CHAPTER **21**

Configuring VRRP

This chapter describes how to configure the Virtual Router Redundancy Protocol (VRRP) on a switch

This chapter includes the following sections:

Information About VRRP

VRRP allows for transparent failover at the first-hop IP router, by configuring a group of routers to share a virtual IP address. VRRP selects a master router in that group to handle all packets for the virtual IP address. The remaining routers are in standby and take over if that the master router fails.

This section includes the following topics:

VRRP Operation

A LAN client can determine which router should be the first hop to a particular remote destination by using a dynamic process or static configuration. Examples of dynamic router discovery are as follows:

- Proxy ARP—The client uses Address Resolution Protocol (ARP) to get the destination it wants to reach, and a router will respond to the ARP request with its own MAC address.

- Routing protocol—The client listens to dynamic routing protocol updates (for example, from Routing Information Protocol [RIP]) and forms its own routing table.

- ICMP Router Discovery Protocol (IRDP) client—The client runs an Internet Control Message Protocol (ICMP) router discovery client.

The disadvantage to dynamic discovery protocols is that they incur some configuration and processing overhead on the LAN client. Also, in the event of a router failure, the process of switching to another router can be slow.

An alternative to dynamic discovery protocols is to statically configure a default router on the client. Although, this approach simplifies client configuration and processing, it creates a single point of failure. If the default gateway fails, the LAN client is limited to communicating only on the local IP network segment and is cut off from the rest of the network.

VRRP can solve the static configuration problem by enabling a group of routers (a VRRP group) to share a single virtual IP address. You can then configure the LAN clients with the virtual IP address as their default gateway.

Figure 21-1 shows a basic VLAN topology. In this example, Routers A, B, and C form a VRRP group. The IP address of the group is the same address that was configured for the Ethernet interface of Router A (10.0.0.1).

Figure 21-1   Basic VRRP Topology
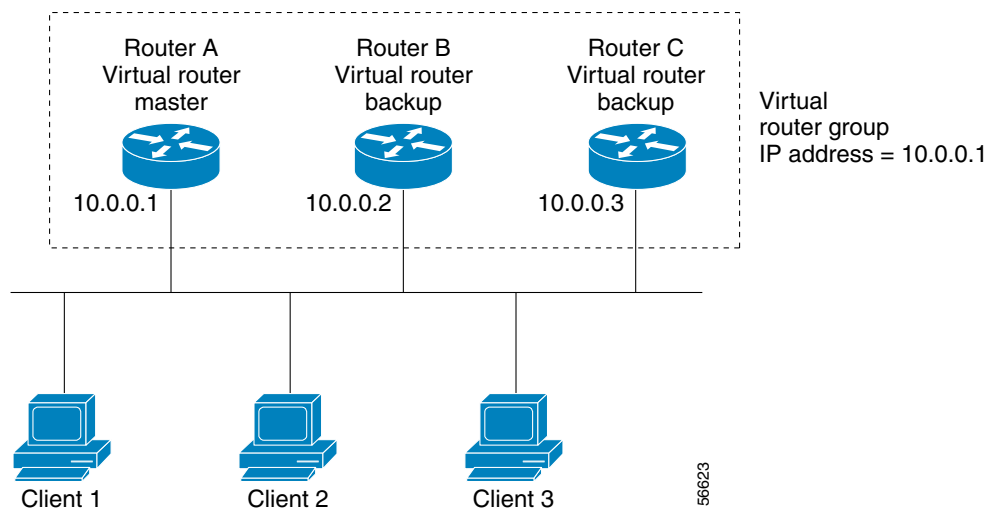
Because the virtual IP address uses the IP address of the physical Ethernet interface of Router A, Router A is the master (also known as the IP address owner*)*. As the master, Router A owns the virtual IP address of the VRRP group router and forwards packets sent to this IP address. Clients 1 through 3 are configured with the default gateway IP address of 10.0.0.1.

Routers B and C function as backups. If the master fails, the backup router with the highest priority becomes the master and takes over the virtual IP address to provide uninterrupted service for the LAN hosts. When router A recovers, it becomes the router master again. For more information, see the "VRRP Router Priority and Preemption" section.

Note Packets received on a routed port destined for the VRRP virtual IP address will terminate on the local router, regardless of whether that router is the master VRRP router or a backup VRRP router. This includes ping and Telnet traffic. Packets received on a Layer 2 (VLAN) interface destined for the VRRP virtual IP address will terminate on the master router.

VRRP Benefits

The benefits of VRRP are as follows:

- Redundance—Enables you to configure multiple routers as the default gateway router, which reduces the possibility of a single point of failure in a network.

- Load Sharing—Allows traffic to and from LAN clients to be shared by multiple routers. The traffic load is shared more equitably among available routers.

- Multiple VRRP groups—Supports up to 255 VRRP groups on a router physical interface if the platform supports multiple MAC addresses. Multiple VRRP groups enable you to implement redundancy and load sharing in your LAN topology.

- Multiple IP Addresses—Allows you to manage multiple IP addresses, including secondary IP addresses. If you have multiple subnets configured on an Ethernet interface, you can configure VRRP on each subnet.

- Preemption—Enables you to preempt a backup router that has taken over for a failing master with a higher priority backup router that has become available.

- Advertisement Protocol—Uses a dedicated Internet Assigned Numbers Authority (IANA) standard multicast address (224.0.0.18) for VRRP advertisements. This addressing scheme minimizes the number of routers that must service the multicasts and allows test equipment to accurately identify VRRP packets on a segment. IANA has assigned the IP protocol number 112 to VRRP.

- The benefits of VRRPv3 are as follows:
    - Interoperability in multi-vendor environments.
    - Support for the IPv4 and IPv6 address families.

Multiple VRRP Groups

You can configure up to 255 VRRP groups on a physical interface. The actual number of VRRP groups that a router interface can support depends on the following factors:

- Router processing capability
- Router memory capability

In a topology where multiple VRRP groups are configured on a router interface, the interface can act as a master for one VRRP group and as a backup for one or more other VRRP groups.

Figure 21-2 shows a LAN topology in which VRRP is configured so that Routers A and B share the traffic to and from clients 1 through 4. Routers A and B act as backups to each other if either router fails.

Figure 21-2   Load Sharing and Redundancy VRRP Topology
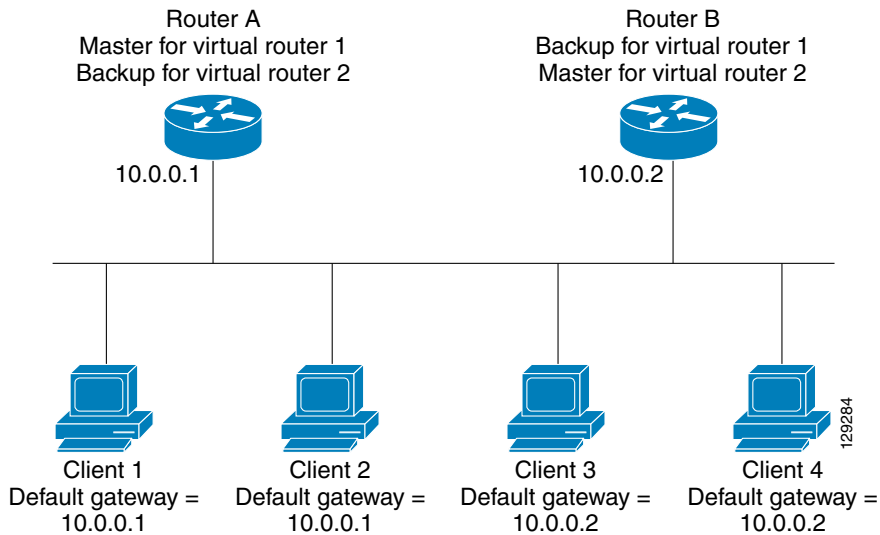
This topology contains two virtual IP addresses for two VRRP groups that overlap. For VRRP group 1, Router A is the owner of IP address 10.0.0.1 and is the master. Router B is the backup to router A. Clients 1 and 2 are configured with the default gateway IP address of 10.0.0.1.

For VRRP group 2, Router B is the owner of IP address 10.0.0.2 and is the master. Router A is the backup to router B. Clients 3 and 4 are configured with the default gateway IP address of 10.0.0.2.

VRRP Router Priority and Preemption

An important aspect of the VRRP redundancy scheme is the VRRP router priority because the priority determines the role that each VRRP router plays and what happens if the master router fails.

If a VRRP router owns the virtual IP address and the IP address of the physical interface, this router functions as the master. The priority of the master is 255.

Priority also determines if a VRRP router functions as a backup router and the order of ascendancy to becoming a master if the master fails.

When the master switch and the backup switches have the same priority value, the backup switch has a higher IP address, and initially the master switch is up. In this scenario, when the backup switch comes up, it should not disturb the state of master switch. Only when the master switch goes down, the backup switch becomes the master switch.

For example, if router A, the master in a LAN topology fails, VRRP must determine if backups B or C should take over. If you configure router B with priority 101 and router C with the default priority of 100, VRRP selects router B to become the master because it has the higher priority. If you configure routers B and C with the default priority of 100, VRRP selects the backup with the higher IP address to become the master.

VRRP uses preemption to determine what happens after a VRRP backup router becomes the master. With preemption enabled by default, VRRP will switch to a backup if that backup comes online with a priority higher than the new master. For example, if Router A is the master and fails, VRRP selects Router B (next in order of priority). If Router C comes online with a higher priority than Router B, VRRP selects Router C as the new master, even though Router B has not failed.

If you disable preemption, VRRP will only switch if the original master recovers or the new master fails.

VRRP Advertisements

The VRRP master sends VRRP advertisements to other VRRP routers in the same group. The advertisements communicate the priority and state of the master. Cisco NX-OS encapsulates the VRRP advertisements in IP packets and sends them to the IP multicast address assigned to the VRRP group. Cisco NX-OS sends the advertisements once every second by default, but you can configure a different advertisement interval.

VRRP Authentication

VRRP supports the following authentication mechanisms:

- No authentication
- Plain text authentication

VRRP rejects packets in any of the following cases:

- The authentication schemes differ on the router and in the incoming packet.
- Text authentication strings differ on the router and in the incoming packet.

VRRPv3

VRRP version 3 (VRRPv3) enables a group of switches to form a single virtual switch in order to provide redundancy and reduce the possibility of a single point of failure in a network. The LAN clients can then be configured with the virtual switch as their default gateway. The virtual switch, representing a group of switches, is also known as a VRRPv3 group.

Virtualization Support

VRRP supports virtual routing and forwarding (VRF) instances. By default, Cisco NX-OS places you in the default VRF unless you specifically configure another VRF.

If you change the VRF membership of an interface, Cisco NX-OS removes all Layer 3 configuration, including VRRP.

For more information, see Chapter 14, "Configuring Layer 3 Virtualization."

Licensing Requirements for VRRP

The following table shows the licensing requirements for this feature:

Product	License Requirement
Cisco NX-OS	VRRP requires no license. Any feature not included in a license package is bundled with the Cisco NX-OS system images and is provided at no extra charge to you. For a complete explanation of the Cisco NX-OS licensing scheme, see the *Cisco NX-OS Licensing Guide*.
	Note Make sure the LAN Base Services license is installed on the switch to enable Layer 3 interfaces.

Guidelines and Limitations

VRRP has the following configuration guidelines and limitations:

- You cannot configure VRRP on the management interface.

- When VRRP is enabled, you should replicate the VRRP configuration across switches in your network.

- We recommend that you do not configure more than one first-hop redundancy protocol on the same interface.

- You must configure an IP address for the interface that you configure VRRP on and enable that interface before VRRP becomes active.

- Cisco NX-OS removes all Layer 3 configurations on an interface when you change the interface VRF membership, port channel membership, or when you change the port mode to Layer 2.

- When you configure VRRP to track a Layer 2 interface, you must shut down the Layer 2 interface and reenable the interface to update the VRRP priority to reflect the state of the Layer 2 interface.

- VRRPv3 has the following configuration guidelines and limitations:

    - VRRPv3 is not intended as a replacement for existing dynamic protocols. VRRPv3 is designed for use over multi-access, multicast, or broadcast-capable Ethernet LANs.

    - VRRPv3 is supported only on Ethernet and Fast Ethernet interfaces, bridge group virtual interfaces (BVIs), and Gigabit Ethernet interfaces as well as on Multiprotocol Label Switching (MPLS) virtual private networks (VPNs), VRF-aware MPLS VPNs, and VLANs.

    - When VRRPv3 is in use, VRRPv2 is unavailable. To configure VRRPv3, you must disable any VRRPv2 configuration.

    - Use VRRPv3 millisecond timers only where absolutely necessary and with careful consideration and testing. Millisecond values work only under favorable circumstances. The millisecond timer values are compatible with third-party vendors, as long as they also support VRRPv3.

Default Settings

Table 21-1 lists the default settings for VRRP parameters.

Table 21-1   Default VRRP Parameters

Parameters	Default
advertisement interval	1 second
authentication	No authentication
preemption	Enabled
priority	100
VRRP feature	Disabled
VRRPv3	Disabled
VRRPv3 secondary address matching	Enables
VRRPv3 timers advertise	1000 milliseconds

Configuring VRRP

This section includes the following topics:

✎
Note If you are familiar with the Cisco IOS CLI, be aware that the Cisco NX-OS commands for this feature might differ from the Cisco IOS commands that you would use.

Enabling the VRRP Feature

You must globally enable the VRRP feature before you can configure and enable any VRRP groups.

To enable the VRRP feature, use the following command in global configuration mode:

Command	Purpose

`feature vrrp`
 	
`Example:`
`switch(config)# feature vrrp`
	Enables VRRP.

To disable the VRRP feature and remove all associated configuration, use the following command in global configuration mode:

Command	Purpose

`no feature vrrp`
 	
`Example:`
`switch(config)# no feature vrrp`
	Disables the VRRP feature.

Configuring VRRP Groups

You can create a VRRP group, assign the virtual IP address, and enable the group.

You can configure one virtual IPv4 address for a VRRP group. By default, the master VRRP router drops the packets addressed directly to the virtual IP address because the VRRP master is only intended as a next-hop router to forward packets. Some applications require that Cisco NX-OS accept packets addressed to the virtual router IP. Use the secondary option to the virtual IP address to accept these packets when the local router is the VRRP master.

Once you have configured the VRRP group, you must explicitly enable the group before it becomes active.

BEFORE YOU BEGIN

Ensure that you configure an IP address on the interface (see the .

SUMMARY STEPS

1. **configure terminal**

2. **interface** *interface-type slot/port*

3. **no switchport**

4. **vrrp** *number*

5. **address** *ip-address* [**secondary**]

6. **no shutdown**

7. (Optional) **show vrrp**

8. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**configure terminal** **Example:** switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	**interface** *interface-type slot/port* **Example:** switch(config)# switch(config-if)# interface ethernet 1/2	Enters interface configuration mode.
Step 3	**no switchport** **Example:** switch(config-if)# no switchport	Configures the interface as a Layer 3 routed interface.
Step 4	**vrrp** *number* **Example:** switch(config-if)# vrrp 250 switch(config-if-vrrp)#	Creates a virtual router group. The range is from 1 to 255.

	Command	Purpose
Step 5	**address** *ip-address* [**secondary**] **Example:** switch(config-if-vrrp)# **address 192.0.2.8**	Configures the virtual IPv4 address for the specified VRRP group. This address should be in the same subnet as the IPv4 address of the interface. Use the **secondary** option only if applications require that VRRP routers accept the packets sent to the virtual router's IP address and deliver to applications.
Step 6	**no shutdown** **Example:** switch(config-if-vrrp)# no shutdown switch(config-if-vrrp)#	Enables the VRRP group. Disabled by default.
Step 7	**show vrrp** **Example:** switch(config-if-vrrp)# show vrrp	(Optional) Displays VRRP information.
Step 8	**copy running-config startup-config** **Example:** switch(config-if-vrrp)# copy running-config startup-config	(Optional) Saves this configuration change.

Configuring VRRP Priority

The valid priority range for a virtual router is from 1 to 254 (1 is the lowest priority and 254 is the highest). The default priority value for backups is 100. For switches whose interface IP address is the same as the primary virtual IP address (the master), the default value is 255.

BEFORE YOU BEGIN

Ensure that you have enabled the VRRP feature (see the "Configuring VRRP" section on page 21-7).

Ensure that you have configured an IP address on the interface (see the "Configuring IPv4 Addressing" section on page 2-8.

SUMMARY STEPS

1. **configure terminal**

2. **interface** *interface-type slot/port*

3. **no switchport**

4. **vrrp** *number*

5. **shutdown**

6. **priority** *level* [**forwarding-threshold lower** *lower-value* **upper** *upper-value*]

7. **no shutdown**

8. (Optional) **show vrrp**

9. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**configure terminal** **Example:** switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	**interface** *interface-type slot/port* **Example:** switch(config)# interface ethernet 1/2 switch(config-if)#	Enters interface configuration mode.
Step 3	**no switchport** **Example:** switch(config-if)# no switchport	Configures the interface as a Layer 3 routed interface.
Step 4	**vrrp** *number* **Example:** switch(config-if)# vrrp 250 switch(config-if-vrrp)#	Creates a virtual router group.
Step 5	**shutdown** **Example:** switch(config-if-vrrp)# shutdown switch(config-if-vrrp)#	Disables the VRRP group. Disabled by default.
Step 6	**priority** *level* [**forwarding-threshold lower** *lower-value* **upper** *upper-value*] **Example:** switch(config-if-vrrp)# priority 60 forwarding-threshold lower 40 upper 50	Sets the priority level used to select the active router in an VRRP group. The *level* range is from 1 to 254. The default is 100 for backups and 255 for a master that has an interface IP address equal to the virtual IP address.
Step 7	**no shutdown** **Example:** switch(config-if-vrrp)# no shutdown switch(config-if-vrrp)#	Enables the VRRP group. Disabled by default.
Step 8	**show vrrp** *Example:* switch(config-if-vrrp)# show vrrp	(Optional) Displays a summary of VRRP information.
Step 9	**copy running-config startup-config** **Example:** switch(config-if-vrrp)# copy running-config startup-config	(Optional) Saves this configuration change.

Configuring VRRP Authentication

You can configure simple text authentication for a VRRP group.

BEFORE YOU BEGIN

Ensure that the authentication configuration is identical for all VRRP switches in the network.

Ensure that you have enabled the VRRP feature (see the "Configuring VRRP" section on page 21-7).

Ensure that you have configured an IP address on the interface (see the "Configuring IPv4 Addressing" section on page 2-8.

SUMMARY STEPS

1. **configure terminal**

2. **interface** *interface-type slot/port*

3. **no switchport**

4. **vrrp** *number*

5. **shutdown**

6. **authentication text** *password*

7. **no shutdown**

8. (Optional) **show vrrp**

9. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose

Step 1	**configure terminal**
	
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**interface** *interface-type slot/port*
	
	Example:
	`switch(config)# interface ethernet 1/2`
	`switch(config-if)#`
		Enters interface configuration mode.

Step 3	**no switchport** **Example:** `switch(config-if)# no switchport`	Configures the interface as a Layer 3 routed interface.

Step 4	**vrrp** *number*
	
	Example:
	`switch(config-if)# vrrp 250`
	`switch(config-if-vrrp)#`
		Creates a virtual router group.

Step 5	**shutdown**
	
	Example:
	`switch(config-if-vrrp)# shutdown`
	`switch(config-if-vrrp)#`
		Disables the VRRP group. Disabled by default.

	Command	Purpose
Step 6	**authentication text** *password* **Example:** switch(config-if-vrrp)# **authentication md5** **prd555oln47espn0 spi 0x0**	Assigns the simple text authentication option and specifies the keyname password. The keyname range is from 1 to 255 characters. We recommend that you use at least 16 characters. The text password is up to eight alphanumeric characters.
Step 7	**no shutdown** **Example:** switch(config-if-vrrp)# no shutdown switch(config-if-vrrp)#	Enables the VRRP group. Disabled by default.
Step 8	**show vrrp** **Example:** switch(config-if-vrrp)# show vrrp	(Optional) Displays a summary of VRRP information.
Step 9	**copy running-config startup-config** **Example:** switch(config-if-vrrp)# copy running-config startup-config	(Optional) Saves this configuration change.

Configuring Time Intervals for Advertisement Packets

You can configure the time intervals for advertisement packets.

BEFORE YOU BEGIN

Ensure that you have enabled the VRRP feature (see the "Configuring VRRP" section on page 21-7).

Ensure that you have configured an IP address on the interface (see the "Configuring IPv4 Addressing" section on page 2-8).

SUMMARY STEPS

1. **configure terminal**

2. **interface** *interface-type slot/port*

3. **no switchport**

4. **vrrp** *number*

5. **shutdown**

6. **advertisement-interval** *seconds*

7. **no shutdown**

8. (Optional) **show vrrp**

9. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**configure terminal** **Example:** switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	**interface** *interface-type slot/port* **Example:** switch(config)# interface ethernet 1/2 switch(config-if)#	Enters interface configuration mode.
Step 3	**no switchport** **Example:** switch(config-if)# no switchport	Configures the interface as a Layer 3 routed interface.
Step 4	**vrrp** *number* **Example:** switch(config-if)# vrrp 250 switch(config-if-vrrp)#	Creates a virtual router group.
Step 5	**shutdown** **Example:** switch(config-if-vrrp)# shutdown switch(config-if-vrrp)#	Disables the VRRP group. Disabled by default.
Step 6	**advertisement-interval** *seconds* **Example:** switch(config-if-vrrp)# advertisement-interval 15	Sets the interval time in seconds between sending advertisement frames. The range is from 1 to 254. The default is 1 second.
Step 7	**no shutdown** **Example:** switch(config-if-vrrp)# no shutdown switch(config-if-vrrp)#	Enables the VRRP group. Disabled by default.
Step 8	**show vrrp** **Example:** switch(config-if-vrrp)# show vrrp	(Optional) Displays a summary of VRRP information.
Step 9	**copy running-config startup-config** **Example:** switch(config-if-vrrp)# copy running-config startup-config	(Optional) Saves this configuration change.

Disabling Preemption

You can disable preemption for a VRRP group member. If you disable preemption, a higher-priority backup router will not take over for a lower-priority master router. Preemption is enabled by default.

BEFORE YOU BEGIN

Ensure that you have enabled the VRRP feature (see the "Configuring VRRP" section on page 21-7).

Ensure that you have configured an IP address on the interface (see the "Configuring IPv4 Addressing" section on page 2-8).

SUMMARY STEPS

1. **configure terminal**
2. **interface** *interface-type slot/port*
3. **no switchport**
4. **vrrp** *number*
5. **shutdown**
6. **no preempt**
7. **no shutdown**
8. (Optional) **show vrrp**
9. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose

Step 1	`configure terminal`
	
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	`interface` *interface-type slot/port*
	
	Example:
	`switch(config)# interface ethernet 1/2`
	`switch(config-if)#`
		Enters interface configuration mode.

Step 3	`no switchport`
	
	Example:
	`switch(config-if)# no switchport`
		Configures the interface as a Layer 3 routed interface.

Step 4	`vrrp` *number*
	
	Example:
	`switch(config-if)# vrrp 250`
	`switch(config-if-vrrp)#`
		Creates a virtual router group.

Step 5	`no shutdown`
	
	Example:
	`switch(config-if-vrrp)# no shutdown`
		Enables the VRRP group. Disabled by default.

Step 6	`no preempt`
	
	Example:
	`switch(config-if-vrrp)# no preempt`
		Disables the preempt option and allows the master to remain when a higher-priority backup appears.

	Command	Purpose
Step 7	`no shutdown` **Example:** switch(config-if-vrrp)# no shutdown	Enables the VRRP group. Disabled by default.
Step 8	`show vrrp` **Example:** switch(config-if-vrrp)# show vrrp	(Optional) Displays a summary of VRRP information.
Step 9	`copy running-config startup-config` **Example:** switch(config-if-vrrp)# copy running-config startup-config	(Optional) Saves this configuration change.

Configuring VRRP Interface State Tracking

Interface state tracking changes the priority of the virtual router based on the state of another interface in the switch. When the tracked interface goes down or the IP address is removed, Cisco NX-OS assigns the tracking priority value to the virtual router. When the tracked interface comes up and an IP address is configured on this interface, Cisco NX-OS restores the configured priority to the virtual router (see the "Configuring VRRP Priority" section on page 21-9).

Note For interface state tracking to function, you must enable preemption on the interface.

Note VRRP does not support Layer 2 interface tracking.

BEFORE YOU BEGIN

Ensure that you have enabled the VRRP feature (see the "Configuring VRRP" section on page 21-7).

Ensure that you have configured an IP address on the interface (see the "Configuring IPv4 Addressing" section on page 2-8.

Ensure that you have enabled the virtual router (see the "Configuring VRRP Groups" section on page 21-7).

SUMMARY STEPS

1. **configure terminal**
2. **interface** *interface-type slot/port*
3. **no switchport**
4. **vrrp** *number*
5. **shutdown**
6. **track interface** *type number* **priority** *value*
7. **no shutdown**
8. (Optional) **show vrrp**

9. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**configure terminal** **Example:** switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	**interface** *interface-type slot/port* **Example:** switch(config)# interface ethernet 1/2 switch(config-if)#	Enters interface configuration mode.
Step 3	**no switchport** **Example:** switch(config-if)# no switchport	Configures the interface as a Layer 3 routed interface.
Step 4	**vrrp** *number* **Example:** switch(config-if)# vrrp 250 switch(config-if-vrrp)#	Creates a virtual router group.
Step 5	**shutdown** **Example:** switch(config-if-vrrp)# shutdown switch(config-if-vrrp)#	Disables the VRRP group. Disabled by default.
Step 6	**track interface** **type** *number* **priority** *value* **Example:** switch(config-if-vrrp)# track interface ethernet 2/10 priority 254	Enables interface priority tracking for a VRRP group. The priority range is from 1 to 254.
Step 7	**no shutdown** **Example:** switch(config-if-vrrp)# no shutdown switch(config-if-vrrp)#	Enables the VRRP group. Disabled by default.
Step 8	**show vrrp** **Example:** switch(config-if-vrrp)# show vrrp	(Optional) Displays a summary of VRRP information.
Step 9	**copy running-config startup-config** **Example:** switch(config-if-vrrp)# copy running-config startup-config	(Optional) Saves this configuration change.

Configuring VRRPv3

Enabling VRRPv3

You must globally enable the VRRPv3 feature before you can configure and enable any VRRPv3 groups.

To enable the VRRPv3 feature, use the following command in global configuration mode:

Command	Purpose

`feature vrrpv3`
 	
`Example:`
`switch(config)# feature vrrpv3`
	Enables VRRP version 3. The **no** form of this command disables VRRPv3 in a VDC.
	
	If VRRPv2 is currently configured, use the **no feature vrrp** command in global configuration mode to remove the VRRPv2 configuration and then use the f**eature vrrpv3** command to enable VRRPv3.

Configuring VRRPv3 Groups

You can create a VRRPv3 group, assign the virtual IP address, and enable the group.

You can configure one virtual IPv4 address for a VRRPv3 group. By default, the master VRRPv3 router drops the packets addressed directly to the virtual IP address because the VRRPv3 master is only intended as a next-hop router to forward packets. Some applications require that Cisco NX-OS accept packets addressed to the virtual router IP. Use the secondary option to the virtual IP address to accept these packets when the local router is the VRRPv3 master.

Note After you have configured the VRRPv3 group, you must explicitly enable the group before it becomes active.

BEFORE YOU BEGIN

- Ensure that the VRRPv3 feature is enabled.
- Ensure that you configure an IP address on the interface.

SUMMARY STEPS

1. **configure terminal**
2. **interface** *interface-type slot/port*
3. **vrrpv3** *number* **address-family** {**ipv4** | **ipv6**}
4. (Optional) **address** *ip-address* [**primary** | **secondary**]
5. (Optional) **description** *description*
6. (Optional) **match-address**
7. (Optional) **preempt** [**delay minimum** *seconds*]
8. (Optional) **priority** *level*

9. (Optional) **timers advertise** *interval*

10. (Optional) **vrrpv2**

11. (Optional) **shutdown**

12. (Optional) **show fhrp** [*interface-type interface-number*] [**verbose**]

13. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose

Step 1	`configure terminal`
	
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	`interface interface-type slot/port`
	
	Example:
	`switch(config)# interface ethernet 2/1`
	`switch(config-if)#`
		Enters interface configuration mode.

Step 3	[**no**] **vrrpv3** number **address-family** {**ipv4** | **ipv6**}
	
	Example:
	`switch(config-if)# vrrpv3 5 address-family`
	`ipv4`
	`switch(config-if-vrrpv3-group)#`
		Creates a VRRPv3 group and enters VRRPv3 group configuration mode. The range is from 1 to 255.
		
		The **no** form of this command removes all configuration defined within the submode.

Step 4	[**no**] **address** *ip-address* [**primary** | **secondary**]
	
	Example:
	`switch(config-if-vrrpv3-group)# address`
	`100.0.1.10 primary`
		(Optional) Specifies a primary or secondary IPv4 or IPv6 address for the VRRPv3 group.
		
		Note To utilize secondary IP addresses in a VRRPv3 group, you must first configure a primary IP address on the same group.

Step 5	[**no**] **description** *description*
	
	Example:
	`switch(config-if-vrrpv3-group)# description`
	`group3`
		(Optional) Specifies a description for the VRRPv3 group. You can enter up to 80 alphanumeric characters.

Step 6	[**no**] **match-address** **Example:** `switch(config-if-vrrpv3-group)# match-address`	(Optional) Matches the secondary address in the advertisement packet against the configured address.

Step 7	[**no**] **preempt** [**delay minimum** *seconds*]
	
	Example:
	`switch(config-if-vrrpv3-group)# preempt`
	`delay minimum 30`
		(Optional) Enables preemption of a lower priority master switch with an optional delay. The range is from 0 to 3600.

Step 8	[**no**] **priority** *level* **Example:** `switch(config-if-vrrpv3-group)# priority 3`	(Optional) Specifies the priority of the VRRPv3 group. The range is from 1 to 254.

	Command	Purpose
Step 9	[**no**] **timers advertise** *interval* **Example:** switch(config-if-vrrpv3-group)# timers advertise 1000	(Optional) Sets the advertisement timer in milliseconds. The range is from 100 to 40950. **Note** Cisco recommends that you set this timer to a value greater than or equal to 1 second.
Step 10	[**no**] **vrrpv2** **Example:** switch(config-if-vrrpv3-group)# vrrpv2	(Optional) Enables support for VRRPv2 simultaneously, to ensure interoperability with devices that support only VRRPv2. **Note** VRRPv2 compatibility mode is provided to allow an upgrade from VRRPv2 to VRRPv3. This is not a full VRRPv2 implementation and should be used only to perform an upgrade.
Step 11	[**no**] **shutdown** **Example:** switch(config-if-vrrp3-group)# shutdown	(Optional) Disables VRRP configuration for the VRRPv3 group.
Step 12	**show fhrp** [*interface-type interface-number*] [**verbose**] **Example:** switch(config-if-vrrp3-group)# show fhrp port-channnel 101 verbose	(Optional) Displays First Hop Redundancy Protocol (FHRP) information. Use the **verbose** keyword to view detailed information.
Step 13	**copy running-config startup-config** **Example:** switch(config-if-vrrp3-group)# copy running-config startup-config	(Optional) Saves this configuration change.

Configuring the Delay Period for FHRP Client Initialization

You can configure the delay period for the initialization of FHRP clients.

Note   In all FHRP protocols, we do not recommend to use aggressive timers as they cause CPU spikes and they result in increased control packet flow. In case of VRRPv3, you should configure sufficient interface delay/reload delay for proper failover of the VRRP nodes.

To configure this feature, use the following command in interface configuration mode:

Command	Purpose
fhrp delay {[**minimum**] | [**reload**] *seconds*} **Example:** switch(config)# fhrp delay minimum 34	Specifies the delay period for the initialization of FHRP clients. The range is from 0 to 3600 seconds. The **minimum** keyword configures the delay period after an interface becomes available. The **reload** command configures the delay period after the device reloads.

Configuring VRRPv3 Control Groups

You can configure a VRRPv3 control group.

BEFORE YOU BEGIN

- Ensure that the VRRPv3 feature is enabled.
- Ensure that you configure an IP address on the interface.

SUMMARY STEPS

1. **configure terminal**
2. **interface** *interface-type slot/port*
3. **ip address** *ip-address mask* [**secondary**]
4. **vrrpv3** *number* **address-family** {**ipv4** \| **ipv6**}
5. (Optional) **address** *ip-address* [**primary** \| **secondary**]
6. (Optional) **shutdown**
7. (Optional) **show fhrp** [*interface-type interface-number*] [**verbose**]
8. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command	Purpose
Step 1	**configure terminal** **Example:** switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	**interface** *interface-type slot/port* **Example:** switch(config)# interface ethernet 2/1 switch(config-if)#	Enters interface configuration mode.

	Command	Purpose
Step 3	[**no**] **ip address** ip-address mask [**secondary**] **Example:** switch(config-if)# ip address 209.165.200.230 255.255.255.224	Configures the IP address on the interface. **Note** You can use the **secondary** keyword to configure additional IP addresses on the interface.
Step 4	[**no**] **vrrpv3** number **address-family** {**ipv4** | **ipv6**} **Example:** switch(config-if)# vrrpv3 5 address-family ipv4 switch(config-if-vrrpv3-group)#	Creates a VRRPv3 group and enters VRRPv3 group configuration mode. The range is from 1 to 255.
Step 5	[**no**] **address** ip-address [**primary** | **secondary**] **Example:** switch(config-if-vrrpv3-group)# address 209.165.200.227 primary	(Optional) Specifies a primary or secondary IPv4 or IPv6 address for the VRRPv3 group.
Step 6	[**no**] **shutdown** **Example**: switch(config-if-vrrp3-group)# shutdown	(Optional) Disables VRRP configuration for the VRRPv3 group.
Step 7	**show fhrp** [*interface-type interface-number*] [**verbose**] **Example:** switch(config-if-vrrp3-group)# show fhrp port-channnel 101 verbose	(Optional) Displays First Hop Redundancy Protocol (FHRP) information. Use the **verbose** keyword to view detailed information.
Step 8	**copy running-config startup-config** **Example:** switch(config-if-vrrp3-group)# copy running-config startup-config	(Optional) Saves this configuration change.

Verifying the VRRPv2 Configuration

To display the VRRPv2 configuration information, perform one of the following tasks:

Command	Purpose
show vrrpv2	Displays the VRRP status for all groups.
show vrrpv2 vr *group-number*	Displays the VRRP status for a VRRP group.
show vrrpv2 vr *number* **interface** *interface-type port* **configuration**	Displays the virtual router configuration for an interface.
show vrrpv2 vr *number* **interface** *interface-type port* **status**	Displays the virtual router status for an interface.
show fhrp [*interface-type interface-number*] [**verbose**]	Displays First Hop Redundancy Protocol (FHRP) information.
show interface *interface-type*	Displays the virtual router configuration for an interface.

Verifying the VRRPv3 Configuration

See the following table for information on the fields in the **show vrrpv3** command output:

Command	Purpose
>	Redirect it to a file
>>	Redirect it to a file in append mode
all	All VRRPV3 information
brief	Brief output
detail	Detail output
ethernet	Ethernet IEEE 802.3z
internal	Internal command
ipv4	IPv4
ipv6	IPv6
loopback	Loopback interface
port-channel	Port Channel interface
statistics	Statistics output
Vlan	VLAN interface
|	Pipe command output to filter

For example, use the **show vrrpv3 statistics** command to display the VRRPv3 statistics:

show vrrpv3 statistics

Displaying VRRP Statistics

To display VRRP statistics, use the following commands:

Command	Purpose
show vrrp vr *number* **interface** *interface-type port* **statistics**	Displays the virtual router information.
show vrrp statistics	Displays the VRRP statistics.

Use the **clear vrrp vr** command to clear the IPv4 VRRP statistics for a specified interface.

Use the **clear vrrp ipv4** command to clear all the statistics for the specified IPv4 virtual router.

Configuration Examples for VRRPv2

In this example, Router A and Router B each belong to three VRRPv2 groups. In the configuration, each group has the following properties:

- Group 1:
  - Virtual IP address is 10.1.0.10.
  - Router A will become the master for this group with priority 120.
  - Advertising interval is 3 seconds.
  - Preemption is enabled.
- Group 5:
  - Router B will become the master for this group with priority 200.
  - Advertising interval is 30 seconds.
  - Preemption is enabled.
- Group 100:
  - Router A will become the master for this group first because it has a higher IP address (10.1.0.2).
  - Advertising interval is the default 1 second.
  - Preemption is disabled.

Router A
```
interface ethernet 1/0
   no switchport
   ip address 10.1.0.2/16
   no shutdown
    vrrpv2 1
     priority 120
     authentication text cisco
     advertisement-interval 3
     address 10.1.0.10
     no shutdown
    vrrpv2 5
     priority 100
     advertisement-interval 30
     address 10.1.0.50
     no shutdown
    vrrpv2 100
     no preempt
     address 10.1.0.100
     no shutdown
```

Router B
```
interface ethernet 1/0
 no switchport
 ip address 10.2.0.1/2
 no shutdown
   vrrpv2 1
    priority 100
    authentication text cisco
    advertisement-interval 3
    address 10.2.0.10
    no shutdown

   vrrpv2 5
    priority 200
    advertisement-interval 30
    address 10.2.0.50
    no shutdown
   vrrpv2 100
    no preempt
```

```
        address 10.2.0.100
        no shutdown
```

Configuration Example for VRRPv3

See the following configuration example for VRRPv3.

```
interface Vlan20
  vrrpv3 10 address-family ipv4
    timers advertise 1000
    priority 100
    preempt
    match-address
    no vrrpv2
    address 20.1.1.1 primary
    address 20.1.1.5 secondary
  vrrpv3 10 address-family ipv6
    timers advertise 1000
    priority 100
    preempt
    match-address
    no vrrpv2
    address fe80::1 primary
    address 2011::5
```

Additional References

For additional information related to implementing VRRP, see the following sections:

- Related Documents, page 21-24

Related Documents

Related Topic	Document Title
Configuring the Hot Standby Routing Protocol	Chapter 20, "Configuring HSRP"
VRRP CLI commands	*Cisco Nexus 3000 Series Command Reference*