



RIPv2 Configuration Guide

Application Note

CONFIDENTIAL

AN1293
Rev. APPL-2024.06
2024-06-28

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This document states the requirement specification for FRR RIP software module in WebStaX.

1. Introduction

The Routing Information Protocol (RIP) is a well-known routing protocol for managing router information. It is classified by the Internet Engineering Task Force (IETF) as one of several interior gateway protocols (IGP).

RIP is a simple vector routing protocol, the routers exchange network information with their neighbors and communicate to each other with a set of destinations which can be reached. RIP uses the hop count as a routing metric and the lowest metric among its routing table is used as the next hop for the traffic forwarding.

Hops are used to consider the routers along the packet path from its source to a destination. In RIP, the hop count increases by one (default) when the packet go through a router. RIP limits the maximum number of hops (15) to prevent routing loops. If the number of hops is 16, the destination is considered unreachable.

FRR is an open-source IP routing protocol suite for Linux and Unix platforms which is a fork of the open-source Quagga router which supports a variety of routing protocol daemons including BGP, IS-IS, LDP, OSPF, PIM, and RIP.

The FRR software module provides RIPv2 support in WebStaX by integrating the open-source router Quagga/FRR.

2. ICLI commands and examples

This section lists the ICLI commands and examples for the FRR RIP software module.

2.1. Enable/Disable RIP process

Use the 'router rip' command in global configuration mode to enable the RIP routing process. Use the no form to disable the RIP routing process.

Syntax

- router rip
- no router rip

Default

No RIP routing process is enabled.

Examples

- This example shows how to enable the RIP routing process.
configure terminal
(config)# router rip
- This example shows how to disable the RIP routing process.
configure terminal
(config)# no router rip

2.2. RIP network

Use the 'network' command in RIP router mode to specify a number of networks that participates in the RIP process. Multiple 'network' commands can be applied on the router. Use the no form to remove the entry. Use the 'show ip rip' command to verify the current settings.

Syntax

- network <ipv4_addr> [<wildcard_mask>]
- no network <ipv4_addr> [<wildcard_mask>]

Parameters

- <ipv4_addr> [<wildcard_mask>]: This parameter pair specifies an address range which allows user to define one or multiple networks that participates in the RIP process. Notice that the wildcard mask value will be used to specify the network mask length, so there is a limitation on the input format as follows: The 'don't care' (value 1) bits must be sequential and the 'match' (value 0) bits MUST always be to the left. For example, 0.0.0.255 means that the network mask length is 8. If the wildcard mask is not specified, it uses the networks classful subnet mask.

Default

No network is specified.

Examples

- This example shows how to specify that the networks 192.168.7.0/24 and 10.9.0.0/16 must participate in the RIP process.

```
# configure terminal
```

```
(config)# router rip
```

```
(router-config)# network 192.168.7.0 0.0.0.255
```

```
(router-config)# network 10.9.0.0 0.0.255.255
```

- This example shows how to remove the network entry 10.9.0.0/16 from the RIP process.

```
# configure terminal
```

```
(config)# router rip
```

```
(router-config)# no network 10.9.0.0 0.0.255.255
```

2.3. Neighbor connection

Use the 'neighbor' command in router configuration mode to add the neighbor connection. Use the no form to delete the neighbor connection.

Syntax

- neighbor <ipv4_addr>
- no neighbor <ipv4_addr>

Parameters

- <ipv4_addr>: The neighbor address. This also accepts the broadcast and network address.

Default

No neighbor connection is configured.

Examples

- This example shows how to add a neighbor connection to 2.2.1.7.
configure terminal
(config)# router rip
(router-config)# neighbor 2.2.1.7
- This example shows how to remove a neighbor connection to 192.168.1.17.
configure terminal
(config)# router rip
(router-config)# no neighbor 192.168.1.17

2.4. RIP version support

2.4.1. Global RIP version

Use the 'version' command in router configuration mode to specify the RIP version support. The global setting can be overridden by the interface setting. Use the no form to restore to the default setting. Use the 'show ip rip' command to verify the current setting.

Syntax

- version {1|2}
- no version

Parameters

- {1|2}: Receive/Send the specific RIP version only.

Default

No RIP version is specified. By default, the router sends RIPv2 and accepts both RIPv1 and RIPv2. When the router receive either version of REQUESTS or triggered updates packets, it replies with the appropriate version.

Usage Guidelines

Be aware that the RIP network class configuration when RIPv1 is involved in the topology. RIPv1 uses classful routing, the subnet information is not included in the routing updates.

The limitation makes it impossible to have different-sized subnets inside of the same network class. In other words, all subnets in a network class must have the same size.

Examples

- This example shows how to configure the router to handle the RIPv2 packets only.
configure terminal
(config)# router rip

```
(router-config)# version 2
```

- This example shows how to change specific RIP version back to default value.

```
# configure terminal
```

```
(config)# router rip
```

```
(router-config)# no version
```

2.4.2. Interface RIP version

Use the 'ip rip receive version' and 'ip rip send version' command in interface configuration mode to specify the RIP version for the advertisement reception or transmission. The interface setting can override the global RIP version setting. Use the no form to remove the setting, that means the acceptable version is based on the global setting. Use the 'show ip rip' command to verify the current setting.

Syntax

- ip rip receive version {1 [2]|2 [1]|none}
- no ip rip receive version
- ip rip send version {1 [2]|2 [1]}
- no ip rip send version

Parameters

- {1 [2]|2 [1]|none}: The RIP version for the advertisement reception on the interface.
- {1 [2]|2 [1]}: The RIP version for the advertisement transmission on the interface.

Default

No RIP version is specified. The acceptable version is based on the global setting.

Examples

- This example shows how to configure interface VLAN 5 to send/receive RIPv1 packets only.

```
# configure terminal
```

```
(config)# interface vlan 5
```

```
(config-if-vlan)# ip rip send version 1
```

```
(config-if-vlan)# ip rip receive version 1
```

2.5. RIP authentication

Use the 'ip rip authentication' command in VLAN interface configuration mode to configure the authentication. Use the no form to remove the setting.

Syntax

- ip rip authentication { mode { text|md5 } | key-chain <word1-31> | string { unencrypted <word1-15> | encrypted <word128> } }
- no ip rip authentication { mode | key-chain | string }

Parameters

- mode: Specify the authentication type.
- text: Use simple password authentication.
- md5: Use MD5 authentication.
- key-chain: Specify the key chain name used by MD5 authentication.
- <word1-31>: The key chain identifier name.
- string: Plain text key used by simple password authentication.
- encrypted: The input format is a encrypted text.
- <word1-15>: Plain text key.
- encrypted: The input format is an encryption of the key.
- <word128>: The encryption of the key.

Default

Null authentication. Authentication is disabled.

NOTE

The key chain is used in MD5 authentication and string configuration is used in simple password authentication. The key chain configuration can not be coexistent with the plain text key configuration.

2.6. RIP passive interface

Use the 'passive-interface vlan' command in router configuration mode to suppress RIP updates on a specific interface. Use the 'passive-interface default' command in router configuration mode to set all VLAN interfaces as passive-interface by default. Use the no form to remove the setting.

Syntax

- passive-interface { default | vlan <vid_list> }
- no passive-interface { default | vlan <vid_list> }

Parameters

- <vid_list>: List of VLAN interface numbers. It can be a single VLAN ID or a combinative list e.g. 1,3,5-8.

Default

No passive-interface is configured.

Examples

- This example shows how to set all VLAN interfaces as passive-interface by default except for VLAN 1.
configure terminal
(config)# router rip
(config-router)# passive-interface default
(config-router)# no passive-interface vlan 1

- This example shows how to set passive-interface on interface VLAN 1 when the passive-interface default mode is not set.

```
# configure terminal
(config)# router rip
(config-router)# passive-interface vlan 1
```

2.7. RIP timers

Use the 'timers basic' command in router configuration mode to set update timer, invalid timer and garbage-collection timer. Use the no form to reset the setting.

Syntax

- timers basic <update_timer> <invalid_timer> <garbage_collection_timer>
- no timers basic

Parameters

- <update_timer>: The update time in seconds is an integer value from 5 to 2147483.
- <invalid_timer>: The invalid time in seconds is an integer value from 5 to 2147483.
- <garbage_collection_timer>: The garbage-collection timer in seconds is an integer value from 5 to 2147483.

Default

The default update timer is 30 seconds, the invalid timer is 180 seconds and the garbage-collection timer is 120 seconds.

NOTE

The invalid timer needs to be greater than the update timer.

Examples

- This example shows how to set the update timer to 20 seconds, the invalid timer to 120 seconds and the garbage collection timer to 80 seconds.

```
# configure terminal
(config)# router rip
(config-router)# timers basic 20 120 80
```

TIP

Use the 'show ip rip' command to verify the current settings.

2.8. RIP split horizon (with poison reverse)

Use the 'ip rip split-horizon' command in VLAN interface mode to enable split horizon. Use the no form to disable the setting.

Syntax

- ip rip split-horizon [poisoned-reverse]
- no ip rip split-horizon [poisoned-reverse]

Parameters

- split-horizon: Enable split horizon
- poisoned-reverse: Enable split horizon with poisoned reverse.

Default

Split horizon is enabled with poisoned-reverse disabled.

Examples

- This example shows how to enable split horizon with poisoned reverse on interface VLAN 100

```
# configure terminal
```

```
(config)# interface vlan 100
```

```
(config-if-vlan)# ip rip split-horizon poisoned-reverse
```

2.9. RIP redistribution

2.9.1. Protocol type redistribution

Use the 'redistribute' command in router configuration mode to set the route redistribution to the RIP domain. Use the no form to remove the setting.

Syntax

- redistribute { static | connected | ospf } [metric <1-16>]
- no redistribute { static | connected | ospf }

Parameters

- { static | connected | ospf }: The RIP redistributed route protocol type. The 'static' argument is used to redistribute the static routes. The 'connected' argument is used to redistribute the directly connected routes with RIP not enabled. The 'ospf' argument is used to redistribute the OSPF routes into the RIP routing domain.
- metric <1-16>: The metric value for redistributed routes.

Default

No route redistribution is configured.

Examples

- This example shows how to set the metric value 8 for the static route redistribution.

```
# configure terminal
```

```
(config)# router rip
```

```
(config-router)# redistribute static metric 8
```

- This example shows how to redistribute the OSPF routes into the RIP routing domain. Use the 'show ip rip' command to check the redistributed result.

```
# configure terminal
```

```
(config)# router rip
```

```
(config-router)# redistribute ospf
```

2.9.2. RIP redistributed default metric

Use the 'default-metric' command in router configuration mode to set the redistributed default metric value when the metric value isn't specified for the redistributed protocol types. Use the no form to restore to the default setting. Use the 'show ip rip' command to verify the current setting.

Syntax

- default-metric <1-16>
- no default-metric

Parameters

- <1-16>: User specified default metric value for the RIP redistributed protocol types.

Default

The default metric value for the redistributed routes is set to 1.

Usage Guidelines

The default metric configuration does not affect the connected routes even if the connected protocol type has configured. In other words, a specific metric value must be assigned for the connected protocol type, otherwise the connected routes will always be incremented by one.

Examples

- This example shows how to set the RIP redistributed default metric value to 2.
configure terminal
(config)# router rip
(config-router)# default-metric 2

2.9.3. Default route redistribution

Use the 'default-information originate' command in router configuration mode to redistribute the default route into the RIP domain. Use the no form to remove the setting. Use the 'show running-config' command to verify the configured settings. Use the 'show ip rip database' command to display the default route information in the RIP routing table.

Syntax

- default-information originate
- no default-information originate

Parameters

- None.

Default

No default route redistribution is configured.

Examples

- This example shows how to configure the router to redistribute the default route into RIP domain.

```
# configure terminal
(config)# router rip
(config-router)# default-information originate
```

2.10. RIP metric manipulation

Use the 'offset-list' command in router configuration mode to configure a RIP offset list, it is used to add an offset to incoming and outgoing routing metric for the routes which are learned via RIP. Use the no form to remove the entry.

Syntax

- offset-list <word1-31> {in|out} <0-16> [vlan <vlan_id>]
- no offset-list <word1-31> {in|out}

Parameters

- <word1-32>: The name of the router access-list.
- {in|out}: Perform offset on incoming or outgoing routing metric updates.
- <0-16>: The offset to incoming or outgoing routing metric. If the offset value is 0, no action is taken.
- <vlan_id>: User specified VLAN ID for the offset list.

Default

None.

Usage Guidelines

- An extended offset list (which includes an interface) takes precedence over an regular offset list (without an interface).
- Except for the routes which are learned via RIP, the offset-list configuration affects the connected routes too. For example, assume the metric value is set to 2 for the connected protocol type and the offset is set to 3 for the outgoing routing metric. Eventually, the value of the outgoing routing metric is 5.

Examples

- This example shows how to create an offset list associated with the access-list named test to apply an offset of 4 to the incoming routing metric.

```
# configure terminal
(config)# router access-list test permit 192.168.1.0 255.255.255.0
(config)# router rip
(config-router)# offset-list test in 4
```

- Continue the previous example, this example shows how to create another offset list associated with the same access-list name and assigned with an different offset value 5 on interface VLAN 12.

This offset-list takes precedence over than the previous example, i.e. the offset 5 is added to incoming routing metric when the source routes are came from VLAN 12 and matched the network segment '192.168.1.0/24' and the offset 4 is used for the rest of matched routes.

```
# configure terminal
```

```
(config)# router access-list test permit 192.168.1.0 255.255.255.0
(config)# router rip
(config-router)# offset-list test in 5 vlan 12
```

2.11. RIP administrative distance

Use the 'distance' command in router configuration mode to configure the RIP administrative distance. Use the no form to restore to the default setting. Use the 'show ip rip' command to verify the current setting.

Syntax

- distance <1-255>
- no distance

Parameters

- <1-255>: User specified administrative metric value for the RIP routing protocol.

Default

The default retransmit-interval value is 120.

Examples

- This example shows how to configure the RIP administrative distance value to 100.
configure terminal
(config)# router rip
(config-router)# distance 100

2.12. Show RIP database

Use the 'show ip rip database' command in privileged EXEC mode to show the RIP routing database information.

Syntax

- show ip rip database

Parameters

None.

Default

None.

Examples

- This example shows the RIP routing database information.

```
# show ip rip database
Codes: R - RIP, C - connected, S - Static, O - OSPF
Sub-codes:
      (n) - normal, (s) - static, (d) - default, (r) - redistribute,
      (i) - interface

      Network          Next Hop      Metric From      Ext. Metric
Tag Time
R(d) 0.0.0.0/0         0.0.0.0          1 self           0
R(s) 1.2.2.0/24        0.0.0.0          1 self           0
S(r) 1.3.3.0/24        24.0.0.2         1 self           0
C(r) 1.20.1.0/24       0.0.0.0          1 self           0
O(r) 1.21.1.0/24       1.20.1.1         1 self           16711690 0
R(n) 22.0.0.0/24       24.0.0.2         2 24.0.0.2
0 00:02:56
C(i) 24.0.0.0/24       0.0.0.0          1 self           0
```

2.13. Show RIP status

Use the 'show ip rip' command in privileged EXEC mode to show the general status information.

Syntax

- show ip rip

Parameters

- None

Default

None.

Examples

- This example shows the RIP general status when RIP is enabled and the output is empty when RIP is disabled.

```
# show ip rip
```

```

Sending updates every 30 seconds, next due in 0 seconds
Invalid after 180 seconds, garbage collect after 240 seconds
Default redistribution metric is 1
Redistributing: connected static
Default version control: send version 2, receive any version
  Interface          Send  Recv  Triggered RIP  Auth      MD5 Key-chain
  Vlan 1             2    1 2    Yes           Simple Pwd
  Vlan 2             2    1 2    Yes           Simple Pwd
  Vlan 3             2    1 2    Yes           MD5       key-name3
Routing for Networks:
  Address            Wildcard-mask
  2.1.2.0            0.0.0.255
  2.1.3.0            0.0.0.255
  2.1.8.0            0.0.0.255
  1.1.1.1
Passive Interface(s):
  Vlan 10
  Vlan 400
Routing Information Sources:
  Gateway            Last Update  Version  Recv. Bad Packets  Recv. Bad Routes
  2.1.8.6            00:00:12    2        11338              0
  2.1.2.4            00:00:04    2         0                  0
  2.1.3.1            00:00:18    2         0                  0
  2.1.3.4            00:00:09    0         3                  0
Distance: (default is 120)

```

3. Appendixes

3.1. Topology examples

3.1.1. An example usecase

The figure below shows an usecase including RIP and OSPF networks. Both RIP and OSPF are enabled on Router-202 and it redistributes routes between the RIP and OSPF domains. Router-201 redistributes static routes and directly-connected interfaces into the RIP domain. Router-208 and Router-212 are running RIPv1 and the rest of the routers are running RIPv2. For Router-201 and Router-206, passive interfaces are configured on the interfaces which are connected to hosts.

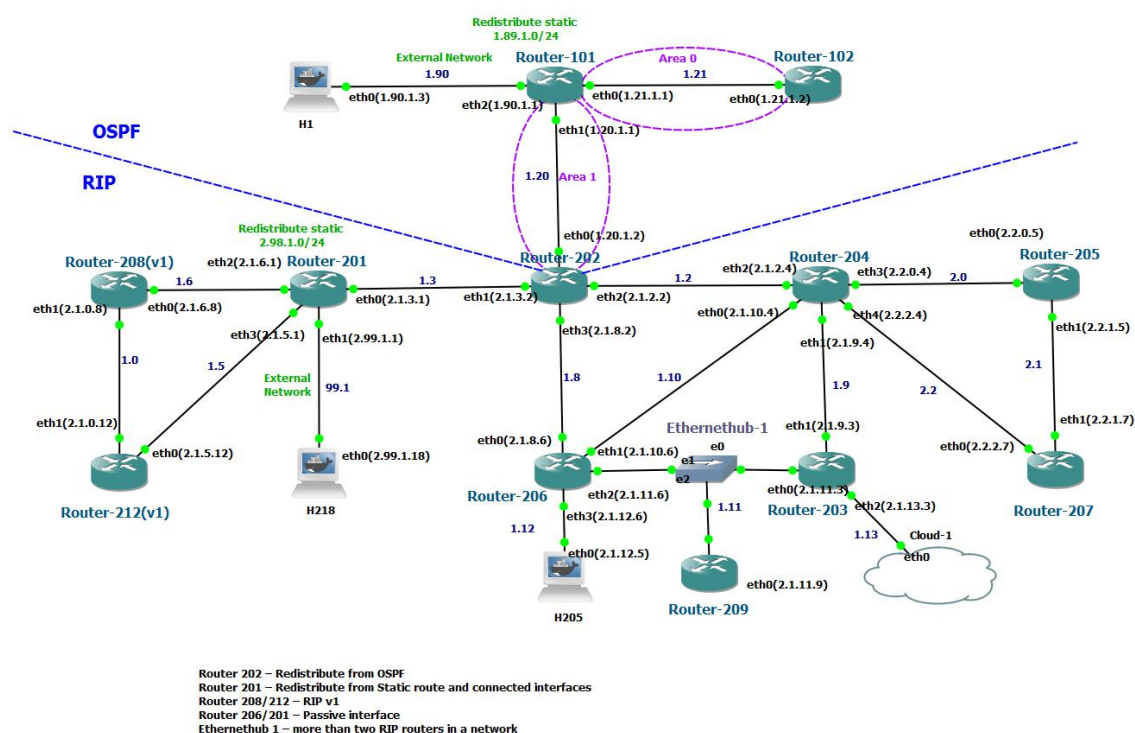


Figure 1. RIPv2 Topology Example

3.2. Limitation

3.2.1. Unsupported features

The following is a listing of limitation that is not supported in the WebStaX FRR RIP software module.

- **Route table overflow**
- **Known bugs in FRRouting**
- **No support for VRF**
- **No support for ECMP**
- **No support for Route Summarization**

3.2.2. Maximum configuration table size

The following is a listing of limitation of the maximum configuration table size.

Feature	Maximum table size
RIP Network configuration	128
RIP Neighbors configuration	128
RIP offset-list configuration	130

3.3. RIP commands on Cisco layer 3 switch product (3650/3750)

The following table lists OSPF commands on a Cisco Layer 3 switch product alongside with the corresponding WebStaX CLI commands.

Feature	Cisco	WebStaX ('x' means the unsupported command, '-' means the same command)
IP routing	<ul style="list-style-type: none"> ip routing 	<ul style="list-style-type: none"> -
RIP process	<ul style="list-style-type: none"> [no] router rip x 	<ul style="list-style-type: none"> [no] router rip clear ip ospf
RIP version	<ul style="list-style-type: none"> [no] version [1] [2] [no] ip rip receive version [1] [2] [no] ip rip send version [1] [2] 	<ul style="list-style-type: none"> [no] version {1 2} [no] ip rip receive version {1 [2] 2 [1] none} [no] ip rip send version {1 [2] 2 [1]}
RIP network	<ul style="list-style-type: none"> [no] network ip-address 	<ul style="list-style-type: none"> [no] network ip-address wildcard-mask
RIP split horizon and poison reverse	<ul style="list-style-type: none"> [no] ip split-horizon [eigrp] 	<ul style="list-style-type: none"> [no] ip rip split-horizon [poisoned-reverse]
RIP redistributed default metric	<ul style="list-style-type: none"> [no] default-metric number-value 	<ul style="list-style-type: none"> [no] default-metric <1-16>
RIP route redistribution	<ul style="list-style-type: none"> [no] redistribute {connected static bgp eigrp isis iso-igrp mobile odr ospf ospfv3 vrf } [process-id] {level-1 level-1-2 level-2} [as-number] [metric {metric-value transparent}] [match {internal external 1 external 2}] [tag tag-value] [route-map map-tag] 	<ul style="list-style-type: none"> [no] redistribute {static connected ospf} [metric <metric_value>]

RIP default route redistribution	<ul style="list-style-type: none"> • [no] default-information originate [on-passive route-map map-name] 	<ul style="list-style-type: none"> • [no] default-information originate
RIP metric manipulation	<ul style="list-style-type: none"> • [no] offset-list {access-list-number access-list-name} {in out} offset [interface-type interface-number] 	<ul style="list-style-type: none"> • [no] offset-list <access_list_name> {in out} <0-16> [vlan <vlan_id>]
RIP administrative distance	<ul style="list-style-type: none"> • [no] distance <1-255> 	<ul style="list-style-type: none"> • [no] distance <1-255>
Show RIP general/neighbor status	<ul style="list-style-type: none"> • show ip protocols • x • x 	<ul style="list-style-type: none"> • x • show ip rip • show ip rip neighbor
Show RIP routing database	<ul style="list-style-type: none"> • show ip rip database [ip-address mask] 	<ul style="list-style-type: none"> • show ip rip database

3.4. Known issues

TODO

4. References

1. FRRouting <http://frrouting.readthedocs.io/en/latest/ripd.html>
2. RFC 1058-Routing Information Protocol <https://www.ietf.org/rfc/rfc1058.txt>
3. RFC 2453-RIP Version 2 <https://www.ietf.org/rfc/rfc2453.txt>
4. RFC 1724-RIP Version 2 MIB Extension <https://www.ietf.org/rfc/rfc1724.txt>