for Cisco IOS applications and features.

- [State Synchronization, page 5](#)
- [Bulk Synchronization, page 5](#)

## State Synchronization

The synchronization manager will be responsible for checking firewall to determine the state of the active device, which must be check pointed to the redundant peers and update that state on the firewall on standby devices.

Periodic updates are sent from the active to the standby for all HA sessions. This information enables the standby to take over the sessions and process the sessions if there is a failover.

The stateful failover feature supports deterministic updates. This means that the updates for a session get sent every N seconds, where N is configurable. Default value for N is 10 sec.

## Bulk Synchronization

Bulk synchronization happens at boot time or when you use the **clear ip inspect ha sessions all** command on the standby device. If the standby device is configured after the active device already has sessions, then only new ha sessions established on the active device are synchronized to the standby device through dynamic synchronization. If you want all the current sessions synchronized from the active to the standby, you must specifically issue the **clear ip inspect ha sessions all** command on the standby device. A single request message is sent from the standby device to the active device which result in add\_session messages from active to standby for all sessions open on the active at that time.

# How to Configure Stateful Failover for Cisco IOS Firewalls

- [Enabling HSRP IP Redundancy and a Virtual IP Address, page 5](#)
- [Enabling SSO, page 9](#)
- [Enabling Stateful Failover for a Cisco IOS Firewall, page 13](#)
- [Configuring the Cisco IOS Firewall HA Update Interval, page 14](#)
- [Troubleshooting Stateful Failover, page 15](#)
- [Maintaining Firewall Stateful Failover, page 16](#)
- [Displaying Firewall Stateful Failover Information, page 16](#)

## Enabling HSRP IP Redundancy and a Virtual IP Address

HSRP provides two services--IP redundancy and a Virtual IP (VIP) address. Each HSRP group may provide either or both of these services. Cisco IOS firewall stateful failover uses the IP redundancy services from only one HSRP standby group. It can use the VIP address from one or more HSRP groups. Use the following task to configure HSRP on the outside and inside interfaces of the router.

**Note**

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Perform this task on both routers (active and standby) and on both interfaces of each router.

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If a switch connects the active and standby routers, you must perform one of the following steps to ensure that the correct settings are configured on that switch:

- Enable the **spanning-tree portfast** command on every switch port that connects to a HSRP-enabled router interface.
- Disable the Spanning Tree Protocol (STP) on the switch only if your switch does not connect to other switches. Disabling spanning tree in a multi-switch environment may cause network instability.

- Enable the **standby delay minimum** [*min-delay*] **reload** [*reload-delay*] command if you do not have access to the switch. The *reload-delay* argument should be set to a value of at least 120 seconds. This command must be applied to all HSRP interfaces on both routers.

For more information on HSRP instability, see the document [Avoiding HSRP Instability in a Switching Environment with Various Router Platforms](#) .

**Note**

You must perform at least one of these steps for correct HSRP operation.

**Note**

- Both the inside (private) interface and the outside (public) interface must belong to separate HSRP groups, but the HSRP group number can be the same.
- The state of the inside interface and the outside interface must be the same--both interfaces must be in the active state or standby state; otherwise, the packets will not have a route out of the private network.
- Standby priorities should be equal on both active and standby routers. If the priorities are not equal, the higher priority router will unnecessarily take over as the active router, negatively affecting uptime.
- The IP addresses on the HSRP-tracked interfaces of the standby and active routers should both be either lower or higher on one router than the other. In the case of equal priorities (an HA requirement), HSRP will assign the active state on the basis of the IP address. If an addressing scheme exists so that the public IP address of Router A is lower than the public IP address of Router B, but the opposite is true for their private interfaces, an active/standby-standby/active split condition could exist which will break connectivity.
- Interface ACL should allow HSRP traffic to flow through.
- Each time an active device relinquishes control to become the standby device, the active device will reload. This functionality ensures that the state of the new standby device synchronizes correctly with the new active device.

**SUMMARY STEPS**

1. **enable**
2. **configure terminal**
3. interface *type number*
4. standby standby-group-number name standby-group-name
5. standby standby-group-number ip ip-address
6. standby standby-group-number track interface-name
7. **standby** [*group-number*] **preempt**
8. **standby** [*group-number*] **timers** [*msec*] *hellotime* [*msec*] *holdtime*
9. **standby delay minimum** [*min-delay*] **reload** [*reload-delay*]
10. Repeat.

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<p><b>enable</b></p> <p><b>Example:</b></p> <pre>Router&gt; enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
Step 2	<p><b>configure terminal</b></p> <p><b>Example:</b></p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>
Step 3	<p><b>interface <i>type number</i></b></p> <p><b>Example:</b></p> <pre>Router(config)# interface Ethernet 0/0</pre>	<p>Configures an interface type for the router and enters interface configuration mode.</p>
Step 4	<p><b>standby standby-group-number name standby-group-name</b></p> <p><b>Example:</b></p> <pre>Router(config-if)# standby 1 name HA-out</pre>	<p>Assigns a user-defined group name to the HSRP redundancy group.</p> <p><b>Note</b> The <i>standby-group-number</i> argument should be the same for both routers that are on directly connected interfaces. However, the <i>standby-group-name</i> argument should be different between two (or more) groups on the same router. The <i>standby-group-number</i> argument can be the same on the other pair of interfaces as well.</p>
Step 5	<p><b>standby standby-group-number ip ip-address</b></p> <p><b>Example:</b></p> <pre>Router(config-if)# standby 1 ip 209.165.201.1</pre>	<p>Assigns an IP address that is to be “shared” among the members of the HSRP group and owned by the primary IP address.</p> <p><b>Note</b> The virtual IP address must be configured identically on both routers (active and standby) that are on directly connected interfaces.</p>
Step 6	<p><b>standby standby-group-number track interface-name</b></p> <p><b>Example:</b></p> <pre>Router(config-if)# standby 1 track Ethernet1/0</pre>	<p>Configures HSRP to monitor the second interface so that if either of the two interfaces goes down, HSRP causes failover to the standby device.</p> <p><b>Note</b> Although this command is not required, it is recommended for dual interface configurations.</p>

	Command or Action	Purpose
Step 7	<b>standby [group-number] preempt</b>  <b>Example:</b>  Router(config-if)# standby 1 preempt	Enables the active device to relinquish control because of an interface tracking event.
Step 8	<b>standby [group-number] timers [msec] hellotime [msec] holdtime</b>  <b>Example:</b>  Router(config-if)# standby 1 timers 1 5	(Optional) Configures the time between hello packets and the time before other routers declare the active Hot Standby or standby router to be down. <ul style="list-style-type: none"> <li>• <i>holdtime</i> --Amount of time the routers take to detect types of failure. A larger hold time means that failure detection will take longer.</li> </ul> For the best stability, it is recommended that you set the hold time between 5 and 10 times the hello interval time; otherwise, a failover could falsely occur when no actual failure has happened.
Step 9	<b>standby delay minimum [min-delay] reload [reload-delay]</b>  <b>Example:</b>  Router(config-if)# standby delay minimum 120 reload 120	Configures the delay period before the initialization of HSRP groups. <p><b>Note</b> It is suggested that you enter 120 as the value for the <i>reload-delay</i> argument and leave the <i>min-delay</i> argument at the preconfigured default value.</p>
Step 10	Repeat.	Repeat this task on both routers (active and standby) and on both interfaces of each router.

### Examples

The following example shows how to configure HSRP on a router:

```
interface Ethernet0/0
 ip address 209.165.201.1 255.255.255.224
 standby 1 ip 209.165.201.3
 standby 1 preempt
 standby 1 name HA-out
 standby 1 track Ethernet1/0
 standby delay minimum 120 reload 120
```

- [Troubleshooting Tips, page 8](#)
- [What to Do Next, page 8](#)

## Troubleshooting Tips

To help troubleshoot possible HSRP-related configuration problems, issue any of the following HSRP-related debug commands--**debug standby errors**, **debug standby events**, and **debug standby packets [terse]**.

## What to Do Next

After you have successfully configured HSRP on both the inside and outside interfaces, you should enable SSO as described in the section “Enabling SSO.”

## Enabling SSO

Use this task to enable SSO, which is used to transfer Cisco IOS firewall session state information between two routers.

SSO is a method of providing redundancy and synchronization for many Cisco IOS applications and features. SSO is necessary for the Cisco IOS firewall to learn about the redundancy state of the network and to synchronize their internal application state with their redundant peers.

- You should configure HSRP before enabling SSO.
- To avoid losing SCTP communication between peers, be sure to include the following commands to the local address section of the SCTP section of the IPC configuration:
  - **retransmit-timeout** *retran-min [msec] retran-max [msec]*
  - **path-retransmit** *max-path-retries*
  - **assoc-retransmit** *retries*

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **redundancy inter-device**
4. **scheme standby** *standby-group-name*
5. **exit**
6. **ipc zone default**
7. **association 1**
8. **protocol sctp**
9. **local-port** *local-port-number*
10. **local-ip** *device-real-ip-address [device-real-ip-address2]*
11. **retransmit-timeout** *retran-min [msec] retran-max [msec]*
12. **path-retransmit** *max-path-retries*
13. **assoc-** retransmit retries
14. **exit**
15. **remote-port** *remote-port-number*
16. **remote-ip** *peer-real-ip-address [peer-real-ip-address2]*

### DETAILED STEPS

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

	Command or Action	Purpose
Step 2	<b>configure terminal</b>  <b>Example:</b> <pre>Router# configure terminal</pre>	Enters global configuration mode.
Step 3	<b>redundancy inter-device</b>  <b>Example:</b> <pre>Router(config)# redundancy inter-device</pre>	<p>Configures redundancy and enters inter-device configuration mode.</p> <p>To exit inter-device configuration mode, use the <b>exit</b> command. To remove all inter-device configuration, use the <b>no</b> form of the command.</p>
Step 4	<b>scheme standby <i>standby-group-name</i></b>  <b>Example:</b> <pre>Router(config-red-interdevice)# scheme standby HA-in</pre>	<p>Defines the redundancy scheme that is to be used. Currently, “standby” is the only supported scheme.</p> <ul style="list-style-type: none"> <li>• <i>standby-group-name</i> --Must match the standby name specified in the <b>standby name</b> interface configuration command. Also, the standby name should be the same on both routers.</li> </ul> <p><b>Note</b> Only the active or standby state of the standby group is used for SSO. The VIP address of the standby group is not required or used by SSO.</p>
Step 5	<b>exit</b>  <b>Example:</b> <pre>Router(config-red-interdevice)# exit</pre>	Exits inter-device configuration mode.
Step 6	<b>ipc zone default</b>  <b>Example:</b> <pre>Router(config)# ipc zone default</pre>	<p>Configures the inter-device communication protocol, Inter-Process Communication (IPC), and enters IPC zone configuration mode.</p> <p>Use this command to initiate the communication link between the active router and standby router.</p>
Step 7	<b>association 1</b>  <b>Example:</b> <pre>Router(config-ipczone)# association 1</pre>	Configures an association between the two devices and enters IPC association configuration mode.
Step 8	<b>protocol sctp</b>  <b>Example:</b> <pre>Router(config-ipczone-assoc)# protocol sctp</pre>	Configures Stream Control Transmission Protocol (SCTP) as the transport protocol and enters SCTP protocol configuration mode.

Command or Action	Purpose
<p><b>Step 9</b> <b>local-port</b> <i>local-port-number</i></p> <p><b>Example:</b></p> <pre>Router(config-ipc-protocol-sctp)# local-port 5000</pre>	<p>Defines the local SCTP port number that is used to communicate with the redundant peer and puts you in IPC transport - SCTP local configuration mode.</p> <ul style="list-style-type: none"> <li>• <i>local-port-number</i> --There is not a default value. This argument must be configured for the local port to enable inter-device redundancy. Valid port values: 1 to 65535. The local port number should be the same as the remote port number on the peer router.</li> </ul>
<p><b>Step 10</b> <b>local-ip</b> <i>device-real-ip-address [device-real-ip-address2]</i></p> <p><b>Example:</b></p> <pre>Router(config-ipc-local-sctp)# local-ip 10.0.0.1</pre>	<p>Defines at least one local IP address that is used to communicate with the redundant peer.</p> <p>The local IP addresses must match the remote IP addresses on the peer router. There can be either one or two IP addresses, which must be in the global VRF. A virtual IP address cannot be used.</p>
<p><b>Step 11</b> <b>retransmit-timeout</b> <i>retran-min [msec] retran-max [msec]</i></p> <p><b>Example:</b></p> <pre>Router(config-ipc-local-sctp)# retransmit-timeout 300 10000</pre>	<p>Configures the maximum amount of time, in milliseconds, that SCTP will wait before retransmitting data.</p> <ul style="list-style-type: none"> <li>• <i>retran-min</i> : 300 to 60000; default: 300</li> <li>• <i>retran-max</i> : 300 to 60000; default: 600</li> </ul>
<p><b>Step 12</b> <b>path-retransmit</b> <i>max-path-retries</i></p> <p><b>Example:</b></p> <pre>Router(config-ipc-local-sctp)# path-retransmit 10</pre>	<p>Configures the number of consecutive retransmissions SCTP will perform before failing a path within an association.</p> <ul style="list-style-type: none"> <li>• <i>max-path-retries</i> : 2 to 10; default: 4 retries</li> </ul>
<p><b>Step 13</b> <b>assoc-</b> retransmit retries</p> <p><b>Example:</b></p> <pre>Router(config-ipc-local-sctp)# assoc -retransmit 10</pre>	<p>Configures the number of consecutive retransmissions SCTP will perform before failing an association.</p> <ul style="list-style-type: none"> <li>• <i>retries</i> : 2 to 10; default: 4 retries</li> </ul>
<p><b>Step 14</b> <b>exit</b></p> <p><b>Example:</b></p> <pre>Router(config-ipc-local-sctp)# exit</pre>	<p>Exits IPC transport - SCTP local configuration mode.</p>

Command or Action	Purpose
<p><b>Step 15</b> <code>remote-port remote-port-number</code></p> <p><b>Example:</b></p> <pre>Router(config-ipc-protocol-sctp)# remote-port 5000</pre>	<p>Defines the remote SCTP port number that is used to communicate with the redundant peer and puts you in IPC transport - SCTP remote configuration mode.</p> <p><b>Note</b> <code>remote-port-number</code> --There is not a default value. This argument must be configured for the remote port to enable inter-device redundancy. Valid port values: 1 to 65535. The remote port number should be the same as the local port number on the peer router.</p>
<p><b>Step 16</b> <code>remote-ip peer-real-ip-address [peer-real-ip-address2</code></p> <p><b>Example:</b></p> <pre>Router(config-ipc-remote-sctp)# remote-ip 10.0.0.2</pre>	<p>Defines at least one remote IP address of the redundant peer that is used to communicate with the local device.</p> <p>All remote IP addresses must refer to the same device.</p> <p>A virtual IP address cannot be used.</p>

### Examples

The following example shows how to enable SSO:

```
!
redundancy inter-device
  scheme standby HA-in
!
!
ipc zone default
  association 1
  no shutdown
  protocol sctp
  local-port 5000
  local-ip 10.0.0.1
  retransmit-timeout 300 10000
  path-retransmit 10
  assoc-retransmit 10
  remote-port 5000
  remote-ip 10.0.0.2
!
```

- [Troubleshooting Tips, page 12](#)
- [What to Do Next, page 12](#)

## Troubleshooting Tips

To help troubleshoot possible SSO-related configuration problems, issue the **debug redundancy** command.

## What to Do Next

After you have enabled SSO, you should enable stateful failover for a firewall, as shown in the following section.

## Enabling Stateful Failover for a Cisco IOS Firewall

Use this task to enabling Stateful Failover for the Cisco IOS firewall.

Before performing this task, the Cisco IOS firewall inspect rule must be configured. Also, HSRP and SSO must be configured to enable box-to-box redundancy.



### Note

The inspect rules should not have ICMP or protocols for which Cisco IOS firewall supports Layer 7 inspection.

>

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** [interface-name]
4. **ip inspect** [rule] **in| out redundancy stateful** [hsrp-group-name]
5. **exit**

### DETAILED STEPS

Command or Action	Purpose
<b>Step 1</b> <b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b> <b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
<b>Step 3</b> <b>interface</b> [interface-name]  <b>Example:</b> Router (config)# interface interface1	Defines the interface.

Command or Action	Purpose
<p><b>Step 4</b> <code>ip inspect [rule] in  out redundancy stateful [hsrp-group-name]</code></p> <p><b>Example:</b></p> <pre>Router (config)# ip inspect rule1 in/out redundancy stateful group101</pre> <p><b>Example:</b></p>	<p>Enables stateful failover for this inspect rule.</p> <p><b>Note</b> The hsrp-group-name is the same hsrp-group-name used in the SSO configuration.</p>
<p><b>Step 5</b> <code>exit</code></p> <p><b>Example:</b></p> <pre>Router (config)# exit</pre>	<p>Exit global configuration mode</p>

## Configuring the Cisco IOS Firewall HA Update Interval

Use this task to change the amount of time between each update to the standby. The default interval of 10 seconds.

### SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `ip inspect redundancy update seconds [10-60]`
4. `exit`

### DETAILED STEPS

Command or Action	Purpose
<p><b>Step 1</b> <code>enable</code></p> <p><b>Example:</b></p> <pre>Router&gt; enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<p><b>Step 2</b> <code>configure terminal</code></p> <p><b>Example:</b></p> <pre>Router# configure terminal</pre>	<p>Enters global configuration mode.</p>

Command or Action	Purpose
<p><b>Step 3</b> ip inspect redundancy update seconds [10-60]</p> <p><b>Example:</b></p> <pre>Router (config)# ip inspect redundancy upate seconds 20</pre> <p><b>Example:</b></p>	<p>Changes the amount of time between each update to the standby. The default interval of 10 seconds is used if you do not specify a value.</p>
<p><b>Step 4</b> exit</p> <p><b>Example:</b></p> <pre>Router (config)# exit</pre>	<p>Exit global configuration mode</p>

## Troubleshooting Stateful Failover

The following commands may be used to display information about Stateful Failover messages or sessions. The **debug** commands may be used in any order or independent of the other **debug** commands.

### SUMMARY STEPS

1. enable
2. debug ip inspect ha [manager | update]

### DETAILED STEPS

Command or Action	Purpose
<p><b>Step 1</b> enable</p> <p><b>Example:</b></p> <pre>Router# enable</pre>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<p><b>Step 2</b> debug ip inspect ha [manager   update]</p> <p><b>Example:</b></p> <pre>Router# debug ip inspect ha manager</pre>	<p>Displays enough information to identify problems with add/delete to ha sessions.</p> <ul style="list-style-type: none"> <li>• manager (Optional)--Displays in detail the message that the FW HA manager code hands over to CF on the active, and on the standby it displays the message that CF hands over to the FW HA manager.</li> <li>• update (Optional)--Displays updated debug data.</li> </ul>

## Maintaining Firewall Stateful Failover

The **clear ip inspect ha** command is used to clear all inspect ha sessions on the device. If the device is the standby device then it initiates a bulk sync of all session from the active. It is also used to clear the ha statistics on the device

### SUMMARY STEPS

1. **enable**
2. **clear ip inspect ha [sessions-all | statistics]**

### DETAILED STEPS

Command or Action	Purpose
<b>Step 1</b> <b>enable</b>  <b>Example:</b> <pre>Router&gt; enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b> <b>clear ip inspect ha [sessions-all   statistics]</b>  <b>Example:</b> <pre>Router# clear ip inspect ha sessions-all all</pre>	The options for this command are: <ul style="list-style-type: none"> <li>• <b>sessions-all</b> --Clears all inspect ha sessions on the device. If the device is the standby device then it initiates a bulk sync of all session from the active.</li> <li>• <b>statistics</b> --clears the ha statistics on the device</li> </ul>

## Displaying Firewall Stateful Failover Information

Use the **show ip inspect ha {sessions [detail] | statistics} [vrf vrf-name]** command to display firewall stateful failover information.

### SUMMARY STEPS

1. **enable**
2. **show ip inspect ha {session [detail] | statistics} [vrf vrf-name]**

### DETAILED STEPS

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

Command or Action	Purpose
<p><b>Step 2</b> <code>show ip inspect ha {session [detail]   statistics} [vrf vrf-name]}</code></p> <p><b>Example:</b></p> <pre>Router# show ip inspect ha session</pre>	<p>The options for this command are:</p> <ul style="list-style-type: none"> <li><b>session [detail]</b>--Displays additional information on pin-holes created for the return traffic, number of bytes that have passed through this session and session time information.</li> <li><b>statistics</b> --Displays HA sessions statistics for both the Active and Standby devices.</li> <li><b>vrf vrf-name</b> (Optional)--Displays information only for the specified Virtual Routing and Forwarding (VRF) interface.</li> </ul>

The following tables provide examples of Stateful Failover error messages and alert message. The table below contains the stateful failover HA error messages.

**Table 1 Stateful Failover Error Messages**

Message	Meaning
<pre>*Apr 13 17:09:20.539: %FW_HA-3-SUBSYS_INIT_FAILED: Firewall High availability subsystem initialization failed</pre>	The HA subsystem initialization failed.
<pre>*Apr 13 16:50:30.007: %FW_HA-3-TW_INIT_FAILED: Firewall High availability update timer initialization failed</pre>	The HA timer wheel initialization failed.
<pre>*Apr 13 16:50:30.007: %FW_HA-3-RF_REG_FAILED: Firewall High availability registration to RF failed *Apr 13 16:50:30.007: %FW_HA-3-CF_REG_FAILED: Firewall High availability registration to CF failed</pre>	Registration to SSO RF/CF failed.
<pre>May 20 21:57:10.475: %FW_HA-6- NO_INSPECT_RULE_ON_STDBY: Firewall High availability - inspect rule is not configured on standby for interface e0/0 dir in/out</pre>	The Inspect rule is not configured on the standby device.
<pre>*May 20 21:57:10.475: %FW_HA-6-PROT_MISMATCH: Firewall High availability - L4/L7 protocol mismatch between active and standby</pre>	Protocol mismatch between the active and standby devices.
<pre>May 20 21:57:10.475: %FW_HA-6- NO_HSRP_GNAME_ON_STDBY: Firewall High availability - Inspect redundancy group is not configured on standby for interface e0/0 dir in/out</pre>	The HSRP group is not configured on the standby device.
<pre>*May 20 21:57:10.475: %FW_HA-6-CONFIG_MISMATCH: Firewall High availability - Inspect HA config mismatch between active and standby. act:inspect rule a_test, hsrp_grp a_hsrp_group; stdby:inspect rule s_test hsrp_grp s_hsrp_group</pre>	HA configuration mismatch between the active and standby devices.

If audit trail is configured on the standby HA device the standard alerts that are shown when a session is added or deleted will be changed to reflect that the session is a standby session. The table below contains the stateful failover alert messages.

**Table 2 Stateful Failover Alert Messages**

Message	Meaning
*Apr 14 23:53:44.641: %FW-HA-6- SESS_AUDIT_TRAIL_STDBY_START: Start tcp standby session: initiator (10.0.0.10:22955) -- responder (11.0.0.10:23)	The Standby session is up.
*Apr 14 23:57:52.891: %FW-HA-6- SESS_AUDIT_TRAIL_STDBY_STOP: Stop tcp standby session: initiator (10.0.0.10:35148) -- responder (11.0.0.10:23)	The Standby session is down.
*Apr 14 23:57:52.891: %FW-HA-6- SESS_AUDIT_TRAIL_STDBY_TO_ACT: Firewall HA transitioning from Standby to Active HA state	The device has transitioned from standby to active.

## Additional References

### Related Documents

Related Topic	Document Title
Cisco IOS commands	<a href="#">Cisco IOS Master Commands List, All Releases</a>
Configuring HSRP	Configuring HSRP

### Standards

Standards	Title
No new or modified standards are supported by this feature.	--

### MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

**RFCs**

RFCs	Title
No new or modified RFCs are supported by this feature.	--

**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.	<a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a>

## Configuration Examples for Stateful Failover

- [Example Stateful Failover, page 19](#)

### Example Stateful Failover

The following output example shows stateful failover that has been configured on a Cisco IOS router:

```
Router 1)
hostname ha-R1
!
boot-start-marker
boot-end-marker
!
!
redundancy inter-device
scheme standby HAin
!
!
redundancy
logging buffered 10000000 debugging
logging rate-limit console 10000
!
no aaa new-model
!
resource policy
!
!
ipc zone default
association 1
no shutdown
protocol sctp
local-port 5000
local-ip 10.0.0.1
remote-port 5000
remote-ip 10.0.0.2
!
```

```

!
ip inspect tcp idle-time 180
ip inspect name ha-protocols tcp
ip inspect name ha-protocols udp
ip inspect redundancy update seconds 60
!
!
!inside interface
interface Ethernet0/0
ip address 10.0.0.1 255.255.255.0
standby delay minimum 120 reload 120
standby 1 ip 10.0.0.3
standby 1 timers 1 10
standby 1 priority 60
standby 1 preempt
standby 1 name HAin
standby 1 track Ethernet1/0
!
!outside interface
interface Ethernet1/0
ip address 211.0.0.1 255.255.255.0
ip access-group fw-ha-acl in
!! The HSRP group used with the inspect config should be the inside HSRP group
ip inspect ha-protocols out redundancy stateful HAin
standby delay minimum 120 reload 120
standby 2 ip 211.0.0.3
standby 2 timers 1 10
standby 2 priority 60
standby 2 preempt
standby 2 name HAout
standby 2 track Ethernet0/0
!
!
!
! ACL on interface should permit HSRP, HA traffic from active to standby device
ip access-list extended fw-ha-acl
permit ip host 211.0.0.2 host 211.0.0.1
permit ip host 211.0.0.1 host 211.0.0.2
deny any any
!
!
!
!
line con 0
exec-timeout 0 0
line aux 0
#####
Router 2)
hostname ha-R2
!
boot-start-marker
boot-end-marker
!
!
redundancy inter-device
scheme standby HAin
!
!
redundancy
logging buffered 10000000 debugging
logging rate-limit console 10000
!
no aaa new-model
!
resource policy
!
!
ipc zone default
association 1
no shutdown
protocol sctp
local-port 5000
local-ip 10.0.0.2

```

```

remote-port 5000
remote-ip 10.0.0.1
!
!
ip inspect tcp idle-time 180
ip inspect name ha-protocols tcp
ip inspect name ha-protocols udp
ip inspect redundancy update seconds 60
!
!
!inside interface
interface Ethernet0/0
ip address 10.0.0.2 255.255.255.0
standby delay minimum 120 reload 120
standby 1 ip 10.0.0.3
standby 1 priority 60
standby 1 preempt
standby 1 name HAin
standby 1 track Ethernet1/0
!
!outside interface
interface Ethernet1/0
ip address 211.0.0.2 255.255.255.0
ip access-group fw-ha-acl in
!! The HSRP group used with the inspect config should be the inside HSRP group
ip inspect ha-protocols out redundancy stateful HAin
standby delay minimum 120 reload 120
standby 2 ip 211.0.0.3
standby 2 priority 60
standby 2 preempt
standby 2 name HAout
standby 2 track Ethernet0/0
!
!
!
! ACL on interface should permit HSRP, HA traffic from active to standby device
ip access-list extended fw-ha-acl
permit ip host 211.0.0.2 host 211.0.0.1
permit ip host 211.0.0.1 host 211.0.0.2
!
!
!
!
line con 0
exec-timeout 0 0
line aux 0

```

## Feature Information for Cisco IOS Firewall Stateful Failover

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](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

**Table 3**      **Feature Information for Cisco IOS Firewall Stateful Failover**

Cisco IOS Firewall Stateful Failover	12.4(6)T	<p>With the introduction of the Stateful Failover, applications and network services are not disrupted if an interface on a router is lost or if a router crashes. With a Stateful Failover configuration, the standby or backup router maintains state information so that firewall operations are maintained in the event of a failure.</p> <p>The following commands are introduced or modified in the feature: <b>clear ip inspect ha</b>, <b>debug ip inspect ha</b>, <b>ip inspect</b>, <b>show ip inspect</b>, <b>show ip inspect ha</b>.</p>
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