

```
Reply from 10.0.13.2: bytes=56 Sequence=1 ttl=255 time=30 ms
Reply from 10.0.13.2: bytes=56 Sequence=2 ttl=255 time=30 ms
Reply from 10.0.13.2: bytes=56 Sequence=3 ttl=255 time=30 ms
Reply from 10.0.13.2: bytes=56 Sequence=4 ttl=255 time=30 ms
Reply from 10.0.13.2: bytes=56 Sequence=5 ttl=255 time=30 ms

--- 10.0.13.2 ping statistics ---
 5 packet(s) transmitted
 5 packet(s) received
 0.00% packet loss
round-trip min/avg/max = 30/30/30 ms
```

Verify that R2 can successfully reach R3 over the 10.0.12.0 network.

```
<R2>ping 10.0.12.3
PING 10.0.12.2: 56 data bytes, press CTRL_C to break
Reply from 10.0.12.3: bytes=56 Sequence=1 ttl=255 time=31 ms
Reply from 10.0.12.3: bytes=56 Sequence=2 ttl=255 time=31 ms
Reply from 10.0.12.3: bytes=56 Sequence=3 ttl=255 time=41 ms
Reply from 10.0.12.3: bytes=56 Sequence=4 ttl=255 time=31 ms
Reply from 10.0.12.3: bytes=56 Sequence=5 ttl=255 time=41 ms

--- 10.0.12.3 ping statistics ---
 5 packet(s) transmitted
 5 packet(s) received
 0.00% packet loss
round-trip min/avg/max = 31/35/41 ms
```

Step 4 **Configure RIPv1.**

Enable RIP on R1, and then advertise the 10.0.0.0 network segment.

```
[R1]rip 1
[R1-rip-1]network 10.0.0.0
```

Enable RIP on R2, and then advertise the 10.0.0.0 network segment.

```
[R2]rip 1
[R2-rip-1]network 10.0.0.0
```

Enable RIP on R3, and then advertise the 10.0.0.0 network segment.

```
[R3]rip 1
[R3-rip-1]network 10.0.0.0
```

Step 5 Verify RIPv1 routes.

View the routing tables of R1, R2, and R3. Make sure that these routers have learned the RIP routes that are highlighted in gray in the following command output.

```
<R1>display ip routing-table
```

```
Route Flags: R - relay, D - download to fib
```

```
-----
```

```
Routing Tables: Public
```

```
Destinations : 13      Routes : 13
```

Destination/Mask	Proto	Pre	Cost	Flags	NextHop	Interface
10.0.1.0/24	Direct	0	0	D	10.0.1.1	LoopBack0
10.0.1.1/32	Direct	0	0	D	127.0.0.1	LoopBack0
10.0.1.255/32	Direct	0	0	D	127.0.0.1	LoopBack0
10.0.2.0/24	RIP	100	1	D	10.0.13.2	GigabitEthernet0/0/0
10.0.3.0/24	RIP	100	2	D	10.0.13.2	GigabitEthernet0/0/0
10.0.12.0/24	RIP	100	1	D	10.0.13.2	GigabitEthernet0/0/0
10.0.13.0/24	Direct	0	0	D	10.0.13.1	GigabitEthernet0/0/0
10.0.13.1/32	Direct	0	0	D	127.0.0.1	GigabitEthernet0/0/0
10.0.13.255/32	Direct	0	0	D	127.0.0.1	GigabitEthernet0/0/0
127.0.0.0/8	Direct	0	0	D	127.0.0.1	InLoopBack0
127.0.0.1/32	Direct	0	0	D	127.0.0.1	InLoopBack0
127.255.255.255/32	Direct	0	0	D	127.0.0.1	InLoopBack0
255.255.255.255/32	Direct	0	0	D	127.0.0.1	InLoopBack0

```
<R2>display ip routing-table
```

```
Route Flags: R - relay, D - download to fib
```

```
-----
```

```
Routing Tables: Public
```

```
Destinations : 15      Routes : 15
```

Destination/Mask	Proto	Pre	Cost	Flags	NextHop	Interface
10.0.1.0/24	RIP	100	1	D	10.0.13.1	GigabitEthernet0/0/0
10.0.2.0/24	Direct	0	0	D	10.0.2.2	LoopBack0
10.0.2.2/32	Direct	0	0	D	127.0.0.1	LoopBack0
10.0.2.255/32	Direct	0	0	D	127.0.0.1	LoopBack0
10.0.3.0/24	RIP	100	1	D	10.0.12.3	GigabitEthernet0/0/1
10.0.12.0/24	Direct	0	0	D	10.0.12.2	GigabitEthernet0/0/1

```

10.0.12.2/32    Direct 0    0    D    127.0.0.1    GigabitEthernet0/0/1
10.0.12.255/32 Direct 0    0    D    127.0.0.1    GigabitEthernet0/0/1
10.0.13.0/24   Direct 0    0    D    10.0.13.2    GigabitEthernet0/0/0
10.0.13.2/32   Direct 0    0    D    127.0.0.1    GigabitEthernet0/0/0
10.0.13.255/32 Direct 0    0    D    127.0.0.1    GigabitEthernet0/0/0
127.0.0.0/8    Direct 0    0    D    127.0.0.1    InLoopBack0
127.0.0.1/32   Direct 0    0    D    127.0.0.1    InLoopBack0
127.255.255.255/32 Direct 0    0    D    127.0.0.1    InLoopBack0
255.255.255.255/32 Direct 0    0    D    127.0.0.1    InLoopBack0

```

```
<R3>display ip routing-table
```

```
Route Flags: R - relay, D - download to fib
```

```
-----
Routing Tables: Public
```

```
Destinations : 13      Routes : 13
```

Destination/Mask	Proto	Pre	Cost	Flags	NextHop	Interface
10.0.1.0/24	RIP	100	2	D	10.0.12.2	GigabitEthernet0/0/1
10.0.2.0/24	RIP	100	1	D	10.0.12.2	GigabitEthernet0/0/1
10.0.3.0/24	Direct	0	0	D	10.0.3.3	LoopBack0
10.0.3.3/32	Direct	0	0	D	127.0.0.1	LoopBack0
10.0.3.255/32	Direct	0	0	D	127.0.0.1	LoopBack0
10.0.12.0/24	Direct	0	0	D	10.0.12.3	GigabitEthernet0/0/1
10.0.12.3/32	Direct	0	0	D	127.0.0.1	GigabitEthernet0/0/1
10.0.12.255/32	Direct	0	0	D	127.0.0.1	GigabitEthernet0/0/1
10.0.13.0/24	RIP	100	1	D	10.0.12.2	GigabitEthernet0/0/1
127.0.0.0/8	Direct	0	0	D	127.0.0.1	InLoopBack0
127.0.0.1/32	Direct	0	0	D	127.0.0.1	InLoopBack0
127.255.255.255/32	Direct	0	0	D	127.0.0.1	InLoopBack0
255.255.255.255/32	Direct	0	0	D	127.0.0.1	InLoopBack0

Test connectivity from R1 to IP address 10.0.23.3. R1 and R3 can communicate with one another.

```
[R1]ping 10.0.12.3
```

```
PING 10.0.12.3: 56 data bytes, press CTRL_C to break
```

```
Reply from 10.0.12.3: bytes=56 Sequence=1 ttl=254 time=70 ms
```

```
Reply from 10.0.12.3: bytes=56 Sequence=2 ttl=254 time=65 ms
```

```
Reply from 10.0.12.3: bytes=56 Sequence=3 ttl=254 time=65 ms
```

```

Reply from 10.0.12.3: bytes=56 Sequence=4 ttl=254 time=65 ms
Reply from 10.0.12.3: bytes=56 Sequence=5 ttl=254 time=65 ms

--- 10.0.12.3 ping statistics ---
 5 packet(s) transmitted
 5 packet(s) received
 0.00% packet loss
 round-trip min/avg/max = 65/66/70 ms

```

The **debugging** command can be used to view RIP periodic updates.

Run the **debugging** command to enable the RIP debugging function. The **debugging** command can be used only in the user view. To identify the currently enabled debugging information, use the **display debugging** command. Run the **terminal debugging** command to display the debugging information.

The information about RIP interactions between routers is displayed.

```

<R1>debugging rip 1
<R1>display debugging
RIP Process id: 1
    Debugs ON: SEND, RECEIVE, PACKET, TIMER, EVENT, BRIEF,
              JOB, ROUTE-PROCESSING, ERROR,
              REPLAY-PROTECT, GR
<R1>terminal debugging
Info: Current terminal debugging is on.
<R1>
Nov 29 2013 09:45:07.860.1+00:00 R1 RIP/7/DBG: 6: 12734: RIP 1: Receiving v1
response on GigabitEthernet0/0/0 from 10.0.13.2 with 3 RTEs
<R1>
Nov 29 2013 09:45:07.860.2+00:00 R1 RIP/7/DBG: 6: 12785: RIP 1: Receive response
from 10.0.13.2 on GigabitEthernet0/0/0
<R1>
Nov 29 2013 09:45:07.860.3+00:00 R1 RIP/7/DBG: 6: 12796: Packet: Version 1, Cmd
response, Length 64
<R1>
Nov 29 2013 09:45:07.860.4+00:00 R1 RIP/7/DBG: 6: 12845: Dest 10.0.2.0, Cost 1
<R1>
Nov 29 2013 09:45:07.860.5+00:00 R1 RIP/7/DBG: 6: 12845: Dest 10.0.3.0, Cost 2
<R1>
Nov 29 2013 09:45:07.860.6+00:00 R1 RIP/7/DBG: 6: 12845: Dest 10.0.12.0, Cost
1
<R1>

```

```
Nov 29 2013 09:45:09.370.1+00:00 R1 RIP/7/DBG: 25: 5071: RIP 1: Periodic timer
expired for interface GigabitEthernet0/0/1
```

Run the **undo debugging rip <process-id>** or **undo debugging all** command to disable the debugging functions.

```
<R1>undo debugging rip 1
```

Individual parameters can be specified to control the debugging information viewed. For example, the **debugging rip 1 event** command allows for only periodical update events sent or received by routers to be viewed. The question mark (?) can be added to the command to query other parameters.

```
<R1>debugging rip 1 event
```

```
<R1>
```

```
Nov 29 2013 10:00:04.880.1+00:00 R1 RIP/7/DBG: 25: 5719: RIP 1: Periodic timer
expired for interface GigabitEthernet0/0/0 (10.0.13.1) and its added to periodic
update queue
```

```
<R1>
```

```
Nov 29 2013 10:00:04.890.1+00:00 R1 RIP/7/DBG: 25: 6048: RIP 1: Interface
GigabitEthernet0/0/0 (10.0.13.1) is deleted from the periodic update queue
```

```
<R1>undo debugging all
```

```
Info: All possible debugging has been turned off
```

Warning: If too many debugging functions are enabled, a large number of router resources will be utilized that may result in system service failure. Therefore, the use of commands (such as **debug all**) for enabling debugging functions in batches should be performed with caution.

Step 6 Configure RIPv2.

After the preceding configuration, you need to configure only **version 2** in the RIP sub view.

```
[R1]rip 1
```

```
[R1-rip-1]version 2
```

```
[R2]rip 1
```

```
[R2-rip-1]version 2
```

```
[R3]rip 1
```

```
[R3-rip-1]version 2
```

Step 7 Verify RIPv2 routes.

View the routing tables of R1, R2, and R3.

Run the **display ip routing-table** command to view the routing tables of R1, R2, and R3. Compare the routes that are highlighted with RIPv1 routes.

```
<R1>display ip routing-table
```

```
Route Flags: R - relay, D - download to fib
```

```
-----
```

```
Routing Tables: Public
```

```
Destinations : 13      Routes : 13
```

Destination/Mask	Proto	Pre	Cost	Flags	NextHop	Interface
10.0.1.0/24	Direct	0	0	D	10.0.1.1	LoopBack0
10.0.1.1/32	Direct	0	0	D	127.0.0.1	LoopBack0
10.0.1.255/32	Direct	0	0	D	127.0.0.1	LoopBack0
10.0.2.0/24	RIP	100	1	D	10.0.13.2	GigabitEthernet0/0/0
10.0.3.0/24	RIP	100	2	D	10.0.13.2	GigabitEthernet0/0/0
10.0.12.0/24	RIP	100	1	D	10.0.13.2	GigabitEthernet0/0/0
10.0.13.0/24	Direct	0	0	D	10.0.13.1	GigabitEthernet0/0/0
10.0.13.1/32	Direct	0	0	D	127.0.0.1	GigabitEthernet0/0/0
10.0.13.255/32	Direct	0	0	D	127.0.0.1	GigabitEthernet0/0/0
127.0.0.0/8	Direct	0	0	D	127.0.0.1	InLoopBack0
127.0.0.1/32	Direct	0	0	D	127.0.0.1	InLoopBack0
127.255.255.255/32	Direct	0	0	D	127.0.0.1	InLoopBack0
255.255.255.255/32	Direct	0	0	D	127.0.0.1	InLoopBack0

```
<R2>display ip routing-table
```

```
Route Flags: R - relay, D - download to fib
```

```
-----
```

```
Routing Tables: Public
```

```
Destinations : 15      Routes : 15
```

Destination/Mask	Proto	Pre	Cost	Flags	NextHop	Interface
10.0.1.0/24	RIP	100	1	D	10.0.13.1	GigabitEthernet0/0/0
10.0.2.0/24	Direct	0	0	D	10.0.2.2	LoopBack0
10.0.2.2/32	Direct	0	0	D	127.0.0.1	LoopBack0

```

10.0.2.255/32   Direct  0    0      D   127.0.0.1   LoopBack0
10.0.3.0/24     RIP    100  1      D   10.0.12.3   GigabitEthernet0/0/1
10.0.12.0/24    Direct  0    0      D   10.0.12.2   GigabitEthernet0/0/1
10.0.12.2/32    Direct  0    0      D   127.0.0.1   GigabitEthernet0/0/1
10.0.12.255/32  Direct  0    0      D   127.0.0.1   GigabitEthernet0/0/1
10.0.13.0/24    Direct  0    0      D   10.0.13.2   GigabitEthernet0/0/0
10.0.13.2/32    Direct  0    0      D   127.0.0.1   GigabitEthernet0/0/0
10.0.13.255/32  Direct  0    0      D   127.0.0.1   GigabitEthernet0/0/0
127.0.0.0/8     Direct  0    0      D   127.0.0.1   InLoopBack0
127.0.0.1/32    Direct  0    0      D   127.0.0.1   InLoopBack0
127.255.255.255/32 Direct  0    0      D   127.0.0.1   InLoopBack0
255.255.255.255/32 Direct  0    0      D   127.0.0.1   InLoopBack0

```

```
[R3]display ip routing-table
```

```
Route Flags: R - relay, D - download to fib
```

```
-----
Routing Tables: Public
```

```
Destinations : 13      Routes : 13
```

Destination/Mask	Proto	Pre	Cost	Flags	NextHop	Interface
10.0.1.0/24	RIP	100	2	D	10.0.12.2	GigabitEthernet0/0/1
10.0.2.0/24	RIP	100	1	D	10.0.12.2	GigabitEthernet0/0/1
10.0.3.0/24	Direct	0	0	D	10.0.3.3	LoopBack0
10.0.3.3/32	Direct	0	0	D	127.0.0.1	LoopBack0
10.0.3.255/32	Direct	0	0	D	127.0.0.1	LoopBack0
10.0.12.0/24	Direct	0	0	D	10.0.12.3	GigabitEthernet0/0/1
10.0.12.3/32	Direct	0	0	D	127.0.0.1	GigabitEthernet0/0/1
10.0.12.255/32	Direct	0	0	D	127.0.0.1	GigabitEthernet0/0/1
10.0.13.0/24	RIP	100	1	D	10.0.12.2	GigabitEthernet0/0/1
127.0.0.0/8	Direct	0	0	D	127.0.0.1	InLoopBack0
127.0.0.1/32	Direct	0	0	D	127.0.0.1	InLoopBack0
127.255.255.255/32	Direct	0	0	D	127.0.0.1	InLoopBack0
255.255.255.255/32	Direct	0	0	D	127.0.0.1	InLoopBack0

Test connectivity from R1 to the IP destination 10.0.12.3 on interface Gigabit Ethernet 0/0/2 of R3.

```
<R1>ping 10.0.12.3
```

```
PING 10.0.12.3: 56 data bytes, press CTRL_C to break
```

```
Reply from 10.0.12.3: bytes=56 Sequence=1 ttl=254 time=74 ms
```

```
Reply from 10.0.12.3: bytes=56 Sequence=2 ttl=254 time=75 ms
```

```
Reply from 10.0.12.3: bytes=56 Sequence=3 ttl=254 time=75 ms
```

```
Reply from 10.0.12.3: bytes=56 Sequence=4 ttl=254 time=75 ms
Reply from 10.0.12.3: bytes=56 Sequence=5 ttl=254 time=75 ms
```

```
--- 10.0.12.3 ping statistics ---
 5 packet(s) transmitted
 5 packet(s) received
 0.00% packet loss
 round-trip min/avg/max = 74/74/75 ms
```

The **debugging** command can be used to view the RIPv2 periodic updates.

```
<R1>terminal debugging
Info: Current terminal debugging is on.
<R1>debugging rip 1 event
<R1>
Nov 29 2013 10:41:04.490.1+00:00 R1 RIP/7/DBG: 25: 5719: RIP 1: Periodic timer
expired for interface GigabitEthernet0/0/0 (10.0.13.1) and its added to periodic
update queue
<R1>
Nov 29 2013 10:41:04.500.1+00:00 R1 RIP/7/DBG: 25: 6048: RIP 1: Interface
GigabitEthernet0/0/0 (10.0.13.1) is deleted from the periodic update queue

<R1>undo debugging rip 1

<R1>debugging rip 1 packet
<R1>
Nov 29 2013 10:43:07.770.1+00:00 R1 RIP/7/DBG: 6: 12776: RIP 1: Sending response
on interface GigabitEthernet0/0/0 from 10.0.13.1 to 224.0.0.9
<R1>
Nov 29 2013 10:43:07.770.2+00:00 R1 RIP/7/DBG: 6: 12796: Packet: Version 2, Cmd
response, Length 24
<R1>
Nov 29 2013 10:43:07.770.3+00:00 R1 RIP/7/DBG: 6: 12864: Dest 10.0.1.0/24, Nexthop
0.0.0.0, Cost 1, Tag 0

<R1>undo debugging rip 1
```

Additional Exercises: Analyzing and Verifying

When using RIPv1, a router sends network IDs and other route update information to its neighbor routers without sending subnet masks. How do neighbor routers process the route update information and generate

the corresponding subnet masks?

How are RIPv1 and RIPv2 compatible with each other?

Final Configuration

```
<R1>display current-configuration
[V200R003C00SPC200]
#
 sysname R1
#
interface GigabitEthernet0/0/0
 ip address 10.0.13.1 255.255.255.0
#
interface GigabitEthernet0/0/1
 shutdown
 ip address 10.0.12.1 255.255.255.0
#
interface LoopBack0
 ip address 10.0.1.1 255.255.255.0
#
rip 1
 version 2
 network 10.0.0.0
#
user-interface con 0
 authentication-mode password
 set authentication password cipher %$%$+L'YR&IZt'4,) >-*#lH",)%K-oJ_M9+'lOU~bD
(\WTqB}%N,%$%$
user-interface vty 0 4
#
return

<R2>display current-configuration
[V200R003C00SPC200]
#
 sysname R2
#
interface GigabitEthernet0/0/0
 ip address 10.0.13.2 255.255.255.0
#
interface GigabitEthernet0/0/1
 ip address 10.0.12.2 255.255.255.0
```

```
#
interface GigabitEthernet0/0/2
 shutdown
 ip address 10.0.23.2 255.255.255.0
#
interface LoopBack0
 ip address 10.0.2.2 255.255.255.0
#
rip 1
 version 2
 network 10.0.0.0
#
user-interface con 0
 authentication-mode password
 set authentication password cipher %$$$1=cd%b%/O%Id-8X:by1N,+s}'4wD6TvO<I|/pd#
#44C@+s#,%$$$
user-interface vty 0 4
#
return

<R3>display current-configuration
[V200R003C00SPC200]
#
 sysname R3
#
interface GigabitEthernet0/0/0
 shutdown
 ip address 10.0.13.3 255.255.255.0
#
interface GigabitEthernet0/0/1
 ip address 10.0.12.3 255.255.255.0
#
interface GigabitEthernet0/0/2
 shutdown
 ip address 10.0.23.3 255.255.255.0
#
interface LoopBack0
 ip address 10.0.3.3 255.255.255.0
#
rip 1
 version 2
 network 10.0.0.0
#
```

```
user-interface con 0
 authentication-mode password
  set authentication password cipher %$$$ksXDMg7Ry6yUU:63:DQ),#/sQg"@*S\U#.s.bHW
  xQ,y%#/v,%$$$
user-interface vty 0 4
#
return
```