Configuring VRRP

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The Virtual Router Redundancy Protocol (VRRP) is an election protocol that dynamically assigns responsibility for one or more virtual routers to the VRRP routers on a LAN, allowing several routers on a multiaccess link to utilize the same virtual IP address. A VRRP router is configured to run the VRRP protocol in conjunction with one or more other routers attached to a LAN. In a VRRP configuration, one router is elected as the virtual router master, with the other routers acting as backups in case the virtual router master fails.

This module explains the concepts related to VRRP and describes how to configure VRRP in a network.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

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 VRRP

VRRP is designed for use over multiaccess, multicast, or broadcast capable LANs. VRRP is not intended as a replacement for existing dynamic protocols.

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VRRP is supported on Fast Ethernet, Bridge Group Virtual Interface (BVI), Gigabit Ethernet and TenGigabit interfaces, Multiprotocol Label Switching (MPLS) Virtual Private Networks (VPNs), VRF-aware MPLS VPNs, and VLANs.

The **vrrp shutdown** commnd should not be used on an interface that is configured to share its interface IP address with the VRRP virtual address. This is a misconfiguration and may result in duplicate IP address errors.

Information About VRRP

VRRP Operation

There are several ways a LAN client can determine which router should be the first hop to a particular remote destination. The client can use 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 to 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 drawback 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.

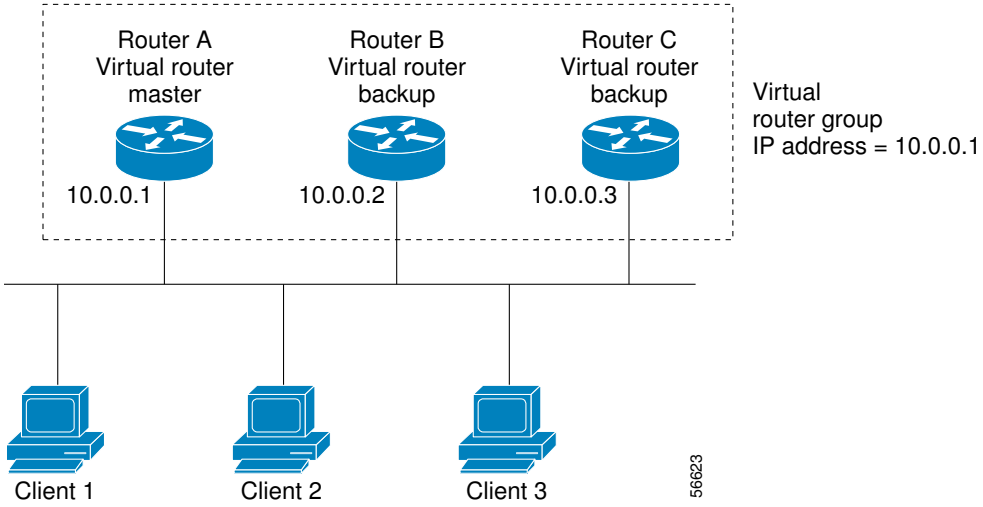
An alternative to dynamic discovery protocols is to statically configure a default router on the client. This approach simplifies client configuration and processing, but creates a single point of failure. If the default gateway fails, the LAN client is limited to communicating only on the local IP network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

VRRP can solve the static configuration problem. VRRP enables a group of routers to form a single *virtual router*. The LAN clients can then be configured with the virtual router as their default gateway. The virtual router, representing a group of routers, is also known as a VRRP group.

VRRP is supported on Fast Ethernet, BVI, and Gigabit Ethernet interfaces, on MPLS VPNs, VRF-aware MPLS VPNs, and VLANs.

The figure below shows a LAN topology in which VRRP is configured. In this example, Routers A, B, and C are *VRRP routers* (routers running VRRP) that comprise a virtual router. The IP address of the virtual router is the same as that configured for the Gigabit Ethernet interface of Router A (10.0.0.1).

Figure 1 Basic VRRP Topology

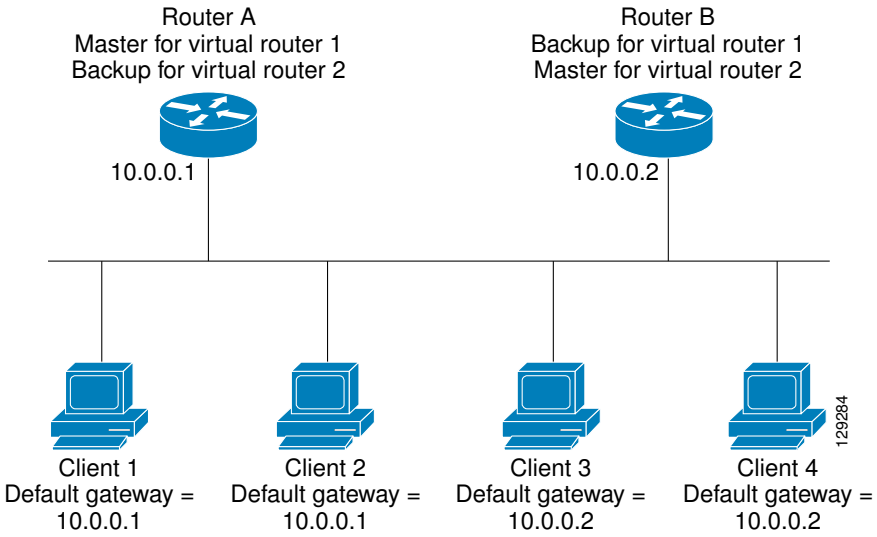


Because the virtual router uses the IP address of the physical Gigabit Ethernet interface of Router A, Router A assumes the role of the *virtual router master* and is also known as the *IP address owner*. As the virtual router master, Router A controls the IP address of the virtual router and is responsible for forwarding 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 *virtual router backups* . If the virtual router master fails, the router configured with the higher priority will become the virtual router master and provide uninterrupted service for the LAN hosts. When Router A recovers, it becomes the virtual router master again. For more detail on the roles that VRRP routers play and what happens if the virtual router master fails, see the VRRP Router Priority and Preemption, page 5 section.

The figure below 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 and that Routers A and B act as virtual router backups to each other if either router fails.

Figure 2 Load Sharing and Redundancy VRRP Topology



In this topology, two virtual routers are configured. (For more information, see the Multiple Virtual Router Support, page 4 section.) For virtual router 1, Router A is the owner of IP address 10.0.0.1 and virtual router master, and Router B is the virtual router backup to Router A. Clients 1 and 2 are configured with the default gateway IP address of 10.0.0.1.

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

VRRP Benefits

Redundancy

VRRP 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

You can configure VRRP in such a way that traffic to and from LAN clients can be shared by multiple routers, thereby sharing the traffic load more equitably among available routers.

Multiple Virtual Routers

VRRP supports up to 255 virtual routers (VRRP groups) on a router physical interface, subject to the platform supporting multiple MAC addresses. Multiple virtual router support enables you to implement redundancy and load sharing in your LAN topology.

Multiple IP Addresses

The virtual router can manage multiple IP addresses, including secondary IP addresses. Therefore, if you have multiple subnets configured on a GigabitEthernet interface, you can configure VRRP on each subnet.

Preemption

The redundancy scheme of VRRP enables you to preempt a virtual router backup that has taken over for a failing virtual router master with a higher priority virtual router backup that has become available.

Advertisement Protocol

VRRP 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. The IANA assigned VRRP the IP protocol number 112.

Multiple Virtual Router Support

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

- Router processing capability
- Router memory capability
- Router interface support of multiple MAC addresses

In a topology where multiple virtual routers are configured on a router interface, the interface can act as a master for one virtual router and as a backup for one or more virtual routers.

VRRP Router Priority and Preemption

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

If a VRRP router owns the IP address of the virtual router and the IP address of the physical interface, this router will function as a virtual router master.

Priority also determines if a VRRP router functions as a virtual router backup and the order of ascendancy to becoming a virtual router master if the virtual router master fails. You can configure the priority of each virtual router backup with a value of 1 through 254 using the **vrrp priority** command.

For example, if Router A, the virtual router master in a LAN topology, fails, an election process takes place to determine if virtual router backups B or C should take over. If Routers B and C are configured with the priorities of 101 and 100, respectively, Router B is elected to become virtual router master because it has the higher priority. If Routers B and C are both configured with the priority of 100, the virtual router backup with the higher IP address is elected to become the virtual router master.

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

VRRP Advertisements

The virtual router master sends VRRP advertisements to other VRRP routers in the same group. The advertisements communicate the priority and state of the virtual router master. The VRRP advertisements are encapsulated in IP packets and sent to the IP Version 4 multicast address assigned to the VRRP group. The advertisements are sent every second by default; the interval is configurable.

In Service Software Upgrade--VRRP

VRRP supports In Service Software Upgrade (ISSU). In Service Software Upgrade (ISSU) allows a high-availability (HA) system to run in stateful switchover (SSO) mode even when different versions of Cisco IOS XE software are running on the active and standby Route Processors (RPs) or line cards.

ISSU provides the ability to upgrade or downgrade from one supported Cisco IOS XErelease to another while continuing to forward packets and maintain sessions, thereby reducing planned outage time. The ability to upgrade or downgrade is achieved by running different software versions on the active RP and standby RP for a short period of time to maintain state information between RPs. This feature allows the system to switch over to a secondary RP running upgraded (or downgraded) software and continue forwarding packets without session loss and with minimal or no packet loss. This feature is enabled by default.

For detailed information about ISSU, see theCisco IOS XE In Service Software Upgrade Process document in the *Cisco IOS XE High Availability Configuration Guide*.

VRRP Support for Stateful Switchover

With the introduction of the VRRP Support for Stateful Switchover feature, VRRP is SSO aware. VRRP can detect when a router is failing over to the secondary RP and continue in its current group state.

SSO functions in networking devices (usually edge devices) that support dual Route Processors (RPs). SSO provides RP redundancy by establishing one of the RPs as the active processor and the other RP as the standby processor. SSO also synchronizes critical state information between the RPs so that network state information is dynamically maintained between RPs.

Prior to being SSO aware, if VRRP was deployed on a router with redundant RPs, a switchover of roles between the active RP and the standby RP would result in the router relinquishing its activity as a VRRP group member and then rejoining the group as if it had been reloaded. The SSO--VRRP feature enables VRRP to continue its activities as a group member during a switchover. VRRP state information between redundant RPs is maintained so that the standby RP can continue the router's activities within the VRRP during and after a switchover.

This feature is enabled by default. To disable this feature, use the **no vrrp sso** command in global configuration mode.

For more information, see the Stateful Switchover document.

How to Configure VRRP

Customizing VRRP

Customizing the behavior of VRRP is optional. Be aware that as soon as you enable a VRRP group, that group is operating. It is possible that if you first enable a VRRP group before customizing VRRP, the router could take over control of the group and become the virtual router master before you have finished customizing the feature. Therefore, if you plan to customize VRRP, it is a good idea to do so before enabling VRRP.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address** *ip-address mask*
5. **vrrp** *group* **description** *text*
6. **vrrp** *group* **priority** *level*
7. **vrrp** *group* **preempt** [**delay minimum** *seconds*]
8. **vrrp** *group* **timers advertise** [**msec**] *interval*
9. **vrrp** *group* **timers learn**
10. **exit**
11. **no vrrp sso**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface GigabitEthernet 0/0/0`	Enters interface configuration mode.
Step 4	**ip address** *ip-address mask* **Example:** `Router(config-if)# ip address 172.16.6.5 255.255.255.0`	Configures an IP address for an interface.
Step 5	**vrrp** *group* **description** *text* **Example:** `Router(config-if)# vrrp 10 description working-group`	Assigns a text description to the VRRP group.
Step 6	**vrrp** *group* **priority** *level* **Example:** `Router(config-if)# vrrp 10 priority 110`	Sets the priority level of the router within a VRRP group. • The default priority is 100.
Step 7	**vrrp** *group* **preempt** [**delay minimum** *seconds*] **Example:** `Router(config-if)# vrrp 10 preempt delay minimum 380`	Configures the router to take over as virtual router master for a VRRP group if it has a higher priority than the current virtual router master. • The default delay period is 0 seconds. • The router that is IP address owner will preempt, regardless of the setting of this command.

	Command or Action	Purpose
Step 8	**vrrp** *group* **timers advertise** [**msec**] *interval* **Example:** `Router(config-if)# vrrp 10 timers advertise 110`	Configures the interval between successive advertisements by the virtual router master in a VRRP group. • The unit of the interval is in seconds unless the **msec** keyword is specified. The default *interval* value is 1 second. **Note** All routers in a VRRP group must use the same timer values. If the same timer values are not set, the routers in the VRRP group will not communicate with each other and any misconfigured router will change its state to master.
Step 9	**vrrp** *group* **timers learn** **Example:** `Router(config-if)# vrrp 10 timers learn`	Configures the router, when it is acting as virtual router backup for a VRRP group, to learn the advertisement interval used by the virtual router master.
Step 10	**exit** **Example:** `Router(config-if)# exit`	Exits interface configuration mode.
Step 11	**no vrrp sso** **Example:** `Router(config)# no vrrp sso`	(Optional) Disables VRRP support of SSO. • VRRP support of SSO is enabled by default.

Enabling VRRP

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address** *ip-address mask*
5. **vrrp** *group* **ip** *ip-address* [**secondary**]
6. **end**
7. **show vrrp** [**brief**] | *group*]
8. **show vrrp interface** *type number* [**brief**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface GigabitEthernet 0/0/0`	Enters interface configuration mode.
Step 4	**ip address** *ip-address mask* **Example:** `Router(config-if)# ip address 172.16.6.5 255.255.255.0`	Configures an IP address for an interface.
Step 5	**vrrp** *group* **ip** *ip-address* [**secondary**] **Example:** `Router(config-if)# vrrp 10 ip 172.16.6.1`	Enables VRRP on an interface. • After you identify a primary IP address, you can use the **vrrp ip** command again with the **secondary** keyword to indicate additional IP addresses supported by this group. **Note** All routers in the VRRP group must be configured with the same primary address and a matching list of secondary addresses for the virtual router. If different primary or secondary addresses are configured, the routers in the VRRP group will not communicate with each other and any misconfigured router will change its state to master.
Step 6	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.

	Command or Action	Purpose
Step 7	**show vrrp** [**brief**] | *group*] **Example:** `Router# show vrrp 10`	(Optional) Displays a brief or detailed status of one or all VRRP groups on the router.
Step 8	**show vrrp interface** *type number* [**brief**] **Example:** `Router# show vrrp interface GigabitEthernet 0/0/0`	(Optional) Displays the VRRP groups and their status on a specified interface.

Disabling a VRRP Group on an Interface

Disabling a VRRP group on an interface allows the protocol to be disabled, but the configuration to be retained. This ability was added with the introduction of the VRRP MIB, RFC 2787, *Definitions of Managed Objects for the Virtual Router Redundancy Protocol* .

You can use a Simple Network Management Protocol (SNMP) management tool to enable or disable VRRP on an interface. Because of the SNMP management capability, the **vrrp shutdown** command was introduced to represent a method via the command line interface (CLI) for VRRP to show the state that had been configured using SNMP.

When the **show running-config** command is entered, you can see immediately if the VRRP group has been configured and set to enabled or disabled. This is the same functionality that is enabled within the MIB.

The **no** form of the command enables the same operation that is performed within the MIB. If the **vrrp shutdown** command is specified using the SNMP interface, then entering the **no vrrp shutdown** command reenables the VRRP group.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address** *ip-address mask*
5. **vrrp** *group* **shutdown**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface GigabitEthernet0/0/0`	Enters interface configuration mode.
Step 4	**ip address** *ip-address mask* **Example:** `Router(config-if)# ip address 172.16.6.5 255.255.255.0`	Configures an IP address for an interface.
Step 5	**vrrp** *group* **shutdown** **Example:** `Router(config-if)# vrrp 10 shutdown`	Disables the VRRP group on an interface. • The command is now visible on the router. **Note** You can have one VRRP group disabled, while retaining its configuration, and a different VRRP group enabled.

Configuring VRRP Text Authentication

VRRP ignores unauthenticated VRRP protocol messages. The default authentication type is text authentication.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address** *ip-address mask* [**secondary**]
5. **vrrp** *group* **authentication text** *text-string*
6. **vrrp** *group* **ip** *ip-address*
7. Repeat Steps 1 through 6 on each router that will communicate.
8. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface GigabitEthernet 0/0/1`	Configures an interface type and enters interface configuration mode.
Step 4	**ip address** *ip-address mask* [**secondary**] **Example:** `Router(config-if)# ip address 10.0.0.1 255.255.255.0`	Specifies a primary or secondary IP address for an interface.

	Command or Action	Purpose
Step 5	**vrrp** *group* **authentication text** *text-string* **Example:** `Router(config-if)# vrrp 1 authentication text textstring1`	Authenticates VRRP packets received from other routers in the group. • If you configure authentication, all routers within the VRRP group must use the same authentication string. • The default string is cisco. **Note** All routers within the VRRP group must be configured with the same authentication string. If the same authentication string is not configured, the routers in the VRRP group will not communicate with each other and any misconfigured router will change its state to master.
Step 6	**vrrp** *group* **ip** *ip-address* **Example:** `Router(config-if)# vrrp 1 ip 10.0.1.20`	Enables VRRP on an interface and identifies the IP address of the virtual router.
Step 7	Repeat Steps 1 through 6 on each router that will communicate.	--
Step 8	**end** **Example:** `Router(config-if)# end`	Returns to privileged EXEC mode.

Enabling the Router to Send SNMP VRRP Notifications

The VRRP MIB supports SNMP Get operations, which allow network devices to get reports about VRRP groups in a network from the network management station.

Enabling VRRP MIB trap support is performed through the CLI, and the MIB is used for getting the reports. A trap notifies the network management station when a router becomes a Master or backup router. When an entry is configured from the CLI, the RowStatus for that group in the MIB immediately goes to the active state.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server enable traps vrrp**
4. **snmp-server host** *host community-string* **vrrp**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.

Step 3	**snmp-server enable traps vrrp**
	
	Example:
	
	`Router(config)#`
	`snmp-server enable traps vrrp`
		Enables the router to send SNMP VRRP notifications (traps and informs).

Step 4	**snmp-server host** *host community-string* **vrrp**
	
	Example:
	
	`Router(config)#`
	`snmp-server host myhost.comp.com public vrrp`
		Specifies the recipient of an SNMP notification operation.

Configuration Examples for VRRP

Example: Configuring VRRP

In the following example, Router A and Router B each belong to three VRRP 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

```
Router(config)# interface GigabitEthernet 1/0/0
Router(config-if)# ip address 10.1.0.2 255.0.0.0
Router(config-if)# vrrp 1 priority 120
Router(config-if)# vrrp 1 authentication cisco
Router(config-if)# vrrp 1 timers advertise 3
Router(config-if)# vrrp 1 timers learn
Router(config-if)# vrrp 1 ip 10.1.0.10
Router(config-if)# vrrp 5 priority 100
Router(config-if)# vrrp 5 timers advertise 30
Router(config-if)# vrrp 5 timers learn
Router(config-if)# vrrp 5 ip 10.1.0.50
Router(config-if)# vrrp 100 timers learn
Router(config-if)# no vrrp 100 preempt
Router(config-if)# vrrp 100 ip 10.1.0.100
Router(config-if)# no shutdown
```

Router B

```
Router(config)# interface GigabitEthernet 1/0/0
Router(config-if)# ip address 10.1.0.1 255.0.0.0
Router(config-if)# vrrp 1 priority 100
Router(config-if)# vrrp 1 authentication cisco
Router(config-if)# vrrp 1 timers advertise 3
Router(config-if)# vrrp 1 timers learn
Router(config-if)# vrrp 1 ip 10.1.0.10
Router(config-if)# vrrp 5 priority 200
Router(config-if)# vrrp 5 timers advertise 30
Router(config-if)# vrrp 5 timers learn
Router(config-if)# vrrp 5 ip 10.1.0.50
Router(config-if)# vrrp 100 timers learn
Router(config-if)# no vrrp 100 preempt
Router(config-if)# vrrp 100 ip 10.1.0.100
Router(config-if)# no shutdown
```

Example: VRRP Text Authentication

The following example shows how to configure VRRP text authentication using a text string:

```
Router(config)# interface GigabitEthernet 0/0/0
Router(config)# ip address 10.21.8.32 255.255.255.0
Router(config-if)# vrrp 10 authentication text stringxyz
Router(config-if)# vrrp 10 ip 10.21.8.10
```

Example: Disabling a VRRP Group on an Interface

The following example shows how to disable one VRRP group on GigabitEthernet interface 0/0/0 while retaining VRRP for group 2 on GigabitEthernet interface 1/0/0:

```
Router(config)# interface GigabitEthernet 0/0/0
Router(config-if)# ip address 10.24.1.1 255.255.255.0
Router(config-if)# vrrp 1 ip 10.24.1.254
Router(config-if)# vrrp 1 shutdown
Router(config-if)# exit
Router(config)# interface GigabitEthernet 1/0/0
Router(config-if)# ip address 10.168.42.1 255.255.255.0
Router(config-if)# vrrp 2 ip 10.168.42.254
```

Example: VRRP MIB Trap

```
Router(config)# snmp-server enable traps vrrp
Router(config)# snmp-server host 10.1.1.0 community abc vrrp
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
VRRP commands	*Cisco IOS IP Application Services Command Reference*
Object tracking	Configuring Enhanced Object Tracking
Hot Standby Routing Protocol (HSRP)	Configuring HSRP
In Service Software Upgrace (ISSU)	"Cisco IOS XE In Service Software Upgrade Process" in the *Cisco IOS XEHigh Availability Configuration Guide*
Gateway Load Balancing Protocol (GLBP)	Configuring GLBP
Stateful Switchover	The Stateful Switchover section in the *Cisco IOS XE High Availability Configuration Guide*

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
VRRP MIB	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
RFC 2338	Virtual Router Redundancy Protocol
RFC 2787	Definitions of Managed Objects for the Virtual Router Redundancy Protocol
RFC 3768	Virtual Router Redundancy Protocol (VRRP)

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 VRRP

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 VRRP

Feature Name	Releases	Feature Information
ISSU--VRRP	Cisco IOS XE Release 2.1	VRRP supports In Service Software Upgrade (ISSU). ISSU allows a high-availability (HA) system to run in stateful switchover (SSO) mode even when different versions of Cisco IOS XE software are running on the active and standby Route Processors (RPs) or line cards. This feature provides customers with the same level of HA functionality for planned outages due to software upgrades as is available with SSO for unplanned outages. That is, the system can switch over to a secondary RP and continue forwarding packets without session loss and with minimal or no packet loss. This feature is enabled by default. There are no new or modified commands for this feature.
SSO--VRRP	Cisco IOS XE Release 2.1	VRRP is now SSO aware. VRRP can detect when a router is failing over to the secondary RP and continue in its current VRRP group state. This feature is enabled by default. The following commands were introduced or modified by this feature: **debug vrrp ha**, **show vrrp, vrrp sso**.

Feature Name	Releases	Feature Information
Virtual Router Redundancy Protocol	Cisco IOS XE Release 2.1	VRRP enables a group of routers to form a single virtual router to provide redundancy. The LAN clients can then be configured with the virtual router as their default gateway. The virtual router, representing a group of routers, is also known as a VRRP group. The following commands were introduced by this feature: **debug vrrp all**, **debug vrrp error**, **debug vrrp events**, **debug vrrp packets**, **debug vrrp state**, **show vrrp**, **show vrrp interface**, **vrrp authentication**, **vrrp description**, **vrrp ip**, **vrrp preempt**, **vrrp priority**, **vrrp timers advertise**, **vrrp timers learn**.
VRRP MIB--RFC 2787	Cisco IOS XE Release 2.6	The VRRP MIB--RFC 2787 feature enables an enhancement to the MIB for use with SNMP-based network management. The feature adds support for configuring, monitoring, and controlling routers that use VRRP. The following command was introduced by this feature: **vrrp shutdown**. The following commands were modified by this feature: **snmp-server enable traps**and **snmp-server host**.

Glossary

virtual IP address owner —The VRRP router that owns the IP address of the virtual router. The owner is the router that has the virtual router address as its physical interface address.

virtual router —One or more VRRP routers that form a group. The virtual router acts as the default gateway router for LAN clients. Also known as a VRRP group.

virtual router backup —One or more VRRP routers that are available to assume the role of forwarding packets if the virtual router master fails.

virtual router master —The VRRP router that is currently responsible for forwarding packets sent to the IP addresses of the virtual router. Usually the virtual router master also functions as the IP address owner.

VRRP router --A router that is running VRRP.