



VRRPv3 Protocol Configuration Guide, Cisco Catalyst IE9300 Rugged Series Switches

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Preface

This preface describes the conventions of this document and information on how to obtain other documentation. It also provides information on what's new in Cisco product documentation.

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Document Conventions

This document uses the following conventions:

Convention	Description
^ or Ctrl	Both the ^ symbol and Ctrl represent the Control (Ctrl) key on a keyboard. For example, the key combination ^D or Ctrl-D means that you hold down the Control key while you press the D key. (Keys are indicated in capital letters but are not case sensitive.)
bold font	Commands and keywords and user-entered text appear in bold font .
<i>Italic font</i>	Document titles, new or emphasized terms, and arguments for which you supply values are in <i>italic font</i> .
Courier font	Terminal sessions and information the system displays appear in <code>courier font</code> .
Bold Courier font	Bold Courier font indicates text that the user must enter.
[x]	Elements in square brackets are optional.
...	An ellipsis (three consecutive nonbolded periods without spaces) after a syntax element indicates that the element can be repeated.
	A vertical line, called a pipe, indicates a choice within a set of keywords or arguments.
[x y]	Optional alternative keywords are grouped in brackets and separated by vertical bars.

Convention	Description
{x y}	Required alternative keywords are grouped in braces and separated by vertical bars.
[x {y z}]	Nested set of square brackets or braces indicate optional or required choices within optional or required elements. Braces and a vertical bar within square brackets indicate a required choice within an optional element.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
< >	Nonprinting characters such as passwords are in angle brackets.
[]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Reader Alert Conventions

This document may use the following conventions for reader alerts:



Note Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the manual.



Tip Means *the following information will help you solve a problem*.



Caution Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.



Timesaver Means *the described action saves time*. You can save time by performing the action described in the paragraph.

Take note of the following general safety warnings:

**Warning****IMPORTANT SAFETY INSTRUCTIONS**

Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Read the installation instructions before using, installing, or connecting the system to the power source. Use the statement number at the beginning of each warning statement to locate its translation in the translated safety warnings for this device.

SAVE THESE INSTRUCTIONS



Related Documentation

**Note**

Before installing or upgrading the , refer to the release notes.

- Cisco Validated Designs documents, located at:

<http://www.cisco.com/go/designzone>

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see [What's New in Cisco Product Documentation](#).

You can also subscribe to the *What's New in Cisco Product Documentation* RSS feed, which delivers lists and content of new and revised Cisco technical documentation directly to your desktop, using any RSS reader application. This RSS feed is a free service.



CHAPTER 1

VRRPv3 Protocol Support

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VRRPv3 protocol

Virtual Router Redundancy Protocol version 3 (VRRPv3) protocol is a network protocol that:

- provides redundancy for default gateway devices,
- supports IPv4 and IPv6 address families, and
- enables load sharing among multiple devices.

VRRPv3 benefits

- IPv4 and IPv6 support: It supports both IPv4 and IPv6 address families, unlike VRRPv2 which supports only IPv4.



Note When VRRPv3 is in use, VRRPv2 is unavailable. For VRRPv3 to be configurable, the **fhrp version vrrpv3** command must be used in global configuration mode.

- Network redundancy: Configures multiple devices as default gateways, eliminating single points of failure in a network.
- Traffic load sharing: Distributes traffic from LAN clients across multiple devices for equitable load distribution.

- Multiple virtual devices: It supports up to 255 virtual devices (VRRP groups) per physical interface, enabling extensive redundancy and load sharing in your LAN topology. In scaled environments, VRRS Pathways should be used in combination with VRRP control groups.
- Multiple IP address management: It manages multiple IP addresses, including secondary addresses, allowing VRRP configuration on each subnet.



Note To utilize secondary IP addresses in a VRRP group, a primary address must be configured on the same group.

- Device preemption: It allows a higher-priority backup device to take over as primary from a lower-priority device.



Note Preemption of a lower priority primary device is enabled with an optional delay.

- Standard advertisement protocol: It uses dedicated IANA standard multicast addresses (224.0.0.18 for IPv4, FF02::0:0:0:0:0:12 for IPv6) for advertisements, minimizing network overhead and enabling accurate identification of VRRP packets. The IANA has assigned VRRP the IP protocol number 112.

VRRP device priority and preemption

VRRP device priority and preemption is an aspect of the VRRP redundancy scheme that:

- determines the role each VRRP device plays,
- dictates the behavior upon a primary virtual device failure, and
- enables a higher-priority device to take over from a lower-priority device.

If a VRRP device owns the IP address of the virtual device and the IP address of the physical interface, this device functions as a primary virtual device. Priority also determines if a VRRP device functions as a virtual device backup and the order of ascendancy to becoming a primary virtual device if the primary virtual device fails. You can configure the priority of each virtual device backup with a value of 1 through 254 using the `priority` command.

By default, a preemptive scheme is enabled whereby a higher priority virtual device backup that becomes available takes over from the virtual device backup that was elected to become primary virtual device. You can disable this preemptive scheme using the `no preempt` command. If preemption is disabled, the virtual device backup that is elected to become primary virtual device remains the primary until the original primary virtual device recovers and becomes primary again.



Note Preemption of a lower priority primary device is enabled with an optional delay.

VRRP device election based on priority

For example, if device A, the primary virtual device in a LAN topology, fails, an election process takes place to determine if virtual device backups B or C should take over.

- If devices B and C are configured with the priorities of 101 and 100, respectively, device B is elected to become primary virtual device because it has the higher priority.
- If devices B and C are both configured with the priority of 100, the virtual device backup with the higher IP address is elected to become the primary virtual device.

VRRP advertisements

VRRP advertisements are messages sent by the primary virtual device that:

- communicate the priority and state of the primary virtual device,
- are encapsulated into either IPv4 or IPv6 packets, and
- are sent to the appropriate multicast address assigned to the VRRP group.

For IPv4, the multicast address is 224.0.0.18. For IPv6, the multicast address is FF02::0:0:0:0:0:0:0:12. The advertisements are sent every second by default and the interval is configurable.

VRRPv3 protocol restrictions

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.

Enable VRRPv3 on a device

To activate VRRPv3 functionality on the device.

Perform these steps to enable VRRPv3 on a device.

Procedure

Step 1 Use the **enable** command to enter privileged EXEC mode.

Example:

```
Switch> enable
```

Step 2 Use the **configure terminal** command to enter global configuration mode.

Example:

```
Switch# configure terminal
```

Step 3 Use the **fhrp version vrrp v3** command to configure VRRPv3 and VRRS.

Example:

```
Switch(config)# fhrp version vrrp v3
```

Step 4 Use the **end** command to return privileged EXEC mode.

Example:

```
Switch(config-if-vrrp)# end
```

Create and customize a VRRP group

You can establish a VRRP group and configure its operational parameters.

VRRP groups enable redundancy and load sharing for network devices.

Before you begin

Ensure VRRPv3 is enabled on the device

Procedure

Step 1 VRRP Group Creation

a) Use the **enable** command to enter privileged EXEC mode.

Example:

```
Switch> enable
```

b) Use the **configure terminal** command to enter global configuration mode.

Example:

```
Switch# configure terminal
```

c) Use the **fhrp version vrrp v3** command to enable the ability to configure VRRPv3 and VRRS.

Example:

```
Switch(config)# fhrp version vrrp v3
```

d) Use the **interface** command to enter interface configuration mode.

Example:

```
Switch(config)# interface GigabitEthernet 1/0/1
```

e) Use the **vrrp group-id address-family {ipv4 | ipv6}** command to create a VRRP group and enter VRRP configuration mode.

Example:

```
Switch(config-if)# vrrp 3 address-family ipv4
```

Step 2 VRRP group customization

- a) (Optional) Use the **address ip-address [primary | secondary]** command to specify a primary or secondary address for the VRRP group.

Example:

```
Switch(config-if-vrrp)# address 100.0.1.10 primary
```

Note

VRRPv3 for IPv6 requires that a primary virtual link-local IPv6 address is configured to allow the group to operate. After the primary link-local IPv6 address is established on the group, you can add the secondary global addresses.

- b) (Optional) Use the **description group** command to specify a description for the VRRP group.

Example:

```
Switch(config-if-vrrp)# description group 3
```

- c) (Optional) Use the **match-address** command to match secondary addresses in the advertisement packet against the configured address.

Example:

```
Switch(config-if-vrrp)# match-address
```

Note

Secondary address matching is enabled by default.

- d) (Optional) Use the **preempt delay minimum** command to enable preemption of lower priority primary Switch with an optional delay.

Example:

```
Switch(config-if-vrrp)# preempt delay minimum 30
```

Note

Preemption is enabled by default.

- e) (Optional) Use the **priority** command to specify the priority value of the VRRP group.

Example:

```
Switch(config-if-vrrp)# priority 3
```

Note

The priority of a VRRP group is 100 by default.

- f) (Optional) Use the **timers advertise** command to set the advertisement timer in milliseconds.

Example:

```
Switch(config-if-vrrp)# timers advertise 1000
```

Note

The advertisement timer is set to 1000 milliseconds by default.

Step 3 Operational VRRP settings

- a) (Optional) Use the **vrrpv2** command to enable support for VRRPv2 configured Switches in compatibility mode.

Example:

```
Switch(config-if-vrrp)# vrrpv2
```

- b) (Optional) Use the **vrrs leader** command to specify a leader's name to be registered with VRRS and to be used by followers.

Example:

```
Switch(config-if-vrrp)# vrrs leader leader-1
```

Note

A registered VRRS name is unavailable by default.

- c) (Optional) Use the **shutdown** command to disable VRRP configuration for the VRRP group.

Example:

```
Switch(config-if-vrrp)# shutdown
```

Note

VRRP configuration is enabled for a VRRP group by default.

- d) (Optional) Use the **end** command to return to privileged EXEC mode.

Example:

```
Switch(config)# end
```

A VRRP group is created and configured according to specified parameters.

Configure the delay period before FHRP client initialization

You can set a delay before FHRP clients initialize on an interface.

This delay helps ensure network stability after an interface comes up.

Before you begin

Ensure VRRPv3 is enabled on the device.

Procedure

- Step 1** Use the **enable** command to enter privileged EXEC mode.

Example:

```
Switch> enable
```

- Step 2** Use the **configure terminal** command to enter global configuration mode.

Example:

```
Switch# configure terminal
```

- Step 3** Use the **fhrp version vrrp v3** command to configure VRRPv3 and VRRS.

Example:

```
Switch(config)# fhrp version vrrp v3
```

Step 4 Use the **interface** command to enter interface configuration mode.

Example:

```
Switch(config)# interface GigabitEthernet 1/0/1
```

Step 5 Use the **fhrp delay {[minimum] [reload] seconds}** command to specify the delay period for the initialization of FHRP clients after an interface comes up. The range is 0-3600 seconds.

Example:

```
Switch(config-if)# fhrp delay minimum 5
```

Step 6 Use the **end** command to return privileged EXEC mode.

Example:

```
Switch(config-if-vrrp)# end
```

VRRP statistics details

You can view the status, configuration, and statistics details for a VRRP group using the **show vrrp detail** command.

```
Switch# show vrrp detail
```

```
GigabitEthernet1/0/1- Group 3 - Address-Family IPv4
```

```
Description is "group 3" State is MASTER State duration 53.901 secs Virtual
```

```
IP address is 100.0.1.10 Virtual MAC address is 0000.5E00.0103
```

```
Advertisement interval is 1000 msec Preemption enabled, delay min 30 secs (0 msec remaining)
```

```
Priority is 100 Master Router is 10.21.0.1 (local),
```

```
priority is 100 Master Advertisement interval is 1000 msec (expires in 832 msec)
```

```
VRRPv3 Advertisements: sent 61 (errors 0) - rcvd 0 VRRPv2 Advertisements: sent 0 (errors 0) - rcvd 0
```

