Allied Telesis™

RIP Next Generation

FEATURE OVERVIEW AND CONFIGURATION GUIDE

Introduction

This guide contains an introduction to the RIPng protocol and a basic RIPng configuration example. To see details on the RIPng commands used in these examples, or to see the outputs of the validation commands, refer to the product's Command Reference.

Products and software version that apply to this guide

This guide applies to AlliedWare Plus™ products that support RIPng, running version 5.4.4 or later.

To see whether your product supports RIPng, see the following documents:

- The product's Datasheet
- The AlliedWare Plus Datasheet
- The product's Command Reference

These documents are available from the above links on our website at alliedtelesis.com.

Feature support may change in later software versions. For the latest information, see the above documents.

AlliedWare Plus™
OPERATING SYSTEM

Content

RIPng Overview

RIPng is the name given to the application of RIP to IPv6.

It is extremely closely based on the IPv4 RIPv2. Really, RIPng is just RIPv2 updated with the minimum set of changes required to enable it to advertise IPv6 routes. Unfortunately, the incorporation of IPv6 into RIP was not just a simple matter of defining a new Address Family ID to be used with RIP, and retaining the existing packet format. Because IPv6 addresses are so much larger than IPv4 addresses, the packet format did require revision.

In the process, a few changes have been made:

1. RIPng uses UDP port 521, rather than RIP's UDP port 520. The destination multicast address used for RIPng packets is FF02::9 – which is the IPv6 equivalent of RIPv2's 224.0.0.9.

2. Next-hop addresses are carried differently in RIPng packets. In RIPv2, there was a next-hop field carried with every route entry in the packet. But in RIPng, carrying a next-hop address with each route entry would greatly reduce the number of route entries that could be carried in a single packet, due to the sheer size of IPv6 addresses. Instead, a special Route Entry is used to define a next-hop address. These special next-hop entries can appear anywhere in a RIP packet. The next-hop address then applies to all the following route entries up until the next next-hop entry in the packet.

3. Authentication is not part of the RIPng protocol. Instead, Authentication and/or encryption of RIPng packets is performed by the inherent IPv6 IPSEC, using the relevant next-headers in the IPv6 packet that carries the RIPng data.

4. No Route tag information is carried in RIPng packets.

However, a lot has remained the same:

- Updates are sent at regular intervals (30 seconds, by default).

- The Update packets advertise all the routes in the IPv6 RIP route table, (except those prevented by Split Horizon considerations).

- Split Horizon and Poison Reverse still operate in the same way.

- A metric of 16 is still considered infinite.

- Routes are still set to metric 16 if their invalid timer (180 seconds, by default) expires.

- There is still a garbage collection time (2 minutes, by default).

- Triggered updates are still sent when route changes occur.

- The ability to request route updates remains.

Configuring RIPng

Configuration of RIPng in AlliedWare Plus is one aspect that does differ noticeably from IPv4 RIP.

Rather than having a network command implicitly enable RIP advertisements on the interfaces whose addresses are within the address range specified by the **network** command, RIPng needs to be explicitly enabled on given interfaces.

The commands to enable RIPng on a VLANx interface are:

```
conf t

interface VLANx

IPv6 router RIP
```

In addition, the RIPng process needs to be enabled globally.

```
conf t

router IPv6 RIP
```

Once RIPng has been configured on an interface, the connected IPv6 route on that interface is immediately imported into the IPv6 RIP route table. Routes can also be redistributed into RIPng.

```
redistribute {connected|static|ospf} [metric <0-16>] [route-map
<route-map>]
```

Or, a route can simply be defined as an IPv6 RIP route, by using the **route** command:
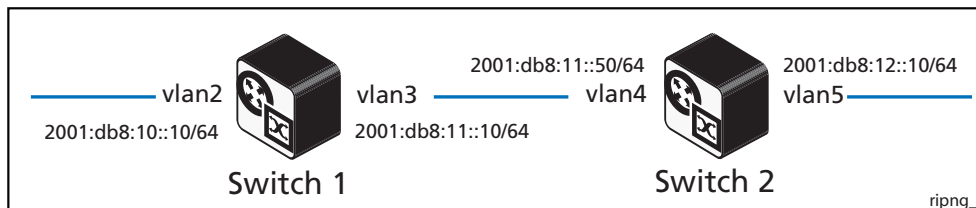
```
configure terminal

router ipv6 rip

route 2001:db8::1/64
```

RIPng will be sent by multicast from the interfaces on which it is configured. To change to unicasting RIPng to specific neighbors on an interface, define the interface to be passive, and configure the neighbor addresses

```
configure terminal

router ipv6 rip

passive-interface vlan2

neighbor 2001:db8:1::1 vlan2
```

Basic RIPng Configuration Example

This example shows the minimum configuration required for enabling RIPng on an interface. Switch1 and Switch 2 are connected via network **2001:db8:11::/64**. To enable RIPng, first add IPv6 addresses to interfaces and then enable RIPng on each interface.

Switch 1

Command	Description
`awplus#` `configure terminal`	Enter the Global Configuration mode.
`awplus(config)#` `router ipv6 rip`	Globally enable RIPng routing on `Switch 1`
`awplus(config-router)#` `exit`	Exit Router Configuration mode and return to Global Configuration mode.
`awplus(config)#` `interface vlan2`	Specify the interface (**vlan2**) and enter the Interface Configuration mode.
`awplus(config-if)#` `ipv6 address 2001:db8:10::10/64`	Configure the IPv6 address on interface **vlan2**.
`awplus(config-if)#` `ipv6 router rip`	Enable RIPng routing on interface `vlan2`.
`awplus(config-if)#` `exit`	Exit Interface mode and enter Global Configuration mode.
`awplus(config)#` `interface vlan3`	Specify the interface (**vlan3**) and enter the Interface Configuration mode.
`awplus(config-if)#` `ipv6 address 2001:db8:11::10/64`	Configure the IPv6 address on interface **vlan3**.
`awplus(config-if)#` `ipv6 router rip`	Enable RIPng routing on interface **vlan3**.
`awplus(config-if)#` `exit`	Exit Interface mode and enter Global Configuration mode.
`awplus(config)#` `router ipv6 rip`	Define a RIPng routing process and enter Router Configuration mode.
`awplus(config-router)#` `exit`	Exit Router Configuration mode
`awplus(config)#` `exit`	Exit Global Configuration mode.

Switch 2

Command	Description
`awplus#` `configure terminal`	Enter the Global Configuration mode.
`awplus(config)#` `router ipv6 rip`	Globally enable RIPng routing on `Switch 2` and enter Router Configuration mode.
`awplus(config-router)#` `exit`	Exit Router Configuration mode and return to Global Configuration mode.
`awplus(config)#` `interface vlan5`	Specify the interface (**vlan5**) and enter the Interface Configuration mode.
`awplus(config-if)#` `ipv6 address 2001:db8:12::10/64`	Configure the IPv6 address on interface **vlan5**.
`awplus(config-if)#` `ipv6 router rip`	Enable RIPng routing on interface **vlan5**
`awplus(config-if)#` `exit`	Exit Interface mode and enter Global Configuration mode.
`awplus(config)#` `interface vlan4`	Specify the interface (**vlan4**) and enter the Interface Configuration mode.
`awplus(config-if)#` `ipv6 address 2001:db8:11::50/64`	Configure the IPv6 address on interface **vlan4**.
`awplus(config-if)#` `ipv6 router rip`	Enable RIPng routing on interface **vlan4**.
`awplus(config-if)#` `exit`	Exit Interface mode and enter Global Configuration mode.
`awplus(config)#` `router ipv6 rip`	Define a RIPng routing process and enter Router Configuration mode.
`awplus(config-router)#` `exit`	Exit Router Configuration mode and return to Global Configuration mode.
`awplus(config)#` `exit`	Exit Global Configuration mode and return to Privileged Exec mode.

Troubleshooting RIPng Adjacency

Follow the steps below to troubleshoot RIPng adjacency:

Step 1: Confirm the interface is not shutdown

`awplus#` `configure terminal`	Enter the Global Configuration mode.
`awplus(config)#` `interface vlan2`	Specify the interface (**vlan2**) and enter the Interface mode.
`awplus(config-if)#` `no shutdown`	Ensure the interface is not administratively shutdown.
`awplus(config-if)#` `exit`	Exit Interface Configuration mode and enter Global Configuration mode.
`awplus(config)#` `exit`	Exit Global Configuration mode and return to Privileged Exec mode.
`awplus#` `show ipv6 interface brief`	Use the **show interface** command to make sure that the interface is not administratively shutdown.

Step 2: Confirm RIPng is enabled on the interface

`awplus#`
`show ipv6 rip interface vlan2`
	Check the configuration. E.g.:
	`vlan2 is up, line protocol is up`
	`  Routing Protocol: RIPng`
	`    Passive interface: Disabled`
	`    Split horizon: Enabled with`
	`Poisoned Reversed`
	`    IPv6 interface address:`
	`      2001:db8:1::10/64`
	`      2001:db8:204:76ff:fec8::/10`

Step 3: Check the interface is not a passive interface

awplus#
show running-config
	Check that the interface is not configured as a passive interface.
	If it is configured to be passive, this is displayed in the output from the **show running config** command, e.g.:
	`!`
	`router ipv6 rip`
	`passive interface vlan2`
	`!`

awplus# configure terminal	Enter the Global Configuration mode.
awplus(config)# router ipv6 rip	Enter the Router Configuration mode.
awplus(config-router)# no passive interface port1.1.1	Remove the passive interface.

Step 4: Ensure RIPng advertisements get exchanged

awplus# configure terminal	Enter the Global Configuration mode.
awplus(config)# debug ipv6 rip event	Check on the interface to make sure that RIPng advertisements are being sent and received.
awplus(config)# debug ipv6 rip packet detail	Check on the interface to make sure that RIPng advertisements are being sent and received.
awplus(config)# exit	Exit Global Configuration mode to enter Privileged Exec mode.
awplus# terminal monitor	View log messages, or use a packet sniffer such as Ethereal or Wireshark, to verify RIPng advertisements.

Viewing RIPng Information in AlliedWare Plus

Viewing the content of the RIPng database is done by using the command: **show IPv6 RIP**

```
awplus#show ipv6 rip
Codes: R - RIP, Rc - RIP connected, Rs - RIP static, Ra - RIP aggregated,
       Rcx - RIP connect suppressed, Rsx - RIP static suppressed,
       C - Connected, S - Static, O - OSPF, B - BGP

    Network                  Next Hop             If        Met Tag Time
Rc 2001:dbb:789a::/64        ::                   vlan8       1   0
Ra 2001:dbb:8923::/48                             --          5   0
Sx 2001:dbb:8923:3456::/64   2001:dbb:789a::2     vlan8       5   0
Rs 2001:dbb:adf4::/64        ::                   --          1   0
S  2001:dbb:c72f::/64        2001:dbb:789a::2     vlan8       5   0
Rc 2001:dbb:d29a::/64        ::                   vlan4       1   0
Ra 2001:dbb:fc31::/48                             --          1   0
Rsx 2001:dbb:fc31:5ae9::/64 ::                    --          1   0
```

In the example above, you can see various types of routes:

Rc routes are connected routes on interfaces that have been configured with the command:

```
router ipv6 RIP
```

Ra routes are routes created by the **aggregate route** command in router IPv6 RIP configuration mode.

Rs routes are routes that have been brought into RIPng by using the **route** command in router IPv6 RIP configuration mode.

S routes are static routes that have been **redistributed** into RIPng.

The **Rsx** and **Sx** routes are routes that have been suppressed because they are component routes of the aggregate routes that have been brought into the RIPng database.

Note that all Ra and Rs routes have "—"in the if (interface) column, as those entries are internally generated and so are not associated with any egress interface.

Some information about the active (and inactive) RIPng interfaces is provided by the command:

```
show IPv6 RIP interface
```

```
awplus#show ipv6 rip interface
lo is up, line protocol is up
 RIPng is not enabled on this interface
vlan1 is up, line protocol is up
 RIPng is not enabled on this interface
vlan2 is up, line protocol is up
 RIPng is not enabled on this interface
vlan3 is up, line protocol is up
 RIPng is not enabled on this interface
vlan4 is up, line protocol is up
 Routing Protocol: RIPng
 Passive interface: Disabled
 Split horizon: Enabled with Poisoned Reversed
 IPv6 interface address:
 2001:dbb:d29a::1/64
 fe80::eecd:6dff:fe48:e67c/64
vlan5 is up, line protocol is up
 RIPng is not enabled on this interface
vlan6 is up, line protocol is up
 RIPng is not enabled on this interface
vlan7 is up, line protocol is up
 RIPng is not enabled on this interface
vlan8 is up, line protocol is up
 Routing Protocol: RIPng
 Passive interface: Disabled
 Split horizon: Enabled with Poisoned Reversed
 IPv6 interface address:
 2001:dbb:789a::1/64
 fe80::eecd:6dff:fe48:e67c/64
```

And, information about the configuration of RIPng itself is provided by the command:

```
show IPv6 protocols rip
```

```
awplus#show ipv6 protocols rip
Routing Protocol is "RIPng"
 Sending updates every 30 seconds with +/-5 seconds, next due in 6
seconds
 Timeout after 180 seconds, garbage collect after 120 seconds
 Outgoing update filter list for all interface is not set
 Incoming update filter list for all interface is not set
 Default redistribute metric is 5
 Redistributing: static
 Interface
 vlan4
 vlan8
 Routing for Networks:
```