

## Configuring RIP V2

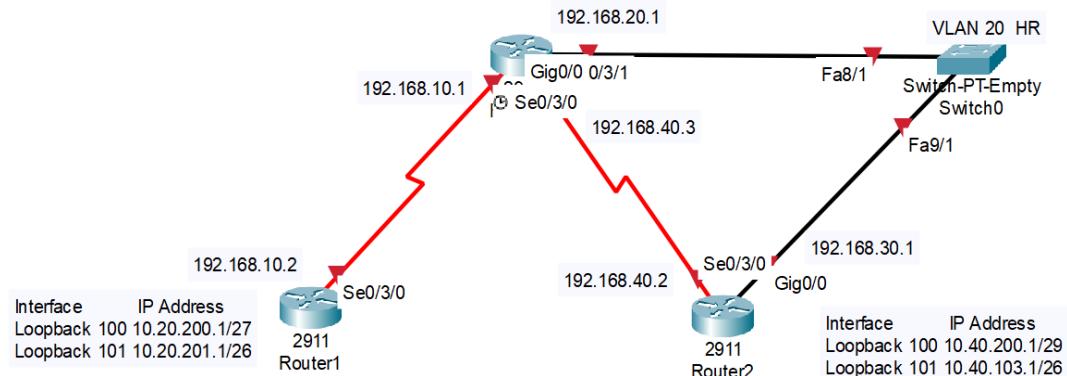


Figure 1 Topology

Routing Information Protocol version 2 (RIPv2) is an enhanced version of RIPv1 that includes support for Classless Inter-Domain Routing (CIDR) and Variable Length Subnet Masks (VLSM). Unlike RIPv1, which is a classful routing protocol, RIPv2 sends subnet mask information in its routing updates, making it more suitable for today's subnetted networks. This guide provides a step-by-step approach to configuring RIPv2 on Cisco IOS routers.

## Key Differences Between RIPv1 and RIPv2

Feature	RIPv1	RIPv2
Subnet Mask	No subnet mask in updates	Includes subnet mask in updates
CIDR/VLSM Support	No	Yes
Update Destination	Broadcast (255.255.255.255)	Multicast (224.0.0.9)
Authentication	No	Yes (MD5 or plain text)
Classful/Classless	Classful	Classless

## Step 1: Access the Router

Connect to your router via console or SSH:

```
Router> enable
Router# configure terminal
Router(config)#
```

## Step 2: Configure IP Addresses on Interfaces

Before configuring RIP, ensure your interfaces have IP addresses configured:

```
Router(config)# interface gigabitethernet 0/0
Router(config-if)# ip address 192.168.1.1 255.255.255.0
Router(config-if)# no shutdown
Router(config-if)# exit
```

```
Router(config)# interface gigabitethernet 0/1
Router(config-if)# ip address 192.168.2.1 255.255.255.0
Router(config-if)# no shutdown
Router(config-if)# exit
```

## Step 3: Enable RIPv2 Routing Protocol

Enter RIP configuration mode and specify version 2:

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

## Step 4: Disable Auto-summarization

By default, RIP automatically summarizes routes at classful network boundaries. Since RIPv2 is designed to support VLSM and CIDR, it's recommended to disable auto-summarization:

```
Router(config-router)# no auto-summary
```

## Step 5: Advertise Networks

Specify the networks to be advertised by RIP. Note that RIP uses classful network commands, so you only specify the major network:

```
Router(config-router)# network 192.168.1.0
Router(config-router)# network 192.168.2.0
```

## Step 6: Configure Passive Interfaces (Optional)

To prevent RIP updates from being sent out on interfaces where no RIP neighbors exist (such as interfaces connected to end-user networks), configure them as passive:

```
Router(config-router)# passive-interface gigabitethernet 0/2
```

## Step 7: Configure Authentication (Optional but Recommended)

To secure RIP updates, configure authentication:

### Step 7.1: Create a Key Chain

```
Router(config)# key chain RIP-AUTH  
Router(config-keychain)# key 1  
Router(config-keychain-key)# key-string MySecretKey  
Router(config-keychain-key)# exit  
Router(config-keychain)# exit
```

### Step 7.2: Apply Authentication to the Interface

```
Router(config)# interface gigabitethernet 0/0  
Router(config-if)# ip rip authentication mode md5  
Router(config-if)# ip rip authentication key-chain RIP-AUTH  
Router(config-if)# exit  
  
Router(config)# interface gigabitethernet 0/1  
Router(config-if)# ip rip authentication mode md5  
Router(config-if)# ip rip authentication key-chain RIP-AUTH  
Router(config-if)# exit
```

## Step 8: Save the Configuration

Save your configuration to ensure changes persist after a router reload:

```
Router(config)# exit  
Router# copy running-config startup-config
```

## Step 9: Verify RIPv2 Configuration

Use the following commands to verify your RIPv2 configuration:

### View RIP Configuration

```
Router# show running-config | section rip
```

### Check RIP Database

```
Router# show ip rip database
```

### View RIP Interfaces

```
Router# show ip protocols
```

### Verify Routes

```
Router# show ip route rip
```

### Check RIP Neighbors

```
Router# debug ip rip
```

Remember to disable debugging when done:

```
Router# undebug all
```

## Common RIPv2 Configuration Issues and Solutions

### Issue 1: Routes Not Being Advertised

**Solution:** Verify network statements and ensure interfaces are up/up:

```
Router# show ip interface brief
```

### Issue 2: RIPv2 Routes Not Being Installed in Routing Table

**Solution:** Check for routing issues or better routes from other protocols:

```
Router# show ip route  
Router# show ip protocols
```

### Issue 3: Authentication Failures

**Solution:** Verify key chains and authentication modes match on all routers:

```
Router# show key chain
```

## Additional RIPv2 Configuration Options

### Configure Route Filtering

To filter routes, use distribute lists:

```
Router(config)# access-list 1 permit 192.168.10.0 0.0.0.255  
Router(config)# router rip  
Router(config-router)# distribute-list 1 out gigabitethernet 0/0
```

### Adjust Timers

You can modify RIP timers to fine-tune convergence:

```
Router(config-router)# timers basic 30 90 180 270
```

The values represent update, invalid, holddown, and flush timers in seconds.

### Configure Default Route Propagation

To propagate a default route in RIP:

```
Router(config-router)# default-information originate
```

You've now successfully configured RIPv2 on your Cisco IOS router. The configuration steps covered include enabling RIPv2, disabling auto-summarization, advertising networks, configuring passive interfaces, and implementing authentication. You've also learned how to verify your configuration and troubleshoot common issues.

RIPv2, while considered a legacy protocol compared to more modern routing protocols like OSPF or EIGRP, is still useful for smaller networks and remains an important fundamental skill for network engineers.

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**TASK#01:** - Configure the hostnames on routers R1, R2 and R3 as illustrated in the topology.

### R1

```
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname Router1
```

### R2

```
Router>en
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname Router2
```

### R3

```
Router>en
Router#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname Router3
```

**TASK#02:** Configure a back-to-back Serial connection between R1 and R3. Configure the DCE interface Serial0/3/0 in R3 to provide clocking to R1 at a clock speed of 128Kbps. Configure IP addresses 192.168.10.1 and 192.168.10.1 on R1 and R3 Serial0/3/0 interfaces respectively. Configure the Loopback interfaces on R1 and R3 with the IP addresses illustrated in the topology.

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### R3

```
Router3#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router3(config)#int se0/3/0
Router3(config-if)#clock rate 128000
Router3(config-if)#ip address 192.168.10.1 255.255.255.0
Router3(config-if)#no shutdown

%LINK-5-CHANGED: Interface Serial0/3/0, changed state to down
Router3(config-if)#
Router3(config-if)#
Router3(config-if)#do show controllers se0/3/0
Interface Serial0/3/0
Hardware is PowerQUICC MPC860
DCE V.35, clock rate 128000

Router3#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router3(config)#int g0/0
Router3(config-if)#ip address 192.168.20.1 255.255.255.0
Router3(config-if)#end

Router3#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router3(config)#int se0/3/1
Router3(config-if)#ip address 192.168.40.3 255.255.255.0
Router3(config-if)#no shutdown

Router3#show ip interface brief
Interface          IP-Address      OK? Method Status           Protocol
GigabitEthernet0/0  192.168.20.1   YES manual administratively down down
GigabitEthernet0/1  unassigned     YES unset  administratively down down
GigabitEthernet0/2  unassigned     YES unset  administratively down down
Serial0/3/0         192.168.10.1   YES manual down             down
Serial0/3/1         192.168.40.3   YES manual down             down
Vlan1              unassigned     YES unset  administratively down down

```

### R1

```
Router1>en
Router1#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router1(config)#int se0/3/0
Router1(config-if)#ip address 192.168.10.2 255.255.255.0
Router1(config-if)#no shutdown

Router1(config-if)#
%LINK-5-CHANGED: Interface Serial0/3/0, changed state to up
```

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```
Router1(config-if)#
Router1(config-if)#int loopback 100

Router1(config-if)#
%LINK-5-CHANGED: Interface Loopback100, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback100, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/3/0, changed state to up

Router1(config-if)#ip address 10.20.200.1 255.255.255.224
Router1(config-if)#int loopback 101

Router1(config-if)#
%LINK-5-CHANGED: Interface Loopback101, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback101, changed state to up

Router1(config-if)#ip address 10.20.201.1 255.255.255.192
Router1(config-if)#do wr
Building configuration...
[OK]
Router1(config-if)#

Router1#show ip interface brief
Interface          IP-Address      OK? Method Status          Protocol
GigabitEthernet0/0 unassigned       YES unset administratively down down
GigabitEthernet0/1 unassigned       YES unset administratively down down
GigabitEthernet0/2 unassigned       YES unset administratively down down
Serial0/3/0         192.168.10.2   YES manual up           up
Serial0/3/1         unassigned       YES unset administratively down down
Loopback100         10.20.200.1    YES manual up           up
Loopback101         10.20.201.1    YES manual up           up
Vlan1              unassigned       YES unset administratively down down
-     . . .

Router1#show controllers se0/3/0
Interface Serial0/3/0
Hardware is PowerQUICC MPC860
DTE V.35 TX and RX clocks detected
```

### R2

```
Router2>en
Router2#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router2(config)#int se0/3/0
Router2(config-if)#ip address 192.168.40.2 255.255.255.0
Router2(config-if)#no shutdown

Router2(config-if)#int g0/0
Router2(config-if)#ip address 192.168.30.1 255.255.255.0
Router2(config-if)#no shutdown
```

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```
Router2(config-if)#int loopback 100

Router2(config-if)#
%LINK-5-CHANGED: Interface Loopback100, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback100, changed state to up

Router2(config-if)#ip address 10.40.200.1 255.255.255.248
Router2(config-if)#int loopback 101

Router2(config-if)#
%LINK-5-CHANGED: Interface Loopback101, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback101, changed state to up

Router2(config-if)#ip address 10.40.103.1 255.255.255.192

Router2#show ip interface brief
Interface          IP-Address      OK? Method Status          Protocol
GigabitEthernet0/0  192.168.30.1   YES manual up           up
GigabitEthernet0/1  unassigned     YES unset administratively down down
GigabitEthernet0/2  unassigned     YES unset administratively down down
Serial0/3/0         192.168.40.2   YES manual up           up
Serial0/3/1         unassigned     YES unset administratively down down
Loopback100         10.40.200.1   YES manual up           up
Loopback101         10.40.103.1   YES manual up           up
Vlan1              unassigned     YES unset administratively down down
```

**TASK#03:** - Enable RIPv2 on R1 and configure RIPv2 routing for the Loopback interfaces and the Serial0/0 interface. Verify on either R1 or R2 that RIPv2 has been enabled using the appropriate commands.

### R1

### R2

```
Router2(config-if)#int s0/3/0
Router2(config-if)#ip address 192.10.0.2 255.255.255.0
Router2(config-if)#no shutdown

Router2(config-if)#int g0/0
Router2(config-if)#ip address 172.20.31.2 255.255.255.252
Router2(config-if)#no shutdown
```

**TASK#04:** - Enable RIPv2 on R1 and configure RIPv2 routing for the Loopback interfaces and the Serial interface. Verify on either R1 or R2 that RIPv2 has been enabled using the appropriate commands.

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## R1

```
Router1>en
Router1#config terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router1(config)#router rip
Router1(config-router)#version 2
Router1(config-router)#network 10.0.0.0
Router1(config-router)#network 192.168.10.0
Router1(config-router)#do wr
Building configuration...
```

## R2

```
Router2#config terminal
Enter configuration commands, one per line. End with CNTL/Z
Router2(config)#router rip
Router2(config-router)#version 2
Router2(config-router)#network 192.168.30.0
Router2(config-router)#network 192.168.40.0
Router2(config-router)#network 10.0.0.0
Router2(config-router)#do wr
Building configuration...
----
```

## R3

```
Router3(config)#router rip
Router3(config-router)#version 2
Router3(config-router)#network 192.168.10.0
Router3(config-router)#network 192.168.20.0
Router3(config-router)#network 192.168.40.0
Router3(config-router)#do wr
Building configuration...
```

## Verifications

```
Router2#show ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 3 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Redistributing: rip
  Default version control: send version 2, receive 2
    Interface          Send   Recv   Triggered RIP  Key-chain
    GigabitEthernet0/0   22
    Serial0/3/0         22
    Loopback100         22
    Loopback101         22
  Automatic network summarization is in effect
  Maximum path: 4
  Routing for Networks:
    10.0.0.0
    192.168.30.0
    192.168.40.0
  Passive Interface(s):
  Routing Information Sources:
    Gateway          Distance      Last Update
    192.168.40.3        120          00:01:44
```

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```
Router3#show ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 1 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Redistributing: rip

Router3#show ip protocols
Routing Protocol is "rip"
  Sending updates every 30 seconds, next due in 1 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Redistributing: rip
  Default version control: send version 2, receive 2
    Interface          Send  Recv  Triggered RIP  Key-chain
    Serial0/3/0        22
    Serial0/3/1        22
  Automatic network summarization is in effect
  Maximum path: 4
  Routing for Networks:
    192.168.10.0
    192.168.20.0
    192.168.40.0
  Passive Interface(s):
  Routing Information Sources:
    Gateway          Distance      Last Update
    192.168.10.2      120          00:00:03
    192.168.40.2      120          00:00:03
  Distance: (default is 120)
```

When configuring RIP routing, you must use the `version 2` keyword under RIP configuration mode. By default, if RIP is enabled and this keyword is not issued, the Cisco IOS router will enable both RIPv1 and RIPv2. RIPv1 will be enabled for inbound and outbound routing updates, and RIPv2 will be enabled only for inbound routing updates. This is illustrated below for a router configured for RIP routing without the `version 2` keyword:

This note provides important information about RIP version configuration behavior on Cisco IOS routers. Let me explain it in detail:

1. **Default Behavior:** When you configure RIP routing without explicitly specifying a version, Cisco routers implement a hybrid approach:
  - o The router will send out (outbound) updates using RIPv1 format only
  - o The router will accept (inbound) updates in both RIPv1 and RIPv2 formats
2. **Why This Matters:** This default behavior can cause problems because:
  - o RIPv1 is classful and doesn't include subnet mask information in updates
  - o This prevents proper support for VLSM (Variable Length Subnet Masks) and CIDR (Classless Inter-Domain Routing)
  - o Routes might not propagate correctly across your network

- You lose RIPv2's benefits like multicast updates and authentication
3. **Solution:** To ensure your router properly uses RIPv2 for both inbound and outbound updates, you must explicitly configure the version with the "version 2" command under router configuration mode:
1. **Router(config)# router rip**
  2. **Router(config-router)# version 2**
4. **Potential Issues:** If you don't set the version explicitly:
- You might see unexpected routing behavior
  - Some subnets might not be properly advertised
  - Security is reduced since authentication is only available in RIPv2
  - More bandwidth is used by broadcast traffic (RIPv1) instead of multicast (RIPv2)
5. **Best Practice:** Always explicitly set the RIP version to 2 when implementing RIP in modern networks to ensure consistent behavior and take advantage of RIPv2's improvements over RIPv1.
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