

Module 4 Routing Configuration

Lab 4-1 Configuring Static Routes and Default Routes

Learning Objectives

As a result of this lab section, you should achieve the following tasks:

- Configuration of a static route using an interface and an IP address as the next hop.
- Verification of static route operation.
- Implementation of the interconnection between a local and external network using a default route.
- Configuration of a backup static route on a router.

Topology

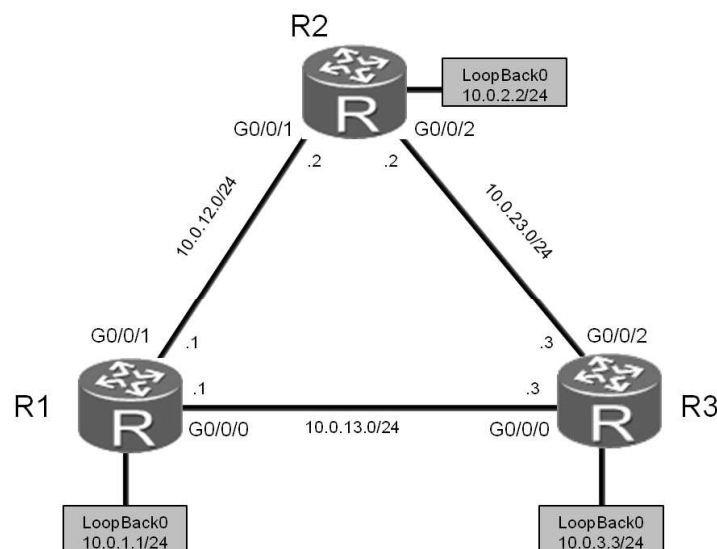


Figure 4.1 Lab topology for static and default routes

Scenario

Assume that you are a network administrator of a company that contains a single administrative domain and within the administrative domain, multiple networks have been defined, for which currently no method of routing exists.

Since the network scale is small, with only a few networks, static routes and default routes are to be used to implement interwork communication. The network addressing is to be applied as shown in Figure 4.1.

If a password is requested, and unless otherwise stated, please use the password: huawei

Tasks

Step 1 Perform basic system and IP address configuration.

Configure the device names and IP addresses for R1, R2, and R3.

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname R1
[R1]interface GigabitEthernet 0/0/0
[R1-GigabitEthernet0/0/0]ip address 10.0.13.1 24
[R1-GigabitEthernet0/0/0]quit
[R1]interface GigabitEthernet 0/0/1
[R1-GigabitEthernet0/0/1]ip address 10.0.12.1 24
[R1-GigabitEthernet0/0/1]quit
[R1]interface LoopBack 0
[R1-LoopBack0]ip address 10.0.1.1 24
```

Run the **display current-configuration** command to check the configuration.

```
<R1>display ip interface brief

Interface                IP Address/Mask      Physical  Protocol
.....output omitted.....
GigabitEthernet0/0/0      10.0.13.1/24         up        up
GigabitEthernet0/0/1      10.0.12.1/24         up        up
GigabitEthernet0/0/2      unassigned           up        down
LoopBack0                 10.0.1.1/24          up        up(s)
```

.....output omitted.....

<Huawei>system-view

Enter system view, return user view with Ctrl+Z.

[Huawei]sysname R2

[R2]interface GigabitEthernet 0/0/1

[R2-GigabitEthernet0/0/1]ip address 10.0.12.2 24

[R2-GigabitEthernet0/0/1]quit

[R2]interface GigabitEthernet0/0/2

[R2-GigabitEthernet0/0/2]ip add 10.0.23.2 24

[R2-GigabitEthernet0/0/2]quit

[R2]interface LoopBack0

[R2-LoopBack0]ip address 10.0.2.2 24

<R2>display ip interface brief

Interface	IP Address/Mask	Physical	Protocol
-----------	-----------------	----------	----------

.....output omitted.....

GigabitEthernet0/0/0	unassigned	up	down
----------------------	------------	----	------

GigabitEthernet0/0/1	10.0.12.2/24	up	up
----------------------	--------------	----	----

GigabitEthernet0/0/2	10.0.23.2/24	up	up
----------------------	--------------	----	----

LoopBack0	10.0.2.2/24	up	up(s)
-----------	-------------	----	-------

.....output omitted.....

<Huawei>system-view

Enter system view, return user view with Ctrl+Z.

[Huawei]sysname R3

[R3]interface GigabitEthernet 0/0/0

[R3-GigabitEthernet0/0/0]ip address 10.0.13.3 24

[R3-GigabitEthernet0/0/0]quit

[R3]interface GigabitEthernet0/0/2

[R3-GigabitEthernet0/0/2]ip address 10.0.23.3 24

[R3-GigabitEthernet0/0/2]quit

[R3]interface LoopBack 0

[R3-LoopBack0]ip address 10.0.3.3 24

<R3>display ip interface brief

Interface	IP Address/Mask	Physical	Protocol
-----------	-----------------	----------	----------

.....output omitted.....

GigabitEthernet0/0/0	10.0.13.3/24	up	up
----------------------	--------------	----	----

GigabitEthernet0/0/1	unassigned	up	down
----------------------	------------	----	------

GigabitEthernet0/0/2	10.0.23.3/24	up	up
----------------------	--------------	----	----

LoopBack0	10.0.3.3/24	up	up(s)
-----------	-------------	----	-------

.....output omitted.....

Use the **ping** command to test network connectivity from R1.

```
<R1>ping 10.0.12.2
PING 10.0.12.2: 56 data bytes, press CTRL_C to break
  Reply from 10.0.12.2: bytes=56 Sequence=1 ttl=255 time=30 ms
  Reply from 10.0.12.2: bytes=56 Sequence=2 ttl=255 time=30 ms
  Reply from 10.0.12.2: bytes=56 Sequence=3 ttl=255 time=30 ms
  Reply from 10.0.12.2: bytes=56 Sequence=4 ttl=255 time=30 ms
  Reply from 10.0.12.2: bytes=56 Sequence=5 ttl=255 time=30 ms

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

<R1>ping 10.0.13.3
PING 10.0.13.2: 56 data bytes, press CTRL_C to break
  Reply from 10.0.13.3: bytes=56 Sequence=1 ttl=255 time=6 ms
  Reply from 10.0.13.3: bytes=56 Sequence=2 ttl=255 time=2 ms
  Reply from 10.0.13.3: bytes=56 Sequence=3 ttl=255 time=2 ms
  Reply from 10.0.13.3: bytes=56 Sequence=4 ttl=255 time=2 ms
  Reply from 10.0.13.3: bytes=56 Sequence=5 ttl=255 time=2 ms

--- 10.0.13.3 ping statistics ---
  5 packet(s) transmitted
  5 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 2/2/6 ms
```

Use the ping command to test network connectivity from R2

```
<R2>ping 10.0.23.3
PING 10.0.23.3: 56 data bytes, press CTRL_C to break
  Reply from 10.0.23.3: bytes=56 Sequence=1 ttl=255 time=31 ms
  Reply from 10.0.23.3: bytes=56 Sequence=2 ttl=255 time=31 ms
  Reply from 10.0.23.3: bytes=56 Sequence=3 ttl=255 time=41 ms
  Reply from 10.0.23.3: bytes=56 Sequence=4 ttl=255 time=31 ms
  Reply from 10.0.23.3: bytes=56 Sequence=5 ttl=255 time=41 ms

--- 10.0.23.3 ping statistics ---
```

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

Step 2 **Test connectivity.**

Use the ping command to test network connectivity from R2 to networks 10.0.13.0/24 and 10.0.3.0/24

```
<R2>ping 10.0.13.3
PING 10.0.13.3: 56 data bytes, press CTRL_C to break
Request time out
Request time out
Request time out
Request time out
Request time out

--- 10.0.13.3 ping statistics ---
5 packet(s) transmitted
0 packet(s) received
100.00% packet loss

<R2>ping 10.0.3.3
PING 10.0.3.3: 56 data bytes, press CTRL_C to break
Request time out
Request time out
Request time out
Request time out
Request time out

--- 10.0.3.3 ping statistics ---
5 packet(s) transmitted
0 packet(s) received
100.00% packet loss
```

If R2 wishes to communicate with the network segment 10.0.3.0, a route destined for this network segment must be configured on R2, and routes destined for the R2 interface must be configured on R3.

The preceding test result shows that R2 cannot communicate with 10.0.3.3 and 10.0.13.3.

Run the **display ip routing-table** command to view the routing table of R2. The routing table does not contain the routes of the two networks.

```
<R2>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
10.0.2.0/24         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
10.0.12.0/24        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
10.0.23.0/24        Direct   0     0      D    10.0.23.2   GigabitEthernet0/0/2
10.0.23.2/32        Direct   0     0      D    127.0.0.1   GigabitEthernet0/0/2
10.0.23.255/32      Direct   0     0      D    127.0.0.1   GigabitEthernet0/0/2
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

```

Step 3 Configure static routes on R2.

Configure a static route for destination networks 10.0.13.0/24 and 10.0.3.0/24, with the next hop set as the IP address 10.0.23.3 of R3, a preference value of 60 is the default and need not be set.

```
[R2]ip route-static 10.0.13.0 24 10.0.23.3
```

```
[R2]ip route-static 10.0.3.0 24 10.0.23.3
```

Note: In the **ip route-static** command, **24** indicates the subnet mask length, which can also be expressed using the decimal format 255.255.255.0.

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

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

```

Destination/Mask    Proto    Pre  Cost  Flags  NextHop    Interface
10.0.3.0/24         Static   60     0      RD    10.0.23.3   GigabitEthernet0/0/2
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	Static	60	0	RD	10.0.23.3	GigabitEthernet0/0/2
10.0.23.0/24	Direct	0	0	D	10.0.23.2	GigabitEthernet0/0/2
10.0.23.2/32	Direct	0	0	D	127.0.0.1	GigabitEthernet0/0/2

Step 4 Configure backup static routes.

The data exchanged between R2 and 10.0.13.3 and 10.0.3.3 is transmitted through the link between R2 and R3. R2 fails to communicate with 10.0.13.3 and 10.0.3.3 if the link between R2 and R3 is faulty.

According to the topology, R2 can communicate with R3 through R1 if the link between R2 and R3 fails. A backup static route can be configured to enable this redundancy. Backup static routes do not take effect in normal cases. If the link between R2 and R3 fails, backup static routes are used to transfer data.

Amend the preferences for the backup static routes to ensure that the routes are used only when the primary link fails. In this example, the preference of the backup static route is set to 80.

```
[R1]ip route-static 10.0.3.0 24 10.0.13.3
```

```
[R2]ip route-static 10.0.13.0 255.255.255.0 10.0.12.1 preference 80
```

```
[R2]ip route-static 10.0.3.0 24 10.0.12.1 preference 80
```

```
[R3]ip route-static 10.0.12.0 24 10.0.13.1
```

Step 5 Test the static routes.

View the current static route configuration in the routing table of R2.

```
<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
10.0.2.0/24	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	Static	60	0	RD	10.0.23.3	GigabitEthernet0/0/2
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	Static	60	0	RD	10.0.23.3	GigabitEthernet0/0/2
10.0.23.0/24	Direct	0	0	D	10.0.23.2	GigabitEthernet0/0/2
10.0.23.2/32	Direct	0	0	D	127.0.0.1	GigabitEthernet0/0/2
10.0.23.255/32	Direct	0	0	D	127.0.0.1	GigabitEthernet0/0/2
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

The routing table contains two static routes that were configured in step 3. The value of the **Protocol** field is **Static**, indicating a static route. The value of the **Preference** field is **60**, indicating the default preference is used for the route.

Test network connectivity to ensure the route between R2 and R3 exists.

```
<R2>ping 10.0.13.3
  PING 10.0.13.3: 56 data bytes, press CTRL_C to break
    Reply from 10.0.13.3: bytes=56 Sequence=1 ttl=255 time=34 ms
    Reply from 10.0.13.3: bytes=56 Sequence=2 ttl=255 time=34 ms
    Reply from 10.0.13.3: bytes=56 Sequence=3 ttl=255 time=34 ms
    Reply from 10.0.13.3: bytes=56 Sequence=4 ttl=255 time=34 ms
    Reply from 10.0.13.3: bytes=56 Sequence=5 ttl=255 time=34 ms

  --- 10.0.13.3 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 34/34/34 ms

<R2>ping 10.0.3.3
  PING 10.0.3.3: 56 data bytes, press CTRL_C to break
    Reply from 10.0.3.3: bytes=56 Sequence=1 ttl=255 time=41 ms
    Reply from 10.0.3.3: bytes=56 Sequence=2 ttl=255 time=41 ms
    Reply from 10.0.3.3: bytes=56 Sequence=3 ttl=255 time=41 ms
    Reply from 10.0.3.3: bytes=56 Sequence=4 ttl=255 time=41 ms
    Reply from 10.0.3.3: bytes=56 Sequence=5 ttl=255 time=41 ms

  --- 10.0.3.3 ping statistics ---
    5 packet(s) transmitted
```

```

5 packet(s) received
0.00% packet loss
round-trip min/avg/max = 41/41/41 ms

```

The command output shows that the route is functioning normally. The **tracert** command can also be run to view the path over which the data is transferred.

```

<R2>tracert 10.0.13.3
  traceroute to 10.0.13.3(10.0.13.3), max hops: 30 ,packet length: 40,
  press CTRL_C to break
 1 10.0.23.3 40 ms 31 ms 30 ms

<R2>tracert 10.0.3.3
  traceroute to 10.0.3.3(10.0.3.3), max hops: 30 ,packet length: 40,
  press CTRL_C to break
 1 10.0.23.3 40 ms 30 ms 30 ms

```

The command output verifies that R2 directly sends data to R3.

Step 6 Test the backup static routes.

Disable the path to 10.0.23.3 via GigabitEthernet0/0/2 on R2 and observe the changes in the IP routing tables.

```

[R2]interface GigabitEthernet0/0/2
[R2-GigabitEthernet0/0/2]shutdown
[R2-GigabitEthernet0/0/2]quit

```

Compare the routing tables with the previous routing tables before Gigabit Ethernet 0/0/2 was disabled.

```

<R2>display ip routing-table
Route Flags: R - relay, D - download to fib

```

```

-----
Routing Tables: Public

```

```

Destinations : 12      Routes : 12

```

Destination/Mask	Proto	Pre	Cost	Flags	NextHop	Interface
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	Static	80	0	D	10.0.12.2	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	Static	80	0	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

The next hops and preferences of the two routes as shown in the preceding routing table for R2 have changed.

Test connectivity between R2 and the destination addresses 10.0.13.3 and 10.0.3.3 on R2.

```
<R2>ping 10.0.3.3
```

```
PING 10.0.3.3: 56 data bytes, press CTRL_C to break
```

```
Reply from 10.0.3.3: bytes=56 Sequence=1 ttl=255 time=3 ms
```

```
Reply from 10.0.3.3: bytes=56 Sequence=2 ttl=255 time=2 ms
```

```
Reply from 10.0.3.3: bytes=56 Sequence=3 ttl=255 time=2 ms
```

```
Reply from 10.0.3.3: bytes=56 Sequence=4 ttl=255 time=2 ms
```

```
Reply from 10.0.3.3: bytes=56 Sequence=5 ttl=255 time=2 ms
```

```
--- 10.0.3.3 ping statistics ---
```

```
5 packet(s) transmitted
```

```
5 packet(s) received
```

```
0.00% packet loss
```

```
round-trip min/avg/max = 2/2/3 ms
```

```
<R2>ping 10.0.13.3
```

```
PING 10.0.13.3: 56 data bytes, press CTRL_C to break
```

```
Reply from 10.0.13.3: bytes=56 Sequence=1 ttl=255 time=3 ms
```

```
Reply from 10.0.13.3: bytes=56 Sequence=2 ttl=255 time=2 ms
```

```
Reply from 10.0.13.3: bytes=56 Sequence=3 ttl=255 time=2 ms
```

```
Reply from 10.0.13.3: bytes=56 Sequence=4 ttl=255 time=2 ms
```

```
Reply from 10.0.13.3: bytes=56 Sequence=5 ttl=255 time=2 ms
```

```
--- 10.0.13.3 ping statistics ---
```

```
5 packet(s) transmitted
```

```
5 packet(s) received
```

```
0.00% packet loss
```

```
round-trip min/avg/max = 2/2/3 ms
```

The network is not disconnected when the link between R2 and R3 is shut down.

The **tracert** command can also be run to view through over which path the data is being forwarded.

```
<R2>tracert 10.0.13.3
  traceroute to 10.0.13.3(10.0.13.3), max hops: 30 ,packet length: 40,press CTRL_C
to break
 1 10.0.12.1 40 ms 21 ms 21 ms
 2 10.0.13.3 30 ms 21 ms 21 ms

<R2>tracert 10.0.3.3
  traceroute to 10.0.3.3(10.0.3.3), max hops: 30 ,packet length: 40,press CTRL_C
to break
 1 10.0.12.1 40 ms 21 ms 21 ms
 2 10.0.13.3 30 ms 21 ms 21 ms
```

The command output shows that the data sent by R2 reaches R3 via the 10.0.12.0 and 10.0.13.0 networks connected to R1.

Step 7 **Using default routes to implement network connectivity.**

Enable the interface that was disabled in step 6 on R2.

```
[R2]interface GigabitEthernet 0/0/2
[R2-GigabitEthernet0/0/2]undo shutdown
```

Verify connectivity to the network 10.0.23.0 from R1.

```
[R1]ping 10.0.23.3
  PING 10.0.23.3: 56 data bytes, press CTRL_C to break
    Request time out
    Request time out
    Request time out
    Request time out
    Request time out

  --- 10.0.23.3 ping statistics ---
    5 packet(s) transmitted
    0 packet(s) received
```

100.00% packet loss

R3 cannot be reached because the route destined for 10.0.23.3 is not configured on R1.

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

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

Routing Tables: Public

Destinations : 14 Routes : 14

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
10.0.3.0/24	Static	60	0	RD	10.0.13.3	GigabitEthernet0/0/0
10.0.12.0/24	Direct	0	0	D	10.0.12.1	GigabitEthernet0/0/1
10.0.12.1/32	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	10.0.13.1	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

A default route can be configured on R1 to implement network connectivity via a next hop of 10.0.13.3.

```
[R1]ip route-static 0.0.0.0 0.0.0.0 10.0.13.3
```

After the configuration is complete, test connectivity between R1 and 10.0.23.3.

```
<R1>ping 10.0.23.3
```

PING 10.0.23.3: 56 data bytes, press CTRL_C to break

Reply from 10.0.23.3: bytes=56 Sequence=1 ttl=255 time=3 ms

Reply from 10.0.23.3: bytes=56 Sequence=2 ttl=255 time=2 ms

Reply from 10.0.23.3: bytes=56 Sequence=3 ttl=255 time=2 ms

Reply from 10.0.23.3: bytes=56 Sequence=4 ttl=255 time=2 ms

Reply from 10.0.23.3: bytes=56 Sequence=5 ttl=255 time=2 ms

```

--- 10.0.23.3 ping statistics ---
 5 packet(s) transmitted
 5 packet(s) received
 0.00% packet loss
round-trip min/avg/max = 2/2/3 ms

```

The default route forwards traffic destined for 10.0.23.3 to the next hop of 10.0.13.3 on R3. R3 is directly connected to the 10.0.23.0 network.

Step 8 Configure a backup default route.

If the link between R1 and R3 fails, a backup default route can be used to communicate with 10.0.23.3 and 10.0.3.3 via the 10.0.12.0 network.

However, R1 is not directly connected to these networks and therefore a backup route (in both directions) must be configured to provide a forwarding path.

```
[R1]ip route-static 0.0.0.0 0.0.0.0 10.0.12.2 preference 80
```

```
[R3]ip route-static 10.0.12.0 24 10.0.23.2 preference 80
```

Step 9 Test the backup default route.

View the routes of R1 when the link between R1 and R3 is operational.

```
<R1>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
0.0.0.0/0           Static   60    0      RD   10.0.13.3        GigabitEthernet0/0/0
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
10.0.3.0/24         Static   60    0      RD   10.0.13.3        GigabitEthernet0/0/0
10.0.12.0/24        Direct   0     0      D    10.0.12.1         GigabitEthernet0/0/1
10.0.12.1/32        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    10.0.13.1         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

```

Disable Gigabit Ethernet 0/0/0 on R1 and disable interface Gigabit Ethernet 0/0/0 on R3 to simulate a link failure, and then view the routes of R1. Compare the current routes with the routes before Gigabit Ethernet 0/0/0 was disabled.

```

[R1]interface GigabitEthernet0/0/0
[R1-GigabitEthernet0/0/0]shutdown
[R1-GigabitEthernet0/0/0]quit

```

```

[R3]interface GigabitEthernet0/0/0
[R3-GigabitEthernet0/0/0]shutdown
[R3-GigabitEthernet0/0/0]quit

```

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

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

```
-----
```

```
Routing Tables: Public
```

```

Destinations : 11      Routes : 11

Destination/Mask    Proto    Pre  Cost    Flags NextHop    Interface
0.0.0.0/0           Static   80   0        RD  10.0.12.2    GigabitEthernet0/0/1
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
10.0.12.0/24        Direct   0    0        D   10.0.12.1    GigabitEthernet0/0/1
10.0.12.1/32        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
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

```

According to the preceding routing table, the value of **80** in the Preference column indicates that the backup default route 0.0.0.0 is actively forwarding traffic to the next hop of 10.0.23.3.

Test network connectivity on R1.

```
<R1>ping 10.0.23.3
```

```
PING 10.0.23.3: 56 data bytes, press CTRL_C to break
```

```

Reply from 10.0.23.3: bytes=56 Sequence=1 ttl=254 time=76 ms
Reply from 10.0.23.3: bytes=56 Sequence=2 ttl=254 time=250 ms
Reply from 10.0.23.3: bytes=56 Sequence=3 ttl=254 time=76 ms
Reply from 10.0.23.3: bytes=56 Sequence=4 ttl=254 time=76 ms
Reply from 10.0.23.3: bytes=56 Sequence=5 ttl=254 time=76 ms
--- 10.0.23.3 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 76/110/250 ms
<R1>tracert 10.0.23.3
tracert to 10.0.23.3(10.0.23.2), max hops: 30 ,packet length: 40,press CTRL_C
to break
 1 10.0.12.2 30 ms 26 ms 26 ms
 2 10.0.23.3 60 ms 53 ms 56 ms

```

The IP packets are reaching R3 (10.0.23.3) via the next hop 10.0.12.2 of R2.

Final Configuration

```

<R1>dis current-configuration
[V200R003C00SPC200]
#
 sysname R1
#
interface GigabitEthernet0/0/0
 shutdown
 ip address 10.0.13.1 255.255.255.0
#
interface GigabitEthernet0/0/1
 ip address 10.0.12.1 255.255.255.0
#
interface LoopBack0
 ip address 10.0.1.1 255.255.255.0
#
ip route-static 0.0.0.0 0.0.0.0 10.0.13.3
ip route-static 0.0.0.0 0.0.0.0 10.0.12.2 preference 80
ip route-static 10.0.3.0 255.255.255.0 10.0.13.3
ip route-static 10.0.12.0 255.255.255.0 10.0.23.2 preference 80
#
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 GigabitEthernet0/0/1
ip address 10.0.12.2 255.255.255.0
#
interface GigabitEthernet0/0/2
ip address 10.0.23.2 255.255.255.0
#
interface LoopBack0
ip address 10.0.2.2 255.255.255.0
#
ip route-static 10.0.3.0 255.255.255.0 10.0.23.3
ip route-static 10.0.3.0 255.255.255.0 10.0.12.1 preference 80
ip route-static 10.0.13.0 255.255.255.0 10.0.23.3
ip route-static 10.0.13.0 255.255.255.0 10.0.12.1 preference 80
#
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 GigabitEthernet0/0/2
ip address 10.0.23.3 255.255.255.0

```

```
#
interface LoopBack0
  ip address 10.0.3.3 255.255.255.0
#
ip route-static 10.0.12.0 255.255.255.0 10.0.13.1
ip route-static 10.0.12.0 255.255.255.0 10.0.23.2 preference 80
#
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
```