



## IPv6 Routing: RIP for IPv6

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IPv6 Routing Information Protocol (RIP) functions the same and offers the same benefits as IPv4 RIP. RIP enhancements for IPv6, detailed in RFC 2080, include support for IPv6 addresses and prefixes and the use of the all-RIP-devices multicast group address, FF02::9, as the destination address for RIP update messages.

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## Information About RIP for IPv6

### RIP for IPv6

IPv6 RIP functions the same and offers the same benefits as RIP in IPv4. RIP enhancements for IPv6, detailed in RFC 2080, include support for IPv6 addresses and prefixes, and the use of the all-RIP-devices multicast group address FF02::9 as the destination address for RIP update messages.

In the Cisco software implementation of IPv6 RIP, each IPv6 RIP process maintains a local routing table, referred to as a Routing Information Database (RIB). The IPv6 RIP RIB contains a set of best-cost IPv6 RIP routes learned from all its neighboring networking devices. If IPv6 RIP learns the same route from two different neighbors, but with different costs, it will store only the lowest cost route in the local RIB. The RIB also stores any expired routes that the RIP process is advertising to its neighbors running RIP. IPv6 RIP will try to insert every non-expired route from its local RIB into the primary IPv6 RIB. If the same route has been learned from a different routing protocol with a better administrative distance than IPv6 RIP, the RIP route will not be added to the IPv6 RIB but the RIP route will still exist in the IPv6 RIP RIB.

### Nonstop Forwarding for IPv6 RIP

Cisco nonstop forwarding (NSF) continues forwarding packets while routing protocols converge, therefore avoiding a route flap on switchover. When an RP failover occurs, the Forwarding Information Base (FIB) marks installed paths as stale by setting a new epoch. Subsequently, the routing protocols reconverge and populate the RIB and FIB. Once all NSF routing protocols converge, any stale routes held in the FIB are removed. A failsafe timer is required to delete stale routes, in case of routing protocol failure to repopulate the RIB and FIB.

RIP registers as an IPv6 NSF client. Doing so has the benefit of using RIP routes installed in the Cisco Express Forwarding table until RIP has converged on the standby.

# How to Configure RIP for IPv6

## Enabling IPv6 RIP

### Before you begin

Before configuring the router to run IPv6 RIP, globally enable IPv6 using the **ipv6 unicast-routing** command in global configuration mode, and enable IPv6 on any interfaces on which IPv6 RIP is to be enabled.

If you want to set or change a global value, follow steps 1 and 2, and then use the optional **ipv6 router rip** command in global configuration mode.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ipv6 unicast-routing**
4. **interface** *type number*
5. **ipv6 rip** *name* **enable**

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b> <b>Example:</b>  Router> enable	Enables privileged EXEC mode.  • Enter your password if prompted.
<b>Step 2</b>	<b>configure terminal</b> <b>Example:</b>  Router# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>ipv6 unicast-routing</b> <b>Example:</b>  Router(config)# ipv6 unicast-routing	Enables the forwarding of IPv6 unicast datagrams.
<b>Step 4</b>	<b>interface</b> <i>type number</i> <b>Example:</b>  Router(config)# interface gigabitethernet 0/0/0	Specifies the interface type and number, and enters interface configuration mode.

	Command or Action	Purpose
Step 5	<b>ipv6 rip</b> <i>name</i> <b>enable</b> <b>Example:</b> Router(config-if)# ipv6 rip process1 enable	Enables the specified IPv6 RIP routing process on an interface.

## Customizing IPv6 RIP

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ipv6 router rip** *word*
4. **maximum-paths** *number-paths*
5. **exit**
6. **interface** *type number*
7. **ipv6 rip** *name* **default-information** {**only** | **originate**} [**metric** *metric-value*]

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b> <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b> <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>ipv6 router rip</b> <i>word</i> <b>Example:</b> Router(config)# ipv6 router rip process1	Configures an IPv6 RIP routing process and enters router configuration mode for the IPv6 RIP routing process. <ul style="list-style-type: none"> <li>• Use the <i>word</i> argument to identify a specific IPv6 RIP routing process.</li> </ul>
Step 4	<b>maximum-paths</b> <i>number-paths</i> <b>Example:</b> Router(config-router)# maximum-paths 1	(Optional) Defines the maximum number of equal-cost routes that IPv6 RIP can support. <ul style="list-style-type: none"> <li>• The <i>number-paths</i> argument is an integer from 1 to 64. The default for RIP is four paths.</li> </ul>
Step 5	<b>exit</b> <b>Example:</b> Router(config-if)# exit	Exits interface configuration mode and enters global configuration mode.

	Command or Action	Purpose
<b>Step 6</b>	<b>interface</b> <i>type number</i> <b>Example:</b> <pre>Router(config)# interface gigabitethernet 0/0/0</pre>	Specifies the interface type and number, and enters interface configuration mode.
<b>Step 7</b>	<b>ipv6 rip</b> <i>name</i> <b>default-information</b> { <b>only</b>   <b>originate</b> } [ <b>metric</b> <i>metric-value</i> ] <b>Example:</b> <pre>Router(config-if)# ipv6 rip process1 default-information originate</pre>	(Optional) Originates the IPv6 default route (::/0) into the specified RIP routing process updates sent out of the specified interface.  <b>Note</b> To avoid routing loops after the IPv6 default route (::/0) is originated out of any interface, the routing process ignores all default routes received on any interface.  <ul style="list-style-type: none"> <li>• Specifying the <b>only</b> keyword originates the default route (::/0) but suppresses all other routes in the updates sent on this interface.</li> <li>• Specifying the <b>originate</b> keyword originates the default route (::/0) in addition to all other routes in the updates sent on this interface.</li> </ul>

## Verifying IPv6 RIP Configuration and Operation

### SUMMARY STEPS

1. **show ipv6 rip** [*name*][**database** | **next-hops**]
2. **show ipv6 route** [*ipv6-address* | *ipv6-prefix/prefix-length* | *protocol* | *interface-type interface-number*]
3. **enable**
4. **debug ipv6 rip** [*interface-type interface-number*]

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>show ipv6 rip</b> [ <i>name</i> ][ <b>database</b>   <b>next-hops</b> ] <b>Example:</b> <pre>Device&gt; show ipv6 rip process1 database</pre>	(Optional) Displays information about current IPv6 RIP processes.  <ul style="list-style-type: none"> <li>• In this example, IPv6 RIP process database information is displayed for the specified IPv6 RIP process.</li> </ul>
<b>Step 2</b>	<b>show ipv6 route</b> [ <i>ipv6-address</i>   <i>ipv6-prefix/prefix-length</i>   <i>protocol</i>   <i>interface-type interface-number</i> ] <b>Example:</b> <pre>Device&gt; show ipv6 route rip</pre>	(Optional) Displays the current contents of the IPv6 routing table.  <ul style="list-style-type: none"> <li>• In this example, only IPv6 RIP routes are displayed.</li> </ul>

	Command or Action	Purpose
Step 3	<b>enable</b> <b>Example:</b> Device> enable	Enables higher privilege levels, such as privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 4	<b>debug ipv6 rip</b> [ <i>interface-type interface-number</i> ] <b>Example:</b> Device# debug ipv6 rip	(Optional) Displays debugging messages for IPv6 RIP routing transactions.

## Configuration Examples for RIP for IPv6

### Example: Enabling the RIP for IPv6 Process

In the following example, the IPv6 RIP process named process1 is enabled on the router and on Gigabit Ethernet interface 0/0/0. The IPv6 default route (::/0) is advertised in addition to all other routes in router updates sent on Gigabit Ethernet interface 0/0/0. Additionally, BGP routes are redistributed into the RIP process named process1 according to a route map where routes that match a prefix list are also tagged. The number of parallel paths is set to one to allow the route tagging, and the IPv6 RIP timers are adjusted. A prefix list named eth0/0-in-flt filters inbound routing updates on Gigabit Ethernet interface 0/0/0.

```

ipv6 router rip process1
  maximum-paths 1
  redistribute bgp 65001 route-map bgp-to-rip
  distribute-list prefix-list eth0/0-in-flt in GigabitEthernet0/0/0
!
interface GigabitEthernet0/0/0
  ipv6 address 2001:DB8::/64 eui-64
  ipv6 rip process1 enable
  ipv6 rip process1 default-information originate
!
ipv6 prefix-list bgp-to-rip-flt seq 10 deny 2001:DB8:3::/16 le 128
ipv6 prefix-list bgp-to-rip-flt seq 20 permit 2001:DB8:1::/8 le 128
!
ipv6 prefix-list eth0/0-in-flt seq 10 deny ::/0
ipv6 prefix-list eth0/0-in-flt seq 15 permit ::/0 le 128
!
route-map bgp-to-rip permit 10
  match ipv6 address prefix-list bgp-to-rip-flt
  set tag 4

```

In the following example, output information about all current IPv6 RIP processes is displayed using the **show ipv6 rip** command:

```

Device> show ipv6 rip

RIP process "process1", port 521, multicast-group FF02::9, pid 62
  Administrative distance is 120. Maximum paths is 1
  Updates every 5 seconds, expire after 15
  Holddown lasts 10 seconds, garbage collect after 30
  Split horizon is on; poison reverse is off

```

```

    Default routes are generated
    Periodic updates 223, trigger updates 1
Interfaces:
  GigabitEthernet0/0/0
Redistribution:
  Redistributing protocol bgp 65001 route-map bgp-to-rip

```

In the following example, output information about a specified IPv6 RIP process database is displayed using the **show ipv6 rip** command with the *name* argument and the **database** keyword. In the following output for the IPv6 RIP process named `process1`, timer information is displayed, and route `2001:DB8::16/64` has a route tag set:

```

Device> show ipv6 rip process1 database

RIP process "process1", local RIB
 2001:DB8::/64, metric 2
   GigabitEthernet0/0/0/FE80::A8BB:CCFF:FE00:B00, expires in 13 secs
 2001:DB8::/16, metric 2 tag 4, installed
   GigabitEthernet0/0/0/FE80::A8BB:CCFF:FE00:B00, expires in 13 secs
 2001:DB8:1::/16, metric 2 tag 4, installed
   GigabitEthernet0/0/0/FE80::A8BB:CCFF:FE00:B00, expires in 13 secs
 2001:DB8:2::/16, metric 2 tag 4, installed
   GigabitEthernet0/0/0/FE80::A8BB:CCFF:FE00:B00, expires in 13 secs
 ::/0, metric 2, installed
   GigabitEthernet0/0/0/FE80::A8BB:CCFF:FE00:B00, expires in 13 secs

```

In the following example, output information for a specified IPv6 RIP process is displayed using the **show ipv6 rip** command with the *name* argument and the **next-hops** keyword:

```

Device> show ipv6 rip process1 next-hops

RIP process "process1", Next Hops
  FE80::A8BB:CCFF:FE00:A00/GigabitEthernet0/0/0 [4 paths]

```

## Additional References

The following sections provide references related to configuring Routing Information Protocol.

### Related Documents

Related Topic	Document Title
Protocol-independent features, filtering RIP information, key management (available in RIP Version 2), and VLSM	<i>Configuring IP Routing Protocol-Independent Features</i>
IPv6 Routing: RIP for IPv6	<i>Cisco IOS IP Routing: RIP Configuration Guide</i>
RIP commands: complete command syntax, command mode, command history, defaults, usage guidelines, and examples	<i>Cisco IOS IP Routing: RIP Command Reference</i>
Configuring Frame Relay	<i>Cisco IOS Wide-Area Networking Configuration Guide</i>

**Standards**

Standard	Title
None	--

**MIBs**

MIB	MIBs Link
No new or modified MIBS are supported and support for existing MIBs has not been modified.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:  <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

**RFCs**

RFC	Title
RFC 1058	<i>Routing Information Protocol</i>
RFC 2082	RIP-2 MD5 Authentication
RFC 2091	<i>Triggered Extensions to RIP to Support Demand Circuits</i>
RFC 2453	RIP version 2

**Technical Assistance**

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	<a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a>

## Feature Information for RIP for IPv6

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](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

**Table 1: Feature Information for RIP for IPv6**

Feature Name	Releases	Feature Information
IPv6 Routing: RIP for IPv6 (RIPng)	12.2(2)T 12.2(17a)SX1 12.2(25)SEA 12.2(25)SG 12.2(33)SRA 12.3 15.0(2)SG Cisco IOS XE Release 2.1 Cisco IOS XE Release 3.2.0SG	RIP enhancements for IPv6 include support for IPv6 addresses and prefixes, and the use of the all-RIP-devices multicast group address FF02::9 as the destination address for RIP update messages.  The following commands were introduced or modified: <b>debug ipv6 rip</b> , <b>ipv6 rip default-information</b> , <b>ipv6 rip enable</b> , <b>ipv6 router rip</b> , <b>ipv6 unicast-routing</b> , <b>maximum-paths</b> , <b>show ipv6 rip</b> , <b>show ipv6 route</b> .
IPv6: RIPng Nonstop Forwarding	12.2(33)SRE 15.0(1)S 15.0(1)SY Cisco IOS XE Release 2.1	The IPv6 RIPng nonstop forwarding feature is supported.