RIP Configuration

Contents

Chapter 1 RIP Configuration

1.1 RIP Description

Routing Information Protocol (RIP) is a routing protocol based on the Distance-Vector (D-V) algorithm and has seen wide deployment. It exchanges routing information by sending route update packets over the User Datagram Protocol (UDP) every 30 seconds. If having not received a route update packet from the peer router within 180 seconds, the local router marks all the routes from the peer router as unreachable. If no update packet is received from the peer router yet in 120 seconds after a route is marked as unreachable, the local router deletes the route from its routing table.

RIP uses Hop Count as a routing metric to measure the distance from a destination host. In a RIP network, Hop Count is 0 if a router is directly connected with a network and 1 if a route needs to traverse a router before reaching the destination network, and so on. To restrain the route convergence time, RIP stipulates that Hop Count is an integer ranging from 0 to 15. The distance is considered infinite if Hop Count is larger than or equal to 16. In this case, the destination network or host is unreachable.

RIP has two versions: RIP-1 and RIP-2 (support for plaintext authentication).

To improve routing performance and avoid routing loops, RIP presents the concepts of Split Horizon and Poison Reverse.

Each RIP router manages a routing database, which contains all the destination reachable routing entries on a network. These routing entries include the following information:

Destination address: IP address of a host or network;

Next-hop address: address of a next router on the route to a destination;

Outbound interface: interface from which packets are forwarded;

Metric value: cost of a route from the local router to a destination, which is an integer from 0 to 15.

Timer: time counted from the last modification of a routing entry. The timer is zeroed every time a routing entry is modified.

The RIP startup and operation procedure is described as follows:

Upon RIP startup on a router, the router broadcasts a request packet to its neighboring routers. After receiving the request packet, the neighboring routers (with RIP started) return a response packet which contains the information about their respective local routing tables.

Upon receipt of the response packets, the router that sends the request packet modifies its local routing table.

RIP broadcasts or multicasts the local routing table to its neighboring routers every 30s. The neighboring routers maintain their local routes to select a best route and then broadcast or multicast the modification to their respective neighboring networks, so that the routing update will eventually take effect globally. RIP employs a timeout mechanism to process expired routes, ensuring that the routes are latest and valid. As an interior routing protocol, RIP helps acquaint routers with the network-wide routing information because of these mechanisms.

RIP has been accepted as one of the standards which regulate the route transmission between a router and a host. L3 switches forward IP packets across a LAN the same way as routers. Therefore, RIP is also widely deployed on L3 switches. It is applicable to most campus networks and regional networks with a simple structure and good continuity but not recommended in complex large networks.

1.2 RIP Configuration

1.2.1 Configuring RIP

Table 1-1 RIP configuration tasks

Configuration Task		Description	Details
Enabling RIP	Enabling/Disabling RIP	Mandatory	1.2.2
Specifying the IP network segment to run RIP		Mandatory	1.2.3
Specifying the RIP operation state for an interface		Mandatory	
Specifying the RIP version for an interface		Mandatory	
Enabling the host route function		Mandatory	
Enabling the route aggregation function		Mandatory	
Configuring RIP packet authentication		Optional	
Configuring split horizon		Optional	
Setting an additional routing metric		Optional	
Defining a prefix list		Optional	
Configuring route redistribution		Optional	
Configuring route filtering		Mandatory	
Displaying RIP configuration		Mandatory	

1.2.2 Basic RIP Configuration

Table 1-2 Basic RIP configuration

Operation	Command	Remarks
Enters the global configuration mode.	**router rip**	-
Enters the global configuration mode.	**no router rip**	-

1.2.3 Specifying the IP Network Segment to Run RIP

By default, an interface does not send or receive RIP packets until the IP net work segment to run RIP is specified by the administrator even if RIP is ena bled on the interface.

Table 1-3 Specifying the IP network segment to run RIP

Operation	Command	Remarks
Runs the command in RIP configuration mode.	**network ip-address**	-
Runs the command in RIP configuration mode.	**No network ip-address**	-

1.2.4 Specifying the RIP Operation State for an Interface

In interface configuration mode, the RIP operation state can be specified for an interface, for example, whether to run RIP on the interface (whether to e nable the interface to send and receive RIP update packets) and configuring t he interface to only send or receive RIP update packets.

Table 1-4 Specifying the RIP operation state for an interface

Operation	Command	Remarks
Runs the command in interface configuration mode.	**ip rip work**	-
Runs the command in interface configuration mode.	**no ip rip work**	-
Allows the interface to receive RIP packets.	**ip rip input**	
Forbids the interface to receive RIP packets.	**no ip rip input**	
Allows the interface to send RIP packets.	**ip rip output**	
Forbids the interface to send RIP packets.	**no ip rip output**	

1.2.5 Specifying the RIP Version for an Interface

RIP has two versions: RIP-1 and RIP-2. You can specify the version of the RIP packets to be processed by an interface.

RIP-1 packets are transmitted in broadcast mode. RIP-2 packets may be trans mitted in either broadcast or multicast mode. The multicast mode is used by default. In RIP-2, the multicast address is 224.0.0.9.

When the multicast mode is used, non-RIP hosts on the same network will n ot receive RIP broadcast packets and RIP-1 hosts will not receive or process t

he RIP-2 routes with a subnet mask. A RIP-2 interface can also receive the RIP-1 broadcast packets.

Table 1-5 Specifying the RIP version for an interface

Operation	Command	Remarks
Runs the command in interface configuration mode.	**ip rip version 1**	-
Sets the RIP operation mode to RIP-2 multicast.	**ip rip version 2 mcast**	-
Sets the RIP operation mode to RIP-2 broadcast.	**ip rip version 2 bcast**	
Deletes the RIP version and uses RIP-1 by default.	**no ip rip version**	

Notes:

A RIP-1 interface can send and receive RIP-1 broadcast packets. A RIP-2 broadcast interface can receive RIP-1 packets and RIP-2 broadcast packets but not RIP-2 multicast packets. A RIP-2 multicast interface can send and receive RIP-2 multicast packets.

1.2.6 Enabling the Host Route Function

The RIP packets received by a route may sometimes contain host route entries, which are not conducive to routing and addressing but occupy a great amount of network resource. This function is designed to determine whether a switch receives the host route entries in RIP packets.

Table 1-6 Enabling the host route function

Operation	Command	Remarks
Runs the command in RIP configuration mode.	**host-route**	-
Runs the command in RIP configuration mode.	**no host-route**	-

1.2.7 Enabling the Route Aggregation Function

Route aggregation consolidates the routes on different subnets of a natural network segment into one route with a natural mask and sends the route to another network segment. This function minimizes both the number of entries in a routing table and the amount of information that needs to be exchanged.

RIP-1 sends only the routes with a natural mask, that is, aggregate routes. RIP-2 supports the subnet mask. To broadcast all the subnet routes, you should disable the route aggregation function of RIP-2.

Table 1-7 Enabling the route aggregation function

Operation	Command	Remarks
Runs the command in RIP configuration mode.	**auto-summary**	-
Runs the command in RIP configuration mode.	**no auto-summary**	-

1.2.8 Configuring RIP Packet Authentication

RIP-1 does not support packet authentication. A RIP-2 interface, however, can be configured with packet authentication in plaintext or MD5.

Table 1-8 Configuring RIP packet authentication

Operation	Command	Remarks
Runs the command in port configuration mode.	**ip rip authentication simple *password***	-
Restores RIP packet authentication.	**no ip rip authentication**	-

1.2.9 Configuring Split Horizon

Split horizon is designed to prevent the routes learned on an interface from being sent through the interface, which avoids routing loops. This function must be disabled in some special situations to ensure correct route advertisement at the cost of advertisement efficiency. By default, split horizon can be enabled on an interface.

Table 1-9 Configuring split horizon

Operation	Command	Remarks
Runs the command in port configuration mode.	**ip rip split**	-
Runs the command in port configuration mode.	**no ip rip split**	-

1.2.10 Setting an Additional Routing Metric

The additional routing metric value is added to RIP routes on an inbound or outbound interface. It does not change the routing metric value of routes in the routing table but adds a designated metric value to the routes to be sent or received by an interface.

Table 1-10 Setting an additional routing metric

Operation	Command	Remarks
Runs the command in port configuration mode.	**ip rip metricin *value***	-
Restores RIP packet authentication.	**no ip rip metricin**	-
Sets an additional routing metric value for rou	**ip rip metricout *value***	

Operation	Command	Remarks
tes in the RIP packets to be sent.		
Forbids the interface to set an additional routing metric value for routes in the RIP packets to be sent.	**no ip rip metricout**	

1.2.11 Defining a Prefix List

A prefix list is identified by a prefix list name, and may contain multiple entries, each of which corresponds to a network prefix identified by a sequence number. The sequence number indicates the matching sequence of a network prefix.

During prefix matching, the switch checks the entries in ascending order of sequence numbers. If an entry is matched, it is permitted by the current prefix list and will not be matched next time.

Note: By default, if more than one prefix list entry has been defined, at least one permit entry should be available. The deny entries can be defined in advance so that the routes that do not meet the condition are filtered quickly. However, if all the entries are prefixed by deny, no route will be permitted by the address prefix list. You are advised to define an entry permit 0.0.0.0/0 after defining multiple deny entries, so that all the routes meeting the condition are permitted.

Alternatively, you can run the ip prefix-list default command to change the default configuration. For details, see the description of this command in a command line manual.

Table 1-11 Defining a prefix list

Operation	Command	Remarks
Runs the command in global configuration mode.	**ip prefix-list**	-
Runs the command in global configuration mode.	**no ip prefix-list**	-
Configures the matching mode to be used when there is no prefix list or matching entry.	**ip prefix-list default**	
Configures the matching mode used when there is no prefix list or matching entry as the default mode.	**no ip prefix-list default**	

1.2.12 Configuring Route Redistribution

Routes of protocols other than RIP can be imported into RIP.

In an Ethernet switch, connected, static, and OSPF routes can be imported into RIP.

Table 1-12 Configuring route redistribution

Operation	Command	Remarks
Runs the command in RIP protocol configuration mode.	**redistribute**	-
Runs the command in RIP protocol configuration mo	**no redistribute**	-

Operation	Command	Remarks
de.		

1.2.13 Configuring Route Filtering

Policies and rules can be configured to filter incoming and outgoing routes ba sed on an address prefix list. In addition, you can configure that only the RIP packets from a specific neighboring Ethernet switch can be received.

Table 1-13 Configuring route filtering

Operation	Command	Remarks
Runs the command in RIP protocol configuration mo de.	**distribute-list prefix-list in**	-
Runs the command in RIP protocol configuration mo de.	**distribute-list prefix-list out**	-
Runs the command in RIP protocol configuration mo de.	**distribute-list gateway in**	
Runs the command in RIP protocol configuration mo de.	**no distribute-list**	

1.2.14 Displaying RIP Configuration

Table 1-14 Displaying RIP configuration

Operation	Command	Remarks
Displays the RIP packet statistics information.	**show ip rip**	-
Displays the RIP interface configuration, such as the version and authentication information.	**show ip rip interface**	-
Displays RIP routing tables.	**show ip route rip**	
Displays the ECMP routes of RIP.	**show ip route ecmp rip**	

1.2.15 Configuration Examples

! To configure RIP to deny host routes, run the following command:

Switch(config-router-rip)#no host-route

! To configure plaintext authentication on VLAN interface 3 and set keyword to Switch, r un the following command:

Switch(config-if-vlanInterface-3)#ip rip authentication simple Switch

! To forbid VLAN interface 3 to receive RIP packets, run the following command:

Switch(config-if-vlanInterface-3)#no ip rip input

! To set the additional routing metric value to 1 for RIP packets received by VLAN interf ace 3, run the following command:

Switch(config-if-vlanInterface-3)#ip rip metricin 1

! To set the additional routing metric value to 1 for RIP packets sent by VLAN interface 3, run the following command:

Switch(config-if-vlanInterface-3)#ip rip metricout 1

! To forbid VLAN interface 3 to send RIP packets, run the following command:

Switch(config-if-vlanInterface-3)#no ip rip output

! To enable split horizon on VLAN interface 3 towards RIP packet sending, run the follo wing command:

Switch(config-if-vlanInterface-3)#ip rip split

! To configure VLAN interface 3 to run RIP-2 multicast, run the following command:

Switch(config-if-vlanInterface-3)#ip rip version 2 mcast

! To allow VLAN interface 3 to send and receive RIP packets, run the following comman d:

Switch(config-if-vlanInterface-3)#ip rip work

! To specify that RIP runs on the network segment 192.1.1.1/24, run the following com mand:

Switch(config-router-rip)#network 192.1.1.1

! To enable RIP, run the following command:

Switch(config)#router rip

! To disable RIP, run the following command:

Switch(config)#no router rip

! To deny all the routes (including subnet routes) destined for 192.168.1.0/24 by configur ing the prefix list, run the following command:

Switch(config)#ip prefix-list pflst001 deny 192.168.1.0 24

Switch(config)#ip prefix-list pflst001 permit 0.0.0.0 0

! To configure the matching mode to permit if no matching entry exists in the prefix list, run the following command:

Switch(config)#ip prefix-list default entry-rule permit

! To display all the prefix lists currently available, run the following command:

Switch(config)#show ip prefix-list

! To import OSPF routes to RIP, run the following command:

Switch(config-router-rip)#redistribute ospf

! To apply the prefix list pflst001 to outgoing routes, run the following command:

Switch(config-router-rip)#distribute-list prefix-list pflst001 out

! To display the RIP statistics on L3 interfaces, run the following command:

Switch(config)#show ip rip

! To display the RIP configuration of L3 interfaces, run the following command:

Switch(config-router-rip)#show ip rip interface

! To display the RIP configuration of L3 interface 1, run the following command:

Switch(config-router-rip)#show ip rip interface vlan-interface 1