Interchassis Asymmetric Routing Support for Zone-Based Policy Firewalls

The Interchassis Asymmetric Routing Support for Zone-Based Firewalls feature supports the forwarding of packets from a standby redundancy group to an active redundancy group for packet handling. If this feature is not enabled, the return TCP packets forwarded to the router that did not receive the initial synchronization (SYN) message are dropped because they do not belong to any known existing session. Interchassis asymmetric routing also supports active/active and active/standby load sharing redundancy.

This module provides an overview of asymmetric routing and active/active and active/standby load sharing redundancy, and describes how to configure asymmetric routing.

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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.

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 Interchassis Asymmetric Routing Support for Zone-Based Policy Firewalls

The following are not supported:

- Asymmetric routing on a Multiprotocol Label Switching (MPLS) VPN network. You cannot configure MPLS on the egress interface and VPN routing and forwarding (VRF) on the ingress interface.
- Configuring asymmetric routing on a redundancy group (RG) interface.
- IPv6 traffic.

Information About Interchassis Asymmetric Routing Support for Zone-Based Policy Firewalls

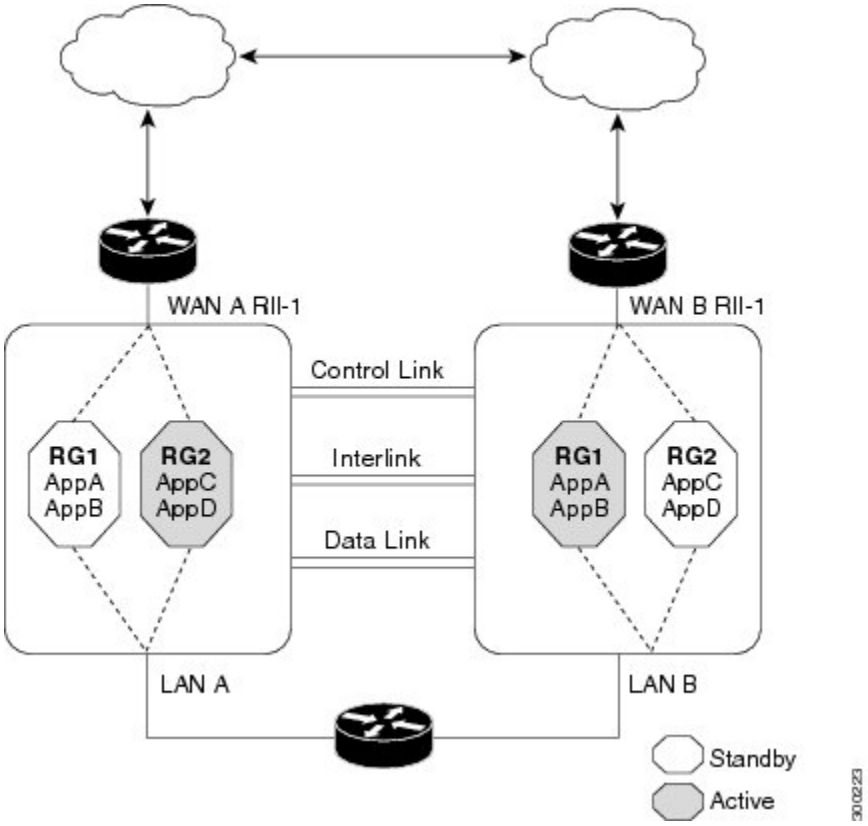
Asymmetric Routing Overview

Asymmetric routing occurs when packets from TCP or UDP connections flow in different directions through different routes. In asymmetric routing, packets that belong to a single TCP or UDP connection are forwarded through one interface in a redundancy group (RG), but returned through another interface in the same RG. In asymmetric routing, the packet flow remains in the same RG. When you configure asymmetric routing, packets received on the standby RG are redirected to the active RG for processing. If asymmetric routing is not configured, the packets received on the standby RG may be dropped.

Asymmetric routing determines the RG for a particular traffic flow. The state of the RG is critical in determining the handling of packets. If an RG is active, normal packet processing is performed. In case the RG is in a standby state and you have configured asymmetric routing and the **asymmetric-routing always-divert enable** command, packets are diverted to the active RG. Use the **asymmetric-routing always-divert enable** command to always divert packets received from the standby RG to the active RG.

The figure below shows an asymmetric routing scenario with a separate asymmetric-routing interlink interface to divert packets to the active RG.

Figure 1: Asymmetric Routing Scenario



The following rules apply to asymmetric routing:

- 1:1 mapping exists between the redundancy interface identifier (RII) and the interface.
- 1:*n* mapping exists between the interface and an RG. (An asymmetric routing interface can receive traffic from and send traffic to multiple RGs. For a non asymmetric-routing interface (normal LAN interface), a 1:1 mapping exists between the interface and the RG.)
- 1:*n* mapping exists between an RG and applications that use it. (Multiple applications can use the same RG).
- 1:1 mapping exists between an RG and the traffic flow. The traffic flow must map only to a single RG. If a traffic flow maps to multiple RGs, an error occurs.
- 1:1 or 1:*n* mapping can exist between an RG and an asymmetric-routing interlink as long as the interlink has sufficient bandwidth to support all the RG interlink traffic.

Asymmetric routing consists of an interlink interface that handles all traffic that is to be diverted. The bandwidth of the asymmetric-routing interlink interface must be large enough to handle all expected traffic that is to be diverted. An IPv4 address must be configured on the asymmetric-routing interlink interface, and the IP address of the asymmetric routing interface must be reachable from this interface.

Note We recommend that the asymmetric-routing interlink interface be used for interlink traffic only and not be shared with high availability control or data interfaces because the amount of traffic on the asymmetric-routing interlink interface could be quite high.

Asymmetric Routing Support in Firewalls

For intrabox asymmetric routing support, the firewall does a stateful Layer 3 and Layer 4 inspection of Internet Control Message Protocol (ICMP), TCP, and UDP packets. The firewall does a stateful inspection of TCP packets by verifying the window size and order of packets. The firewall also requires the state information from both directions of the traffic for stateful inspection. The firewall does a limited inspection of ICMP information flows. It verifies the sequence number associated with the ICMP echo request and response. The firewall does not synchronize any packet flows to the standby redundancy group (RG) until a session is established for that packet. An established session is a three-way handshake for TCP, the second packet for UDP, and informational messages for ICMP. All ICMP flows are sent to the active RG.

The firewall does a stateless verification of policies for packets that do not belong to the ICMP, TCP, and UDP protocols.

The firewall depends on bidirectional traffic to determine when a packet flow should be aged out and diverts all inspected packet flows to the active RG. Packet flows that have a pass policy and that include the same zone with no policy or a drop policy are not diverted.

Note The firewall does not support the **asymmetric-routing always-divert enable** command that diverts packets received on the standby RG to the active RG. By default, the firewall forces all packet flows to be diverted to the active RG.

Active/Active Failover

In an active/active failover configuration, both devices can process network traffic. Active/active failover generates virtual MAC (VMAC) addresses for interfaces in each redundancy group (RG).

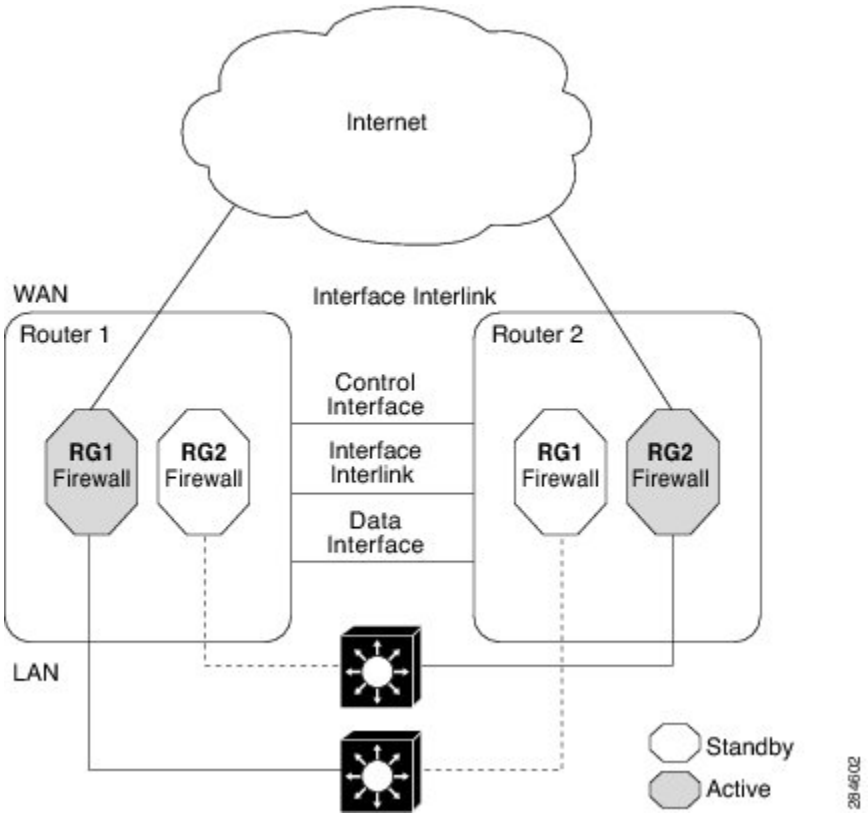
One device in an active/active failover pair is designated as the primary (active) device, and the other is designated as the secondary (standby) device. Unlike with active/standby failover, this designation does not indicate which device becomes active when both devices start simultaneously. Instead, the primary/secondary designation determines the following:

- The device that provides the running configuration to the failover pair when they start simultaneously.
- The device on which the failover RG appears in the active state when devices start simultaneously. Each failover RG in the configuration is configured with a primary or secondary device preference. You can configure both failover RGs to be in the active state on a single device and the standby failover RGs to be on the other device. You can also configure one failover RG to be in the active state and the other RG to be in the standby state on a single device.

Active/Active Load-Sharing Application Redundancy

The following figure shows two RGs, RG1 and RG2. The firewall is registered to both the groups. RG1 has a high priority on Router 1 and RG2 on Router 2. The firewall will process half of the sessions through RG1 on Router 1 and the other half through RG2 on Router 2. As a result, the firewall actively processes traffic on both routers.

Figure 2: Active/Active Load-Sharing Application Redundancy



In an enterprise scenario, if all WAN links on Router 1 fail, switchover happens on Router 2. For example, if there is only one WAN link per box, the failure of the WAN link on the active RG triggers a failover. In the case of a hardware or software failure such as Cisco software reload, the standby will detect active groups on the failed router either through the hello packets timeout or through Bidirectional Forwarding Detection (BFD) if BFD is configured on the control interface.

When Router 1 goes down in the scenarios described, the standby RG will assume the active role on Router 2. When the RG changes the state from standby to active, the firewall will change the state of all sessions in the new active RG and will start processing the traffic.

Active/Standby Failover

Active/standby failover enables you to use a standby device to take over the functionality of a failed device. A failed active device changes to the standby state, and the standby device changes to the active state. The device that is now in the active state takes over IP addresses and MAC addresses of the failed device and

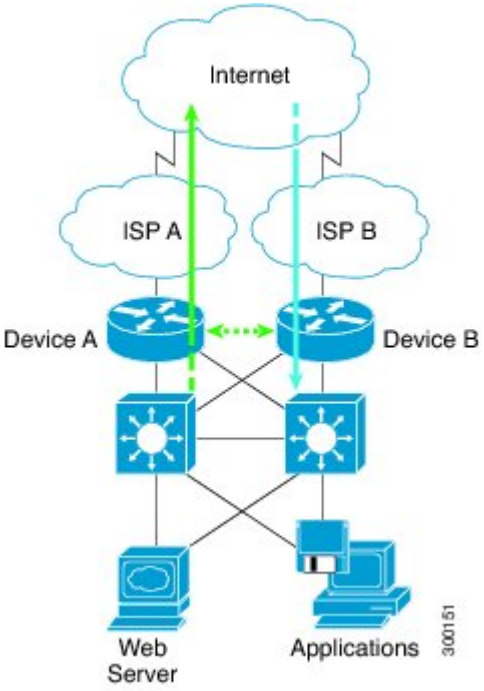
starts processing traffic. The device that is now in the standby state takes over standby IP addresses and MAC addresses. Because network devices do not see any change in the MAC-to-IP address pairing, Address Resolution Protocol (ARP) entries do not change or time out anywhere on the network.

In an active/standby scenario, the main difference between two devices in a failover pair depends on which device is active and which device is a standby, namely which IP addresses to use and which device actively passes the traffic. The active device always becomes the active device if both devices start up at the same time (and are of equal operational health). MAC addresses of the active device are always paired with active IP addresses.

Asymmetric Routing in a WAN-LAN Topology

Asymmetric routing supports only a WAN-LAN topology. In a WAN-LAN topology, devices are connected through LAN interfaces on the inside and WAN interfaces on the outside. There is no control on the routing of return traffic received through WAN links. Asymmetric routing controls the routing of return traffic received through WAN links in a WAN-LAN topology. The figure below shows a WAN-LAN topology.

Figure 3: Asymmetric Routing in a WAN-LAN Topology



Exclusive Virtual IP Addresses and Exclusive Virtual MAC Addresses

Virtual IP (VIP) addresses and virtual MAC (VMAC) addresses are used by security applications to control interfaces that receive traffic. An interface is paired with another interface, and these interfaces are associated with the same redundancy group (RG). The interface that is associated with an active RG exclusively owns the VIP and VMAC. The Address Resolution Protocol (ARP) process on the active device sends ARP replies for any ARP request for the VIP, and the Ethernet controller for the interface is programmed to receive packets destined for the VMAC. When an RG failover occurs, the ownership of the VIP and VMAC changes. The

interface that is associated with the newly active RG sends a gratuitous ARP and programs the interface's Ethernet controller to accept packets destined for the VMAC.

IPv6 Support

You can assign each redundancy group (RG) on a traffic interface for both IPv4 and IPv6 virtual IP (VIP) addresses under the same redundancy interface identifier (RII). Each RG uses a unique virtual MAC (VMAC) address per RII. For an RG, the IPv6 link-local VIP and global VIP coexist on an interface.

You can configure an IPv4 VIP, a link-local IPv6 VIP, and/or a global IPv6 VIP for each RG on a traffic interface. IPv6 link-local VIP is mainly used when configuring static or default routes, whereas IPv6 global VIP is widely used in both LAN and WAN topologies.

You must configure a physical IP address before configuring an IPv4 VIP.

Checkpoint Facility Support for Application Redundancy

Checkpointing is the process of storing the current state of a device and using that information during restart when the device fails. The checkpoint facility (CF) supports communication between peers by using the Inter-Process Communication (IPC) protocol and the IP-based Stream Control Transmission Protocol (SCTP). CF also provides an infrastructure for clients or devices to communicate with their peers in multiple domains. Devices can send checkpoint messages from the active to the standby device.

Application redundancy supports multiple domains (also called groups) that can reside within the same chassis and across chassis. Devices that are registered to multiple groups can send checkpoint messages from one group to their peer group. Application redundancy supports interchassis domain communication. Checkpointing happens from an active group to a standby group. Any combination of groups can exist across chassis. The communication across chassis is through SCTP transport over a data link interface that is dedicated to application redundancy.

Note Domains in the same chassis cannot communicate with each other.

How to Configure Interchassis Asymmetric Routing Support for Zone-Based Policy Firewalls

Configuring a Firewall

In this task, you will do the following:

- Configure a firewall.
- Create a security source zone.
- Create a security destination zone.
- Create a security zone pair by using the configured source and destination zones.
- Configure an interface as a zone member.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **class-map type inspect match-any** *class-map-name*
4. **match protocol** {**icmp** | **tcp** | **udp**}
5. **exit**
6. **parameter-map type inspect global**
7. **redundancy**
8. **exit**
9. **policy-map type inspect** *policy-map-name*
10. **class type inspect** *class-map-name*
11. **inspect**
12. **exit**
13. **class class-default**
14. **drop**
15. **exit**
16. **exit**
17. **zone security** *security-zone-name*
18. **exit**
19. **zone security** *security-zone-name*
20. **exit**
21. **zone-pair security** *zone-pair-name* **source** *source-zone* **destination** *destination-zone*
22. **service-policy type inspect** *policy-map-name*
23. **exit**
24. **interface** *type number*
25. **ip address** *ip-address mask*
26. **encapsulation dot1q** *vlan-id*
27. **zone-member security** *security-zone-name*
28. **end**
29. To attach a zone to another interface, repeat Steps 21 to 25.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**class-map type inspect match-any** *class-map-name* **Example:** `Device(config)# class-map type inspect match-any ddos-class`	Creates an application-specific inspect type class map and enters QoS class-map configuration mode.
Step 4	**match protocol** {**icmp** | **tcp** | **udp**} **Example:** `Device(config-cmap)# match protocol tcp`	Configures the match criterion for a class map based on the specified protocol.
Step 5	**exit** **Example:** `Device(config-cmap)# exit`	Exits QoS class-map configuration mode and enters global configuration mode.
Step 6	**parameter-map type inspect global** **Example:** `Device(config)# parameter-map type inspect global`	Defines a global inspect parameter map and enters parameter-map type inspect configuration mode.
Step 7	**redundancy** **Example:** `Device(config-profile)# redundancy`	Enables firewall high availability.
Step 8	**exit** **Example:** `Device(config-profile)# exit`	Exits parameter-map type inspect configuration mode and enters global configuration mode.
Step 9	**policy-map type inspect** *policy-map-name* **Example:** `Device(config)# policy-map type inspect ddos-fw`	Creates a protocol-specific inspect type policy map and enters QoS policy-map configuration mode.
Step 10	**class type inspect** *class-map-name* **Example:** `Device(config-pmap)# class type inspect ddos-class`	Specifies the traffic class on which an action is to be performed and enters QoS policy-map class configuration mode.

	Command or Action	Purpose
Step 11	**inspect** **Example:** `Device(config-pmap-c)# inspect`	Enables stateful packet inspection.
Step 12	**exit** **Example:** `Device(config-pmap-c)# exit`	Exits QoS policy-map class configuration mode and enters QoS policy-map configuration mode.
Step 13	**class class-default** **Example:** `Device(config-pmap)# class class-default`	Configures the default class on which an action is to be performed and enters QoS policy-map class configuration mode.
Step 14	**drop** **Example:** `Device(config-pmap-c)# drop`	Allows traffic to pass between two interfaces in the same zone.
Step 15	**exit** **Example:** `Device(config-pmap-c)# exit`	Exits QoS policy-map class configuration mode and enters QoS policy-map configuration mode.
Step 16	**exit** **Example:** `Device(config-pmap)# exit`	Exits QoS policy-map configuration mode and enters global configuration mode.
Step 17	**zone security** *security-zone-name* **Example:** `Device(config)# zone security private`	Creates a security zone and enters security zone configuration mode. • You need two security zones to create a zone pair—a source and a destination zone.
Step 18	**exit** **Example:** `Device(config-sec-zone)# exit`	Exits security zone configuration mode and enters global configuration mode.
Step 19	**zone security** *security-zone-name* **Example:** `Device(config)# zone security public`	Creates a security zone and enters security zone configuration mode. • You need two security zones to create a zone pair—a source and a destination zone.

	Command or Action	Purpose
Step 20	**exit** **Example:** `Device(config-sec-zone)# exit`	Exits security zone configuration mode and enters global configuration mode.
Step 21	**zone-pair security** *zone-pair-name* **source** *source-zone* **destination** *destination-zone* **Example:** `Device(config)# zone-pair security private2public source private destination public`	Creates a zone pair and enters security zone-pair configuration mode.
Step 22	**service-policy type inspect** *policy-map-name* **Example:** `Device(config-sec-zone-pair)# service-policy type inspect ddos-fw`	Attaches a policy map to a top-level policy map.
Step 23	**exit** **Example:** `Device(config-sec-zone-pair)# exit`	Exits security zone-pair configuration mode and enters global configuration mode.
Step 24	**interface** *type number* **Example:** `Device(config)# interface gigabitethernet 0/1/0.1`	Configures an interface and enters subinterface configuration mode.
Step 25	**ip address** *ip-address mask* **Example:** `Device(config-subif)# ip address 10.1.1.1 255.255.255.0`	Configures an IP address for the subinterface.
Step 26	**encapsulation dot1q** *vlan-id* **Example:** `Device(config-subif)# encapsulation dot1q 2`	Sets the encapsulation method used by the interface.
Step 27	**zone-member security** *security-zone-name* **Example:** `Device(config-subif)# zone-member security private`	Configures the interface as a zone member. • For the *security-zone-name* argument, you must configure one of the zones that you had configured by using the **zone security** command. • When an interface is in a security zone, all traffic to and from that interface (except traffic going to the device or initiated by the device) is dropped by default. To permit traffic through an interface that is a zone member, you

	Command or Action	Purpose
		must make that zone part of a zone pair to which you apply a policy. If the policy permits traffic (via **inspect** or **pass** actions), traffic can flow through the interface.
Step 28	**end** **Example:** `Device(config-subif)# end`	Exits subinterface configuration mode and enters privileged EXEC mode.
Step 29	To attach a zone to another interface, repeat Steps 21 to 25.	—

Configuring a Redundancy Application Group and a Redundancy Group Protocol

Redundancy groups consist of the following configuration elements:

- The amount by which the priority will be decremented for each object.
- Faults (objects) that decrement the priority
- Failover priority
- Failover threshold
- Group instance
- Group name
- Initialization delay timer

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **redundancy**
4. **application redundancy**
5. **group** *id*
6. **name** *group-name*
7. **priority** *value* [**failover threshold** *value*]
8. **preempt**
9. **track** *object-number* **decrement** *number*
10. **exit**
11. **protocol** *id*
12. **timers hellotime** {*seconds* | **msec** *msec*} **holdtime** {*seconds* | **msec** *msec*}
13. **authentication** {**text** *string* | **md5 key-string** [**0** | **7**] *key* [**timeout** *seconds*] | **key-chain** *key-chain-name*}
14. **bfd**
15. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**redundancy** **Example:** `Device(config)# redundancy`	Enters redundancy configuration mode.
Step 4	**application redundancy** **Example:** `Device(config-red)# application redundancy`	Configures application redundancy and enters redundancy application configuration mode.
Step 5	**group** *id* **Example:** `Device(config-red-app)# group 1`	Configures a redundancy group and enters redundancy application group configuration mode.

	Command or Action	Purpose
Step 6	**name** *group-name* **Example:** `Device(config-red-app-grp)# name group1`	Specifies an optional alias for the protocol instance.
Step 7	**priority** *value* [**failover threshold** *value*] **Example:** `Device(config-red-app-grp)# priority 100 failover threshold 50`	Specifies the initial priority and failover threshold for a redundancy group.
Step 8	**preempt** **Example:** `Device(config-red-app-grp)# preempt`	Enables preemption on the redundancy group and enables the standby device to preempt the active device. • The standby device preempts only when its priority is higher than that of the active device.
Step 9	**track** *object-number* **decrement** *number* **Example:** `Device(config-red-app-grp)# track 50 decrement 50`	Specifies the priority value of a redundancy group that will be decremented if an event occurs on the tracked object.
Step 10	**exit** **Example:** `Device(config-red-app-grp)# exit`	Exits redundancy application group configuration mode and enters redundancy application configuration mode.
Step 11	**protocol** *id* **Example:** `Device(config-red-app)# protocol 1`	Specifies the protocol instance that will be attached to a control interface and enters redundancy application protocol configuration mode.
Step 12	**timers hellotime** {*seconds* | **msec** *msec*} **holdtime** {*seconds* | **msec** *msec*} **Example:** `Device(config-red-app-prtcl)# timers hellotime 3 holdtime 10`	Specifies the interval between hello messages sent and the time period before which a device is declared to be down. • Holdtime should be at least three times the hellotime.
Step 13	**authentication** {**text** *string* | **md5 key-string** [**0** | **7**] *key* [**timeout** *seconds*] | **key-chain** *key-chain-name*} **Example:** `Device(config-red-app-prtcl)# authentication md5 key-string 0 n1 timeout 100`	Specifies authentication information.

	Command or Action	Purpose
Step 14	**bfd** **Example:** `Device(config-red-app-prtcl)# bfd`	Enables the integration of the failover protocol running on the control interface with the Bidirectional Forwarding Detection (BFD) protocol to achieve failure detection in milliseconds. • BFD is enabled by default.
Step 15	**end** **Example:** `Device(config-red-app-prtcl)# end`	Exits redundancy application protocol configuration mode and enters privileged EXEC mode.

Configuring Data, Control, and Asymmetric Routing Interfaces

In this task, you configure the following redundancy group (RG) elements:

- The interface that is used as the control interface.
- The interface that is used as the data interface.
- The interface that is used for asymmetric routing. This is an optional task. Perform this task only if you are configuring asymmetric routing for Network Address Translation (NAT).

Note Asymmetric routing, data, and control must be configured on separate interfaces for zone-based firewall. However, for Network Address Translation (NAT), asymmetric routing, data, and control can be configured on the same interface.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **redundancy**
4. **application redundancy**
5. **group** *id*
6. **data** *interface-type interface-number*
7. **control** *interface-type interface-number* **protocol** *id*
8. **timers delay** *seconds* [**reload** *seconds*]
9. **asymmetric-routing interface** *type number*
10. **asymmetric-routing always-divert enable**
11. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**redundancy** **Example:** `Device(config)# redundancy`	Enters redundancy configuration mode.
Step 4	**application redundancy** **Example:** `Device(config-red)# application redundancy`	Configures application redundancy and enters redundancy application configuration mode.
Step 5	**group** *id* **Example:** `Device(config-red-app)# group 1`	Configures a redundancy group (RG) and enters redundancy application group configuration mode.
Step 6	**data** *interface-type interface-number* **Example:** `Device(config-red-app-grp)# data GigabitEthernet 0/0/1`	Specifies the data interface that is used by the RG.
Step 7	**control** *interface-type interface-number* **protocol** *id* **Example:** `Device(config-red-app-grp)# control GigabitEthernet 1/0/0 protocol 1`	Specifies the control interface that is used by the RG. • The control interface is also associated with an instance of the control interface protocol.
Step 8	**timers delay** *seconds* [**reload** *seconds*] **Example:** `Device(config-red-app-grp)# timers delay 100 reload 400`	Specifies the time required for an RG to delay role negotiations that start after a fault occurs or the system is reloaded.
Step 9	**asymmetric-routing interface** *type number* **Example:** `Device(config-red-app-grp)# asymmetric-routing interface GigabitEthernet 0/1/1`	Specifies the asymmetric routing interface that is used by the RG.

	Command or Action	Purpose
Step 10	**asymmetric-routing always-divert enable** **Example:** `Device(config-red-app-grp)# asymmetric-routing always-divert enable`	Always diverts packets received from the standby RG to the active RG.
Step 11	**end** **Example:** `Device(config-red-app-grp)# end`	Exits redundancy application group configuration mode and enters privileged EXEC mode.

Configuring a Redundant Interface Identifier and Asymmetric Routing on an Interface

Note

- You must not configure a redundant interface identifier (RII) on an interface that is configured either as a data interface or as a control interface.
- You must configure the RII and asymmetric routing on both active and standby devices.
- You cannot enable asymmetric routing on the interface that has a virtual IP address configured.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **redundancy rii** *id*
5. **redundancy group** *id* [**decrement** *number*]
6. **redundancy asymmetric-routing enable**
7. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Device(config)# interface GigabitEthernet 0/1/3`	Selects an interface to be associated with the redundancy group (RG) and enters interface configuration mode.
Step 4	**redundancy rii** *id* **Example:** `Device(config-if)# redundancy rii 600`	Configures the redundancy interface identifier (RII).
Step 5	**redundancy group** *id* [**decrement** *number*] **Example:** `Device(config-if)# redundancy group 1 decrement 20`	Enables the RG redundancy traffic interface configuration and specifies the amount to be decremented from the priority when the interface goes down. **Note** You need not configure an RG on the traffic interface on which asymmetric routing is enabled.
Step 6	**redundancy asymmetric-routing enable** **Example:** `Device(config-if)# redundancy asymmetric-routing enable`	Establishes an asymmetric flow diversion tunnel for each RG.
Step 7	**end** **Example:** `Device(config-if)# end`	Exits interface configuration mode and enters privileged EXEC mode.

Configuration Examples for Interchassis Asymmetric Routing Support for Zone-Based Policy Firewalls

Example: Configuring a Firewall

```
Router# configure terminal
Router(config)# class-map type inspect match-any ddos-class
Router(config-cmap)# match protocol tcp
Router(config-cmap-c)# exit
Router(config)# parameter-map type inspect global
Router(config-profile)# redundancy
```

```
Router(config-profile)# exit
Router(config)# policy-map type inspect ddos-fw
Router(config-pmap)# class type inspect ddos-class
Router(config-pmap-c)# inspect
Router(config-pmap-c)# exit
Router(config-pmap)# class class-default
Router(config-pmap-c)# drop
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# zone security private
Router(config-sec-zone)# exit
Router(config)# zone security public
Router(config-sec-zone)# exit
Router(config)# zone-pair security private2public source private destination public
Router((config-sec-zone-pair)# service-policy type inspect ddos-fw
Router((config-sec-zone-pair)# exit
Router(config)# interface gigabitethernet 0/1/0.1
Router(config-subif)# ip address 10.1.1.1 255.255.255.0
Router(config-subif)# encapsulation dot1q 2
Router(config-subif)# zone-member security private
Router(config-subif)# exit
Router(config)# interface gigabitethernet 1/1/0.1
Router(config-subif)# ip address 10.2.2.2 255.255.255.0
Router(config-subif)# encapsulation dot1q 2
Router(config-subif)# zone-member security public
Router(config-subif)# end
```

Example: Configuring a Redundancy Application Group and a Redundancy Group Protocol

```
Device# configure terminal
Device(config)# redundancy
Device(config-red)# application redundancy
Device(config-red-app)# group 1
Device(config-red-app-grp)# name group1
Device(config-red-app-grp)# priority 100 failover threshold 50
Device(config-red-app-grp)# preempt
Device(config-red-app-grp)# track 50 decrement 50
Device(config-red-app-grp)# exit
Device(config-red-app)# protocol 1
Device(config-red-app-prtcl)# timers hellotime 3 holdtime 10
Device(config-red-app-prtcl)# authentication md5 key-string 0 n1 timeout 100
Device(config-red-app-prtcl)# bfd
Device(config-red-app-prtcl)# end
```

Example: Configuring Data, Control, and Asymmetric Routing Interfaces

```
Device# configure terminal
Device(config)# redundancy
Device(config-red)# application redundancy
Device(config-red-app)# group 1
Device(config-red-app-grp)# data GigabitEthernet 0/0/1
Device(config-red-app-grp)# control GigabitEthernet 1/0/0 protocol 1
Device(config-red-app-grp)# timers delay 100 reload 400
Device(config-red-app-grp)# asymmetric-routing interface GigabitEthernet 0/1/1
Device(config-red-app-grp)# asymmetric-routing always-divert enable
Device(config-red-app-grp)# end
```

Example: Configuring a Redundant Interface Identifier and Asymmetric Routing on an Interface

```
Device# configure terminal
Device(config)# interface GigabitEthernet 0/1/3
Device(config-if)# redundancy rii 600
Device(config-if)# redundancy group 1 decrement 20
Device(config-if)# redundancy asymmetric-routing enable
Device(config-if)# end
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
Security commands	• Cisco IOS Security Command Reference: Commands A to C • Cisco IOS Security Command Reference: Commands D to L • Cisco IOS Security Command Reference: Commands M to R • Cisco IOS Security Command Reference: Commands S to Z

Technical Assistance

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

Feature Information for Interchassis Asymmetric Routing Support for Zone-Based Policy Firewalls

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

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

Table 1: Feature Information for Interchassis Asymmetric Routing Support for Zone-Based Policy Firewalls

Feature Name	Releases	Feature Information
Interchassis Asymmetric Routing Support for Zone-Based Policy Firewalls	15.2(3)T	The Interchassis Asymmetric Routing Support for Zone-Based Policy Firewalls feature supports the forwarding of packets from a standby redundancy group to the active redundancy group for packet handling. The following commands were introduced or modified: **asymmetric-routing**, **debug redundancy application group asymmetric-routing**, **redundancy asymmetric-routing enable**, **redundancy group (interface)**, **redundancy rii**, and **show redundancy application asymmetric-routing**.