VRF-Aware NAT for WAN-WAN Topology with Symmetric Routing Box-to-Box Redundancy

In Cisco IOS XE Release 3.14S, Network Address Translation (NAT) supports the VRF-Aware NAT for WAN-WAN Topology with Symmetric Routing Box-to-Box Redundancy feature. VRF-Aware NAT for WAN-to-LAN topology is already supported in NAT.

This module describes this feature.

Restrictions for VRF-Aware NAT for WAN-WAN Topology with Symmetric Routing Box-to-Box Redundancy

The following features are not supported:

- Asymmetric routing
- Cisco TrustSec
- Edge switching services
- Header Compression
- IPsec
- Lawful intercept (Intercept twice, once at active and once at standby)
- Layer 2 Tunneling Protocol (L2TP)
- Locator-ID Separation Protocol (LISP) inner packet inspection
- Port Bundle

- Stile and Ceasr
- Secure Sockets Layer (SSL) VPN
- Session Border Controller (SBC)

Information About VRF-Aware NAT for WAN-WAN Topology with Symmetric Routing Box-to-Box Redundancy

VRF-Aware Box-to-Box High Availability Support

In Cisco IOS XE Release 3.14S, Network Address Translation (NAT) supports VRF-aware box-to-box high availability in a WAN-to-WAN topology.

To support VRF-aware box-to-box high availability, NAT ties the NAT mapping with a mandatorily configured mapping ID when a redundancy group (RG) is configured. The standby device retrieves the correct locally significant VRF ID from the mapping ID after synchronization. The VRF ID is set before NAT processes or translates a packet on the active device.

The VRF-aware box-to-box high availability configuration must be the same on both active and standby devices. The VRF configuration must use the same VRF name at active and standby devices. NAT provides a hashed VRF name value in the high availability message, and sends it to active and standby devices, so that the corresponding local VRF ID is converted at the peer device by using the VRF name hash value-to-VRF ID mapping.

Note In a High Availability configuration with HSRP or box-to-box redundancy, only the inside source NAT mappings are supported. The outside source NAT mappings are not supported with this configuration.

Note In some cases you might experience FTP disconnection after failover in a NAT B2B scenario. To resolve this issue, quit the existing FTP connection and start a new FTP connection.

Stateful Interchassis Redundancy Overview

You can configure the Stateful Interchassis Redundancy feature to determine the active device from a group of devices, based on a number of failover conditions. When a failover occurs, the standby device seamlessly takes over, starts performing traffic forwarding services, and maintains a dynamic routing table.

Note Manually shutting down the control or data interface link on an active NAT router results in traffic outage as the NAT router never transitions to active state.

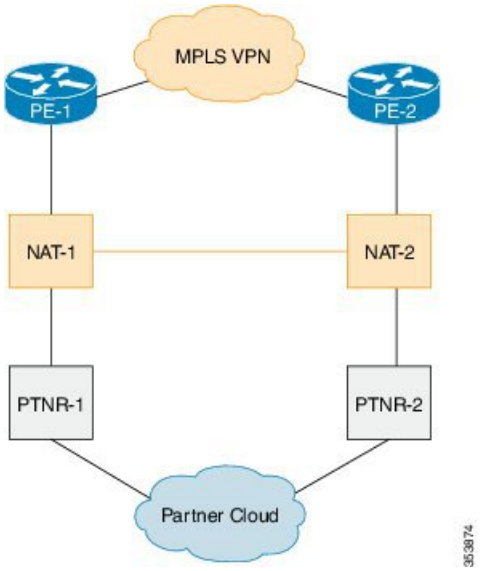
Stateful Interchassis Redundancy Operation in NAT

You can configure pairs of devices to act as hot standbys for each other. Redundancy is configured on an interface basis. Pairs of redundant interfaces are known as redundancy groups (RGs). Redundancy occurs at

an application level and does not require a complete physical failure of the interface or device for a switchover of the application to occur. When a switchover occurs, the application activity continues to run seamlessly on the redundant interface.

The figure below depicts an active/standby load-sharing scenario. The figure shows how an RG is configured for a pair of devices that has one outgoing interface. Group A on Router 1 is the active RG and Group A on Router 2 is the standby RG.

Figure 1: Stateful Interchassis Redundancy Operation in a WAN-WAN Topology



Redundant devices are joined by a configurable control link and a data synchronization link. The control link is used to communicate the status of devices. The data synchronization link is used to transfer stateful information from Network Address Translation (NAT) and the firewall and synchronize the stateful database. The pairs of redundant interfaces are configured with the same unique ID number known as the redundant interface identifier (RII).

The status of redundancy group members is determined through the use of hello messages sent over the control link. The software considers either device not responding to a hello message within a configurable amount of time to be a failure and initiates a switchover. For the software to detect a failure in milliseconds, control links run the failover protocol that is integrated with the Bidirectional Forwarding Detection (BFD) protocol. You can configure the following parameters for hello messages:

- Hello time—Interval at which hello messages are sent.
- Hold time—Amount of time before which the active or standby device is declared to be down.

The hello time defaults to 3 seconds to align with the Hot Standby Router Protocol (HSRP), and the hold time defaults to 10 seconds. You can also configure these timers in milliseconds by using the **timers hellotime msec** command.

To determine the pairs of interfaces that are affected by the switchover, you must configure a unique ID for each pair of redundant interfaces. This ID is known as the RII that is associated with the interface.

A switchover to the standby device can occur when the priority setting that is configured on each device changes. The device with the highest priority value acts as the active device. If a fault occurs on either the active or standby device, the priority of the device is decremented by a configurable amount known as the weight. If the priority of the active device falls below the priority of the standby device, a switchover occurs and the standby device becomes the active device. This default behavior can be overridden by disabling the

preemption attribute for the RG. You can also configure each interface to decrease the priority when the Layer 1 state of the interface goes down. The priority that is configured overrides the default priority of an RG.

Each failure event that causes a modification of an RG priority generates a syslog entry that contains a time stamp, the RG that was affected, the previous priority, the new priority, and a description of the failure event cause.

A switchover also can occur when the priority of a device or interface falls below a configurable threshold level.

A switchover to the standby device occurs under the following circumstances:

- Power loss or a reload occurs on the active device (including reloads).
- The run-time priority of the active device goes below that of the standby device (with preempt configured).
- The run-time priority of the active device goes below that of the configured threshold.
- The redundancy group on the active device is reloaded manually. Use the **redundancy application reload group** *rg-number* command for a manual reload.

How to Configure VRF-Aware NAT for WAN-WAN Topology with Symmetric Routing Box-to-Box Redundancy

The configuration for VRF-aware box-to-box redundancy is same as the configuration for stateful interchassis redundancy. For more information, see the "Configuring Stateful Interchassis Redundancy" module in the *IP Addressing: NAT Configuration Guide*.

Configuration Examples for VRF-Aware NAT for WAN-WAN Topology with Symmetric Routing Box-to-Box Redundancy

Example: Configuring VRF-Aware NAT for WAN-WAN Topology with Symmetric Routing Box-to-Box Redundancy

The following is a sample WAN-to-WAN symmetric routing configuration:

```
vrf definition Mgmt-intf
 address-family ipv4
  exit-address-family
!
address-family ipv6
 exit-address-family
!
!
vrf definition VRFA
 rd 100:1
 route-target export 100:1
 route-target import 100:1
 address-family ipv4
  exit-address-family
```

```
!
!
no logging console
no aaa new-model
!
multilink bundle-name authenticated
!
redundancy
 mode sso
 application redundancy
  group 1
   preempt
   priority 120
   control GigabitEthernet 0/0/1 protocol 1
   data GigabitEthernet 0/0/2
!
!
!
!
ip tftp source-interface GigabitEthernet0
ip tftp blocksize 8192
!
track 1 interface GigabitEthernet 0/0/4 line-protocol
!
interface Loopback 0
 ip address 209.165.201.1 255.255.255.224
!
interface GigabitEthernet 0/0/0
 vrf forwarding VRFA
 ip address 192.168.0.1 255.255.255.248
 ip nat inside
 negotiation auto
 bfd interval 50 min_rx 50 multiplier 3
 redundancy rii 2
!
interface GigabitEthernet 0/0/1
 ip address 209.165.202.129 255.255.255.224
 negotiation auto
!
interface GigabitEthernet 0/0/2
 ip address 192.0.2.1 255.255.255.224
 negotiation auto
!
interface GigabitEthernet 0/0/3
 ip address 198.51.100.1 255.255.255.240
 negotiation auto
!
interface GigabitEthernet 0/0/4
 ip address 203.0.113.1 255.255.255.240
 negotiation auto
!
interface GigabitEthernet 0
 vrf forwarding Mgmt-intf
 ip address 172.16.0.1 255.255.0.0
 negotiation auto
!
interface vasileft 1
 vrf forwarding VRFA
 ip address 10.4.4.1 255.255.0.0
 ip nat outside
 no keepalive
!
interface vasiright 1
ip address 10.4.4.2 255.255.0.0
```

```
no keepalive
!
router mobile
!
router bgp 577
 bgp router-id 1.1.1.1
 bgp log-neighbor-changes
 neighbor 203.0.113.1 remote-as 223
 neighbor 203.0.113.1 description PEERING to PTNR neighbor 10.4.4.1 remote-as 577
 neighbor 10.4.4.1 description PEEERING to VASI VRFA interface
!
address-family ipv4
 network 203.0.113.1 mask 255.255.255.240
 network 10.4.0.0 mask 255.255.0.0
 network 209.165.200.224 mask 255.255.255.224
 neighbor 203.0.113.1 activate
 neighbor 10.4.4.1 activate
 neighbor 10.4.4.1 next-hop-self
 exit-address-family
!
address-family ipv4 vrf VRFA
 bgp router-id 4.4.4.4
 network 192.168.0.0 mask 255.255.255.248
 network 10.4.0.0 mask 255.255.0.0
 redistribute connected
 redistribute static
 neighbor 192.168.0.2 remote-as 65004
 neighbor 192.168.0.2 fall-over bfd
 neighbor 192.168.0.2 activate
 neighbor 10.4.4.2 remote-as 577
 neighbor 10.4.4.2 description PEERING to VASI Global intf
 neighbor 10.4.4.2 activate
 exit-address-family
!
ip nat switchover replication http
ip nat pool att_pool 209.165.200.225 209.165.200.225 prefix-length 16
ip nat inside source list 4 pool att_pool redundancy 1 mapping-id 100 vrf VRFA overload
ip forward-protocol nd
!
no ip http server
no ip http secure-server
ip route 203.0.113.1 255.255.255.224 10.4.4.1
ip route 192.168.0.0 255.255.0.0 10.4.4.1
ip route 209.165.200.224 255.255.255.224 10.4.4.1
ip route vrf Mgmt-intf 209.165.200.1 255.255.255.224 172.16.0.0
!
ip prefix-list VRF_Pool seq 5 permit 209.165.200.0/27
ip prefix-list p1-adv-1 seq 5 permit 209.165.200.0/27
ip prefix-list p1-exist-1 seq 5 permit 203.0.113.193/27
logging esm config
access-list 4 permit 203.0.113.193 255.255.255.224
!
control-plane
line console 0
 stopbits 1
!
line vty 0 3
 login
!
line vty 4
 password lab
 login
!
```

```
end
```

Additional References for VRF-Aware NAT for WAN-WAN Topology with Symmetric Routing Box-to-Box Redundancy

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Command List, All Releases
NAT commands	Cisco IOS IP Addressing Services Command Reference
NAT stateful interchassis redundancy	Configuring Stateful Interchassis Redundancy

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/support

Feature Information for VRF-Aware NAT for WAN-WAN Topology with Symmetric Routing Box-to-Box Redundancy

Table 1: Feature Information for VRF-Aware NAT for WAN-WAN Topology with Symmetric Routing Box-to-Box Redundancy

Feature Name	Releases	Feature Information
VRF-Aware NAT for WAN-WAN Topology with Symmetric Routing Box-to-Box Redundancy	Cisco IOS XE Release 3.14S	In Cisco IOS XE Release 3.14S, Network Address Translation (NAT) supports the VRF-Aware NAT for WAN-WAN Topology with Symmetric Routing Box-to-Box Redundancy feature. This feature contains the following two features: VRF-aware stateful interchassis redundancy and VRF-aware interchassis symmetric routing. No commands were introduced or modified by this feature.