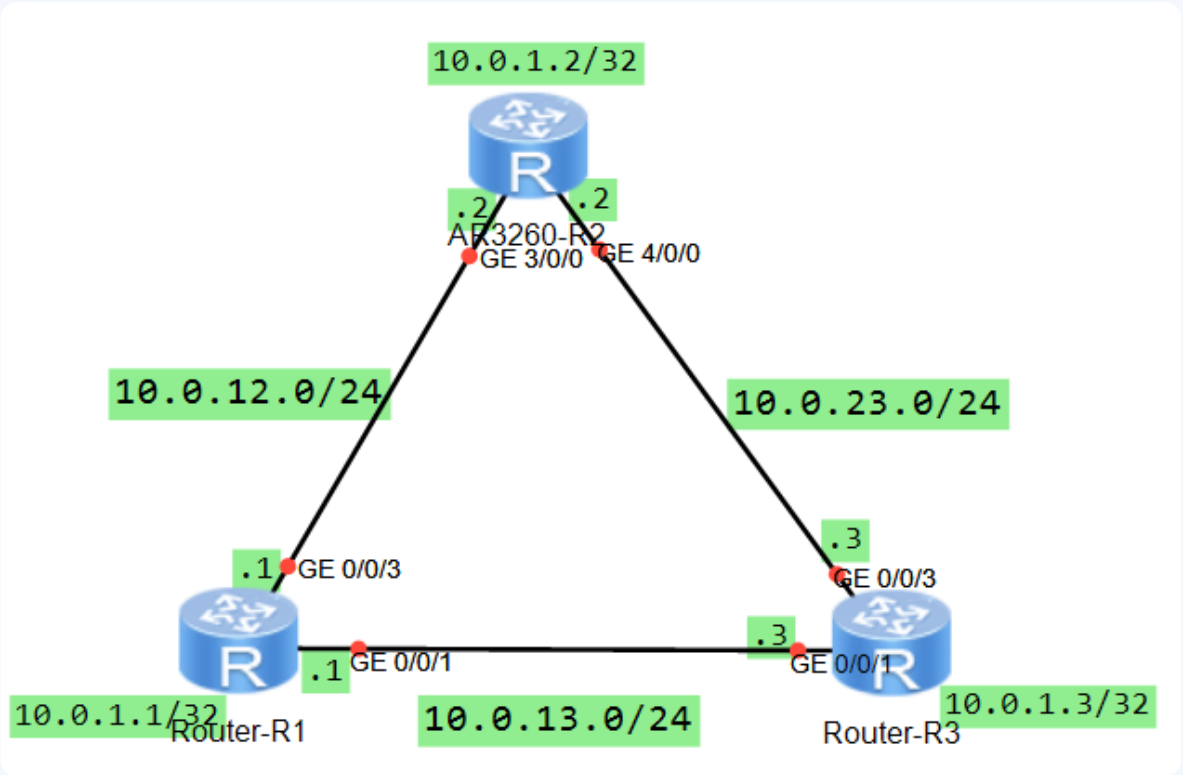
Lab2

1 Lab2 part1 IPv4 Addressing and Routing

1.1 Overview

> This lab focuses on configuring static routes and testing connectivity between loopback interfaces on Huawei routers.



1.2 Equipment Setup

Three routers R1, R2, and R3 are used with loopback interfaces simulating clients.

1.3 Interface Configuration

Device	Interface	IP Address	Subnet Mask
R1	Loopback0	10.0.1.1	/32
R1	Gig0/0/1	10.0.13.1	/24
R1	Gig0/0/3	10.0.12.1	/24
R2	Loopback0	10.0.1.2	/32
R2	Gig3/0/	10.0.12.2	/24
R2	Gig4/0/0	10.0.23.2	/24
R3	Loopback0	10.0.1.3	/32
R3	Gig0/0/1	10.0.13.3	/24
R3	Gig0/0/3	10.0.23.3	/24

1.3.1 R1 Configuration

```markdown
<1>system-view
[1]interface GigabitEthernet0/0/3
[1-GigabitEthernet0/0/3]ip address 10.0.12.1 24
[1-GigabitEthernet0/0/3]interface GigabitEthernet0/0/1
[1-GigabitEthernet0/0/1]ip address 10.0.13.1 24
[1-GigabitEthernet0/0/1]interface LoopBack0
[R1-LoopBack0]ip address 10.0.1.1 32
```

> This sets up the IP addresses for R1's interfaces with subnet masks and configures a loopback interface.

1.3.2 R2 Configuration

```Markdown
<R2>system-view
[R2]interface GigabitEthernet3/0/0
[R2-GigabitEthernet3/0/0]ip address 10.0.12.2 24
[R2-GigabitEthernet3/0/0]interface GigabitEthernet4/0/0
[R2-GigabitEthernet4/0/0]ip address 10.0.23.2 24
[R2-GigabitEthernet4/0/0]interface LoopBack0
[R2-LoopBack0]ip address 10.0.1.2 32
```

> This sets up the IP addresses for R2's interfaces with subnet masks and configures a loopback interface.

1.3.3 R3 Configuration

```Markdown
<R3>system-view
[R3]interface GigabitEthernet0/0/3
[R3-GigabitEthernet0/0/3]ip address 10.0.23.3 24
[R3-GigabitEthernet0/0/3]interface GigabitEthernet0/0/1
[R3-GigabitEthernet0/0/1]ip address 10.0.13.3 24
[R3-GigabitEthernet0/0/1]interface LoopBack0
[R3-LoopBack0]ip address 10.0.1.3 32
```

> This sets up the IP addresses for R3's interfaces with subnet masks and configures a loopback interface.

1.3.4 Connectivity Tests

```
<Huawei>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=90 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=10 ms
    Reply from 10.0.12.2: bytes=56 Sequence=4 ttl=255 time=50 ms
    Reply from 10.0.12.2: bytes=56 Sequence=5 ttl=255 time=50 ms

  --- 10.0.12.2 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 10/46/90 ms
```

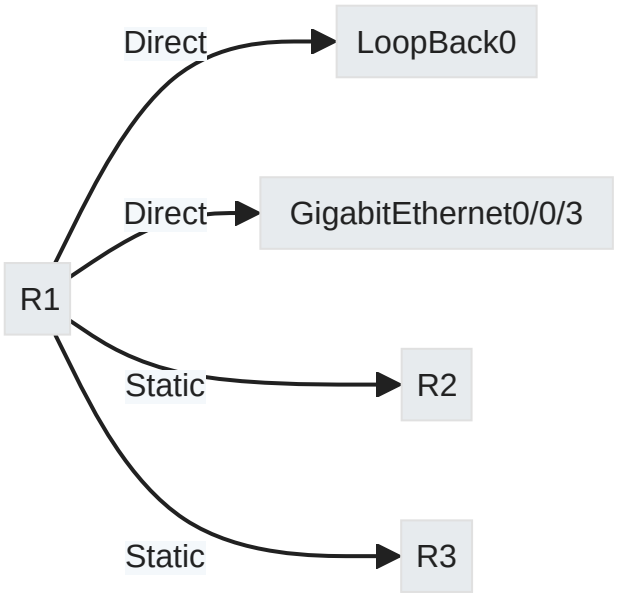
```
<Huawei>ping 10.0.13.3
  PING 10.0.13.3: 56  data bytes, press CTRL_C to break
    Reply from 10.0.13.3: bytes=56 Sequence=1 ttl=255 time=40 ms
    Reply from 10.0.13.3: bytes=56 Sequence=2 ttl=255 time=20 ms
    Reply from 10.0.13.3: bytes=56 Sequence=3 ttl=255 time=50 ms
    Reply from 10.0.13.3: bytes=56 Sequence=4 ttl=255 time=30 ms
    Reply from 10.0.13.3: bytes=56 Sequence=5 ttl=255 time=10 ms

  --- 10.0.13.3 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 10/30/50 ms
```

1.4 Routing Table Analysis

Destinations : 10 Routes : 10

Destination/Mask	Proto	Pre	Cost	Flags	NextHop	Interface
10.0.12.0/24	Direct	0	0	D	10.0.12.1	GigabitEthernet0/0/3
10.0.12.1/32	Direct	0	0	D	127.0.0.1	GigabitEthernet0/0/3
10.0.12.255/32	Direct	0	0	D	127.0.0.1	GigabitEthernet0/0/3
10.0.13.0/24	Direct	0	0	D	10.0.13.1	GigabitEthernet0/0/1
10.0.13.1/32	Direct	0	0	D	127.0.0.1	GigabitEthernet0/0/1
10.0.13.255/32	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

Routing table for direct connect



> **Note**
>
> Direct routes are automatically generated for local interfaces.

1.5 Connectivity Tests

Test Connectivity for Loopback

```Markdown
[R1]ping -a 10.0.1.1 10.0.1.2
```

```
ping –a <source-ip-address> <destination-ip-addr>
```

```
PING 10.0.1.2: 56  data bytes, press CTRL_C to break
   Request time out
   Request time out
   Request time out
   Request time out
   Request time out

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

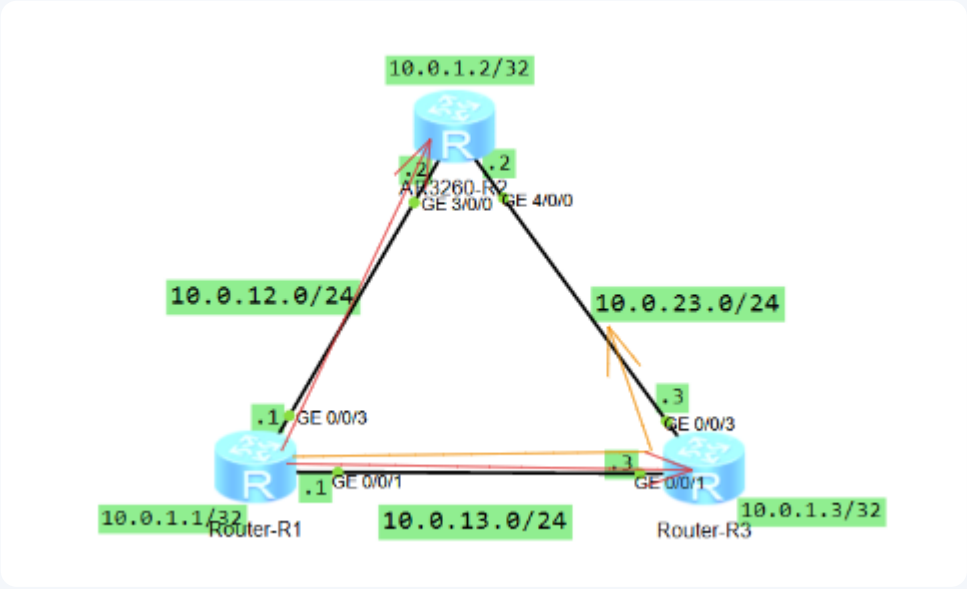
> It fail since router doesn't know the path for loopback you need to configure it either manually of using routing protocol

1.6 Static Routes Configuration

1.6.1 On R1:

Markdown

```
[R1]ip route-static 10.0.23.0 24 10.0.13.3
[R1]ip route-static 10.0.1.3 32 10.0.13.3
[R1]ip route-static 10.0.1.2 32 10.0.12.2
```

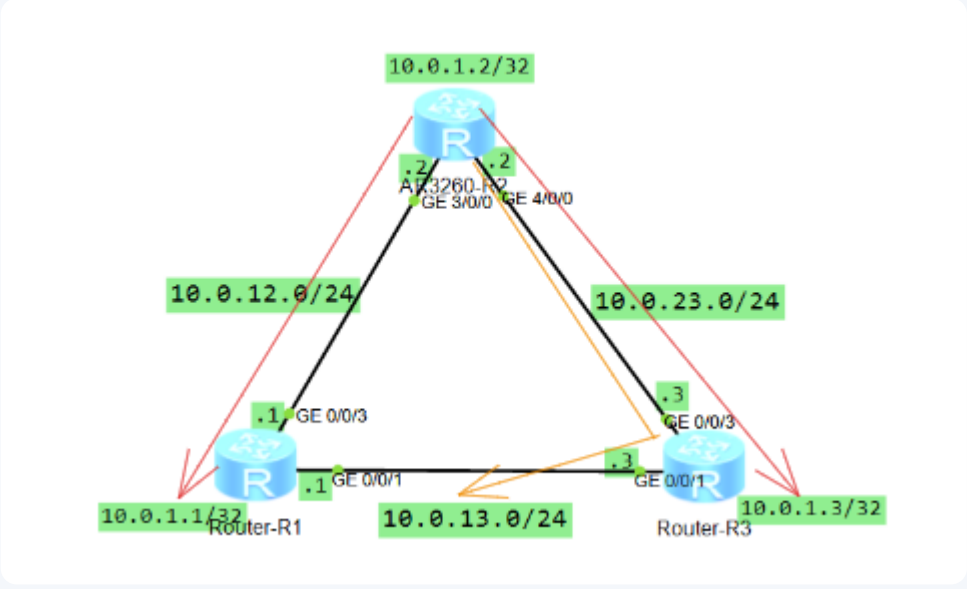


Route to network `10.0.23.0` and loopback `10.0.1.3` and `10.0.1.2`

1.6.2 On R2:

Markdown

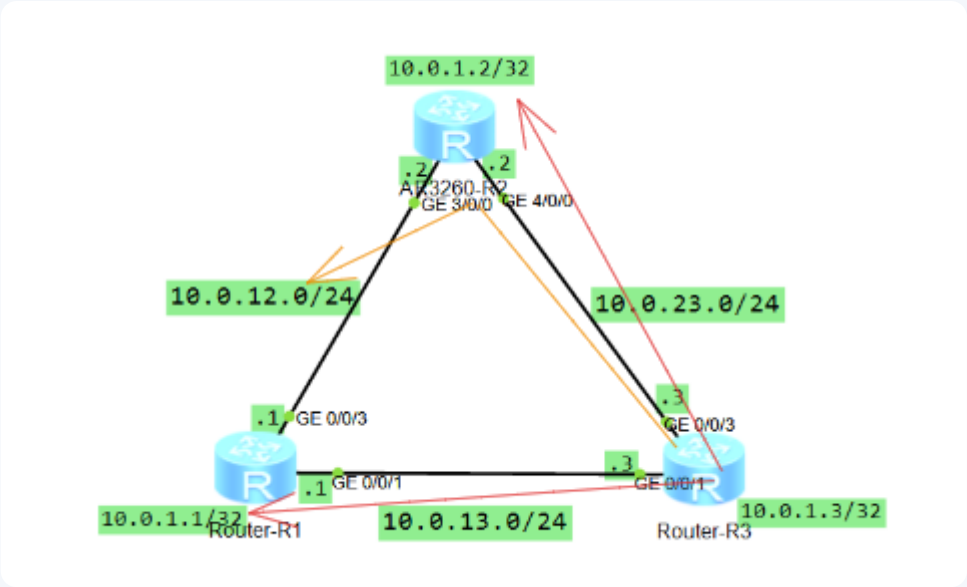
```
[R2]ip route-static 10.0.13.0 24 10.0.23.3
[R2]ip route-static 10.0.1.3 32 10.0.23.3
[R2]ip route-static 10.0.1.1 32 10.0.12.1
```



> Route to network `10.0.13.0` and loopback `10.0.1.3` and `10.0.1.1`

1.6.3 On R3:

```
Markdown
1 [R3]ip route-static 10.0.12.0 24 10.0.23.2
2 [R3]ip route-static 10.0.1.2 32 10.0.23.2
3 [R3]ip route-static 10.0.1.1 32 10.0.13.1
```



> Route to network `10.0.12.0` and loopback `10.0.1.2` and `10.0.1.1`

> After configuration, connectivity between loopback interfaces is successful.

1.6.4 Display connectivity

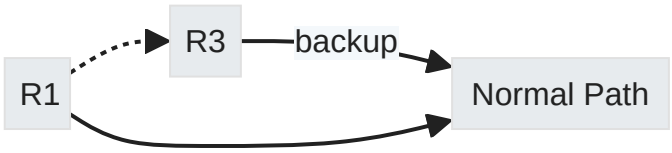
```
<Huawei>ping -a 10.0.1.1 10.0.1.2
  PING 10.0.1.2: 56  data bytes, press CTRL_C to break
    Reply from 10.0.1.2: bytes=56 Sequence=1 ttl=255 time=110 ms
    Reply from 10.0.1.2: bytes=56 Sequence=2 ttl=255 time=50 ms
    Reply from 10.0.1.2: bytes=56 Sequence=3 ttl=255 time=30 ms
    Reply from 10.0.1.2: bytes=56 Sequence=4 ttl=255 time=30 ms
    Reply from 10.0.1.2: bytes=56 Sequence=5 ttl=255 time=20 ms

  --- 10.0.1.2 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 20/48/110 ms
```

1.6.5 Display IP routing and Interfaces

```
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 10        Routes : 10

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

        10.0.1.1/32  Direct  0    0           D   127.0.0.1       LoopBack0
        10.0.1.2/32  Static  60   0          RD   10.0.12.2       GigabitEthernet
0/0/3
        10.0.1.3/32  Static  60   0          RD   10.0.13.3       GigabitEthernet
0/0/1
       10.0.12.0/24  Direct  0    0           D   10.0.12.1       GigabitEthernet
0/0/3
       10.0.12.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/3
       10.0.13.0/24  Direct  0    0           D   10.0.13.1       GigabitEthernet
0/0/1
       10.0.13.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/1
       10.0.23.0/24  Static  60   0          RD   10.0.13.3       GigabitEthernet
0/0/1
       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
```

```
Interface                         IP Address/Mask      Physical   Protocol
Ethernet0/0/0                     unassigned           down       down
Ethernet0/0/1                     unassigned           down       down
GigabitEthernet0/0/0              unassigned           down       down
GigabitEthernet0/0/1              10.0.13.1/24         up         up
GigabitEthernet0/0/2              unassigned           down       down
GigabitEthernet0/0/3              10.0.12.1/24         up         up
LoopBack0                         10.0.1.1/32          up         up(s)
NULL0                             unassigned           up         up(s)
Serial0/0/0                       unassigned           down       down
Serial0/0/1                       unassigned           down       down
Serial0/0/2                       unassigned           down       down
Serial0/0/3                       unassigned           down       down
```

1.7 Backup Path Configuration

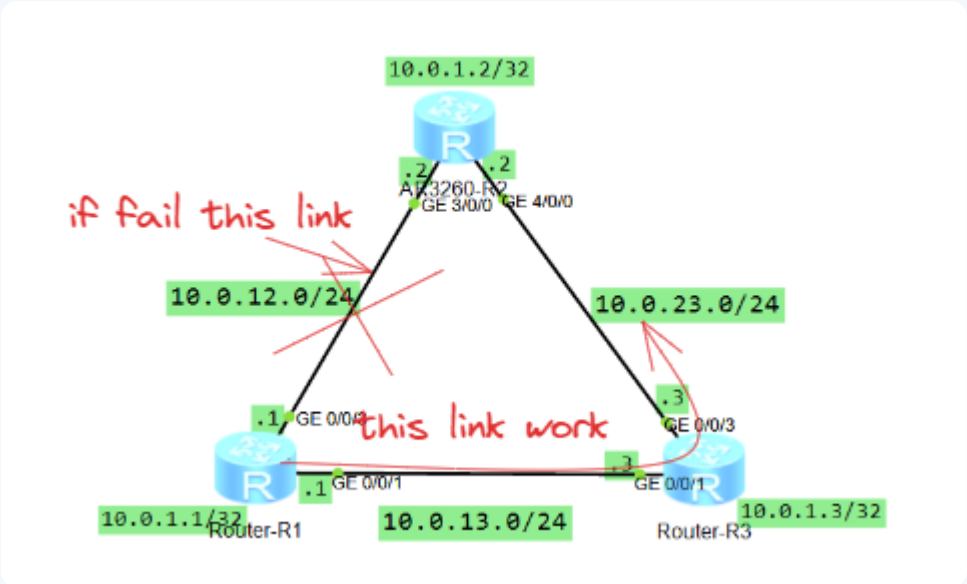


Ensure backup paths have lower priority by setting preference value higher than the normal path routing preference.

1.7.1 R1

Markdown

```
[R1]ip route-static 10.0.23.0 24 10.0.12.2 pre 100
```

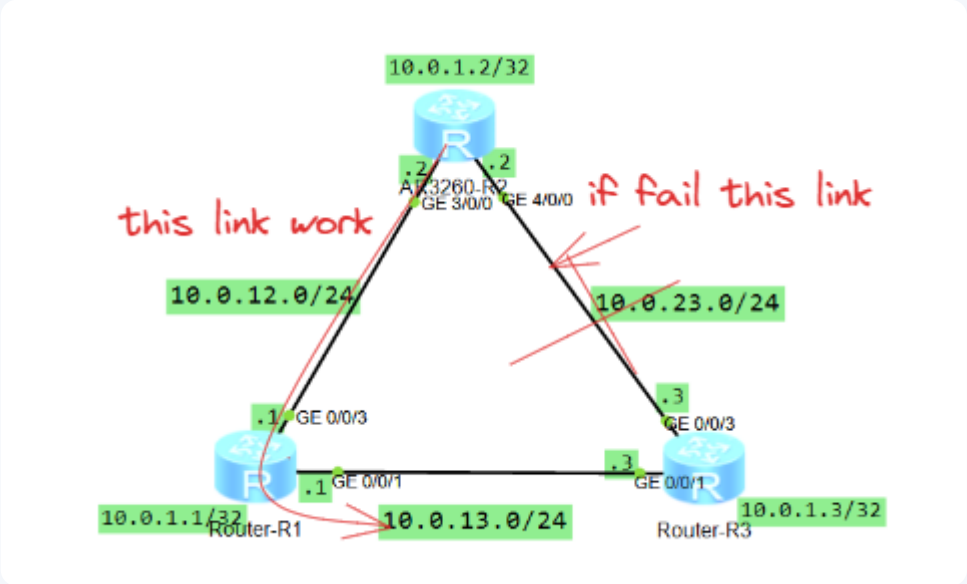


> Backup path to `10.0.23.0` via R3

1.7.2 R2

Markdown

```
[R1]ip route-static 10.0.13.0 24 10.0.12.1 pre 100
```

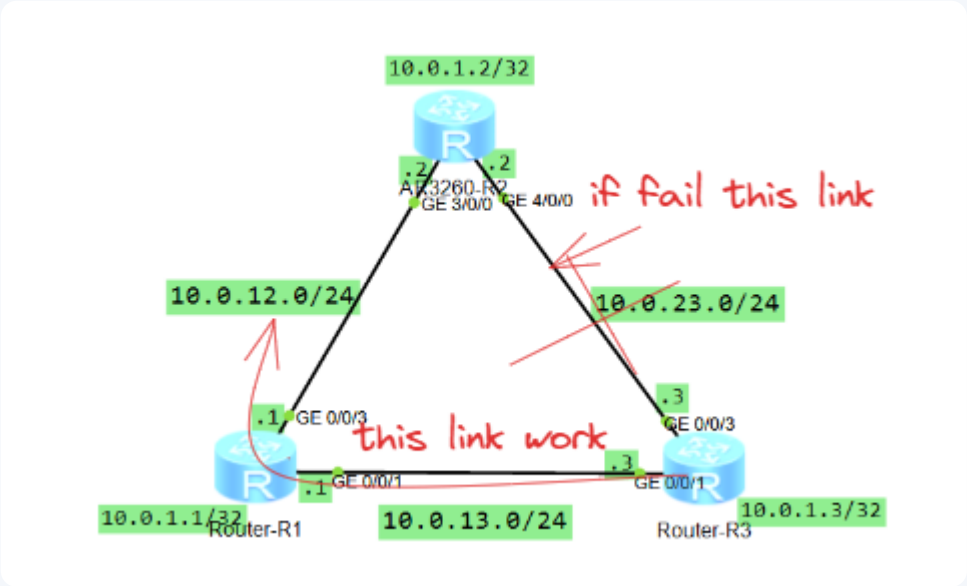


Backup path to `10.0.13.0` via R1

1.7.3 R3

Markdown

```
[R1]ip route-static 10.0.12.0 24 10.0.13.1 pre 100
```



Backup path to `10.0.12.0` via R1

1.7.4 Display routing and connectivity

```
[R1]display IP routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 10        Routes : 10

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

        10.0.1.1/32  Direct  0    0           D   127.0.0.1       LoopBack0
        10.0.1.2/32  Static  100  0           RD  10.0.13.3       GigabitEthernet0/0/1
        10.0.1.3/32  Static  60   0           RD  10.0.13.3       GigabitEthernet0/0/1
       10.0.13.0/24  Direct  0    0           D   10.0.13.1       GigabitEthernet0/0/1
       10.0.13.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/1
     10.0.13.255/32  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
```

When the primary link is failed the backup link goes up

```
[R1]ping -a 10.0.1.1 10.0.1.2
  PING 10.0.1.2: 56  data bytes, press CTRL_C to break
    Reply from 10.0.1.2: bytes=56 Sequence=1 ttl=254 time=80 ms
    Reply from 10.0.1.2: bytes=56 Sequence=2 ttl=254 time=60 ms
    Reply from 10.0.1.2: bytes=56 Sequence=3 ttl=254 time=60 ms
    Reply from 10.0.1.2: bytes=56 Sequence=4 ttl=254 time=110 ms
    Reply from 10.0.1.2: bytes=56 Sequence=5 ttl=254 time=80 ms

  --- 10.0.1.2 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 60/78/110 ms
```

Successful connection with backup link

```
[R1]tracert -a 10.0.1.1 10.0.1.2

traceroute to  10.0.1.2(10.0.1.2), max hops: 30 ,packet length: 40,press CTRL_C to break

1 10.0.13.3 40 ms  30 ms  50 ms

2 10.0.23.2 80 ms  80 ms  60 ms
```

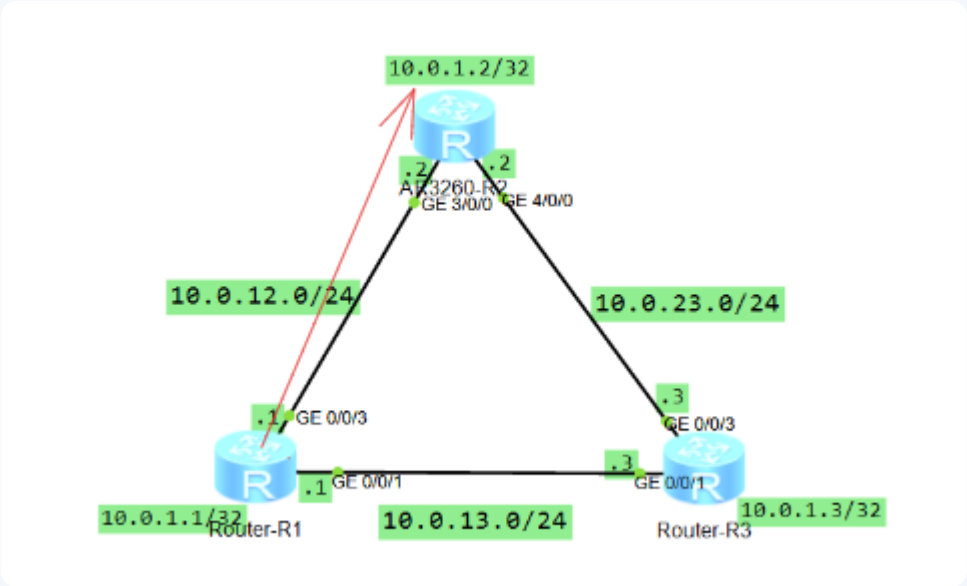
The `tracert` command displays the path of packets from the source to the destination

1.8 Configure a default route on R

Replace static route with default route

Markdown

```
1 [R1]ip route-static 0.0.0.0 0 10.0.12.2
```



Default route to reach loopback `R2`

1.8.1 Display routing

```
[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

        0.0.0.0/0   Static  60   0           RD  10.0.12.2       GigabitEthernet0/0/3
       10.0.1.1/32  Direct  0    0           D   127.0.0.1       LoopBack0
       10.0.1.3/32  Static  60   0           RD  10.0.13.3       GigabitEthernet0/0/1
      10.0.12.0/24  Direct  0    0           D   10.0.12.1       GigabitEthernet0/0/3
      10.0.12.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/3
    10.0.12.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/3
      10.0.13.0/24  Direct  0    0           D   10.0.13.1       GigabitEthernet0/0/1
      10.0.13.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/1
    10.0.13.255/32  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
```

1.9 Quiz Review

Question1

When will static routes be added to the IP routing table?

Answer1

Static routes are added when the next-hop is reachable unless configured otherwise and This route is the optimal route to the destination network or host.

Question2

In step 3, if the -a argument is not specified during the connectivity test between loopback interfaces, what is the source IP address of ICMP packets? Why?

Answer2

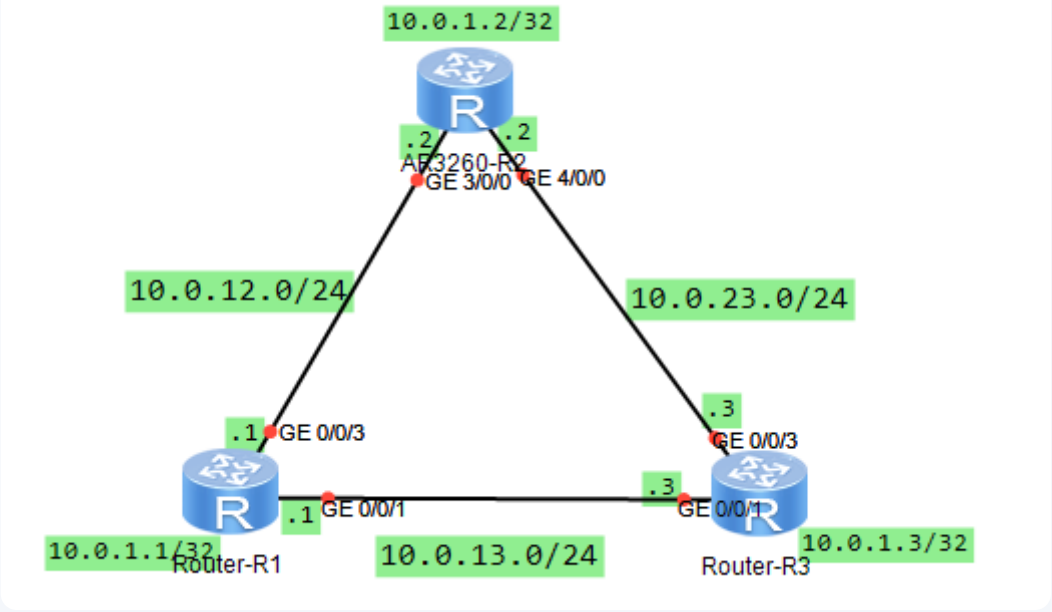
If `-a` argument is omitted in ping command, source IP will be chosen based on routing table entries which best match the destination IP.

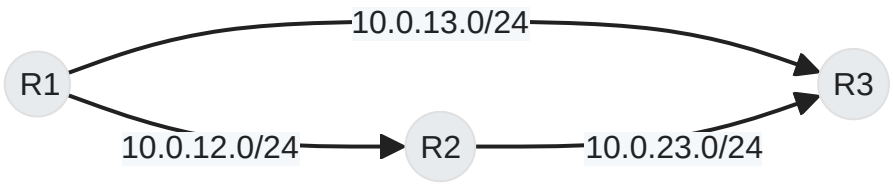
2 Lab2 part2 OSPF Routing

2.1 Overview

This note outlines the steps for configuring OSPF (Open Shortest Path First) on Huawei routers, including basic setup, authentication, default route advertisement, and cost adjustments.

2.2 Basic Device Configuration





- Set up router names.
- Configure IP addresses for physical and loopback interfaces.
- View the routing table using `display ip routing-table`.

```
[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

        10.0.1.1/32  Direct  0    0           D  127.0.0.1       LoopBack0
       10.0.12.0/24  Direct  0    0           D  10.0.12.1       GigabitEthernet0/0/3
       10.0.12.1/32  Direct  0    0           D  127.0.0.1       GigabitEthernet0/0/3
     10.0.12.255/32  Direct  0    0           D  127.0.0.1       GigabitEthernet0/0/3
       10.0.13.0/24  Direct  0    0           D  10.0.13.1       GigabitEthernet0/0/1
       10.0.13.1/32  Direct  0    0           D  127.0.0.1       GigabitEthernet0/0/1
     10.0.13.255/32  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
```

Note: Initially, only direct routes exist on the device.

2.3 OSPF Process Creation

2.3.1 R1

Markdown

```
[R1]ospf 1 router-id 10.0.1.1
```

Create an OSPF process

default is 1 if not specified

2.3.2 R2

```Markdown
[R2]ospf 1
```

> Create an OSPF process

> default is 1 if not specified

2.3.3 R3

```Markdown
[R3]ospf 1 router-id 10.0.1.3
```

> Create an OSPF process

> default is 1 if not specified

2.4 Enable OSPF on Interfaces

2.4.1 R1

```Markdown
[R1-ospf-1]area 0
[R1-ospf-1-area-0.0.0.0]network 10.0.12.0 0.0.0.255
[R1-ospf-1-area-0.0.0.0]network 10.0.13.0 0.0.0.255
[R1-ospf-1-area-0.0.0.0]network 10.0.1.1 0.0.0.0
```

> **Define area and enable OSPF on interfaces when the following two conditions are:**

- The mask length of the interface's IP address is not shorter than that specified in the network command.
- The address of the interface must be within the network range specified in the network command.

2.4.2 R2

Markdown

```
[R2-ospf-1]area 0
[R2-ospf-1-area-0.0.0.0]network 10.0.12.0 0.0.0.255
[R2-ospf-1-area-0.0.0.0]network 10.0.13.0 0.0.0.255
[R2-ospf-1-area-0.0.0.0]network 10.0.1.1 0.0.0.0
```

> **Define area and enable OSPF on interfaces when the following two conditions are:**

- The mask length of the interface's IP address is not shorter than that specified in the network command.
- The address of the interface must be within the network range specified in the network command.

2.4.3 R3

Markdown

```
[R3-ospf-1]area 0
[R3-ospf-1-area-0.0.0.0]network 10.0.12.0 0.0.0.255
[R3-ospf-1-area-0.0.0.0]network 10.0.13.0 0.0.0.255
```

```
4 [R3-ospf-1-area-0.0.0.0]network 10.0.1.1 0.0.0.0
```

> **Define area and enable OSPF on interfaces when the following two conditions are:**

- The mask length of the interface's IP address is not shorter than that specified in the network command.
- The address of the interface must be within the network range specified in the network command.

2.4.4 Display the OSPF status

```
[R1]display ospf peer

         OSPF Process 1 with Router ID 10.0.1.1
                   Neighbors

 Area 0.0.0.0 interface 10.0.13.1(GigabitEthernet0/0/1)'s neighbors
 Router ID: 10.0.1.3             Address: 10.0.13.3
   State: Full  Mode:Nbr is  Master  Priority: 1
   DR: 10.0.13.3  BDR: 10.0.13.1  MTU: 0
   Dead timer due in 36  sec
   Retrans timer interval: 0
   Neighbor is up for 00:00:30
   Authentication Sequence: [ 0 ]

                   Neighbors
Area 0.0.0.0 interface 10.0.12.1(GigabitEthernet0/0/3)'s neighbors
Router ID: 10.0.1.2             Address: 10.0.12.2
  State: Full  Mode:Nbr is  Master  Priority: 1
  DR: 10.0.12.2  BDR: 10.0.12.1  MTU: 0
  Dead timer due in 39  sec
  Retrans timer interval: 4
  Neighbor is up for 00:00:28
  Authentication Sequence: [ 0 ]
```

2.4.5 Display ip routing

```
[R1]display ip routing-table protocol ospf
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Public routing table : OSPF
         Destinations : 3        Routes : 4

OSPF routing table status : <Active>
         Destinations : 3        Routes : 4

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

        10.0.1.2/32  OSPF    10   1           D   10.0.12.2       GigabitEthernet0/0/3
        10.0.1.3/32  OSPF    10   1           D   10.0.13.3       GigabitEthernet0/0/1
       10.0.23.0/24  OSPF    10   2           D   10.0.13.3       GigabitEthernet0/0/1
                     OSPF    10   2           D   10.0.12.2       GigabitEthernet0/0/3

OSPF routing table status : <Inactive>
         Destinations : 0        Routes : 0
```

2.5 OSPF Authentication Configuration

```
[R1]display ospf peer brief

 OSPF Process 1 with Router ID 10.0.1.1
   Peer Statistic Information
 ----------------------------------------------------------------------------
 Area Id          Interface                     Neighbor id      State
 ----------------------------------------------------------------------------
 Total Peer(s):      0
```

> ⚠ **Warning**
>
> Ensure all routers have matching authentication settings to form neighbor relationships.

2.5.1 Interface Authentication Mode:

2.5.2 R1

```
[R1]int gig3/0/0
[R1-GigabitEthernet0/0/1]ospf authentication-mode md5 1 cipher Data
[R1-GigabitEthernet0/0/1]int gig4/0/0
[R1-GigabitEthernet0/0/4]ospf authentication-mode md5 1 cipher Data
```

> For each interface requiring authentication

2.5.3 Area Authentication Mode:

```
[R2-ospf-1-area-0.0.0.0]authentication-mode md5 1 cipher Data
```

> Repeat for every router

> Configure Authentication at the area level

2.5.4 Display Authentication interface

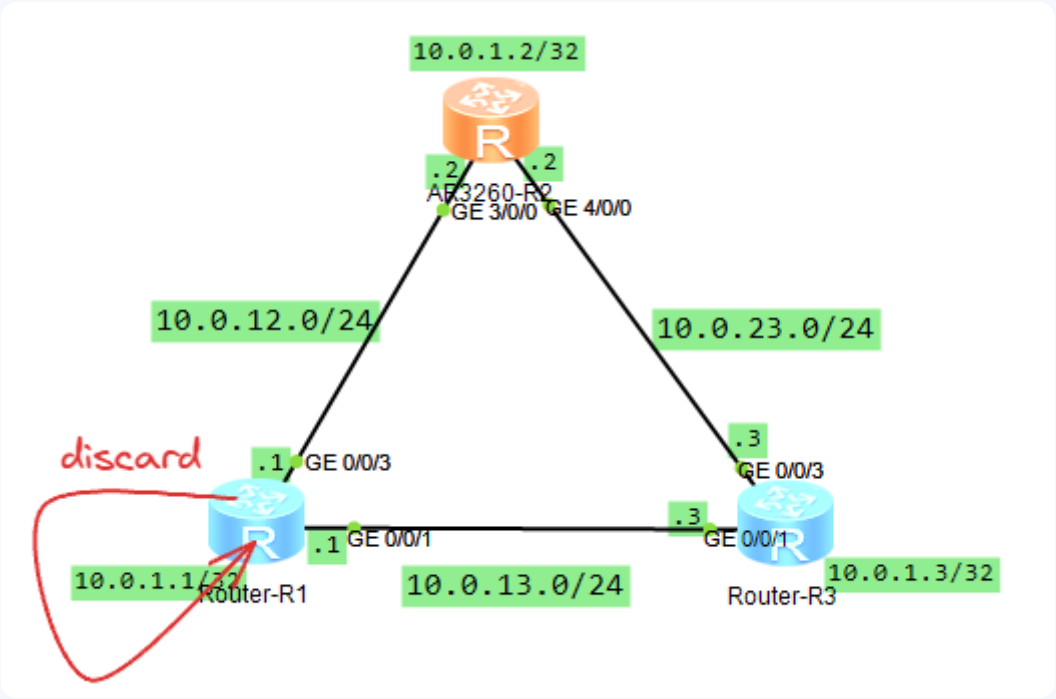
```
interface GigabitEthernet0/0/3
 ip address 10.0.12.1 255.255.255.0
 ospf authentication-mode md5 1 cipher foCQTYsq-4.A\^38y!DVwQ0#
```

> Since the password is cipher text

2.6 Advertise Default Route in OSPF

Default Route:

```
Markdown
1 [R1]ip route-static 0.0.0.0 0.0.0.0 NULL0
```



> Path for every packet doesn't match the routes table then it will goes into null and it will be discarded

Advertise Default:

```
Markdown
1 [R1-ospf-1]default-route-advertise always
```

> Advertise default route in ospf process

> **Tip:** The 'always' keyword ensures advertisement regardless of active non-OSPF default routes.

2.6.1 Display ip routing table

```
[R2]display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 15        Routes : 16

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

        0.0.0.0/0   O_ASE   150  1           D   10.0.12.1       GigabitEthernet0/0/3
       10.0.1.1/32  OSPF    10   1           D   10.0.12.1       GigabitEthernet0/0/3
       10.0.1.2/32  Direct  0    0           D   127.0.0.1       LoopBack0
       10.0.1.3/32  OSPF    10   1           D   10.0.23.3       GigabitEthernet0/0/4
      10.0.12.0/24  Direct  0    0           D   10.0.12.2       GigabitEthernet0/0/3
      10.0.12.2/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/3
    10.0.12.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/3
      10.0.13.0/24  OSPF    10   2           D   10.0.12.1       GigabitEthernet0/0/3
                    OSPF    10   2           D   10.0.23.3       GigabitEthernet0/0/4
      10.0.23.0/24  Direct  0    0           D   10.0.23.2       GigabitEthernet0/0/4
      10.0.23.2/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/4
    10.0.23.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/4
       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
```

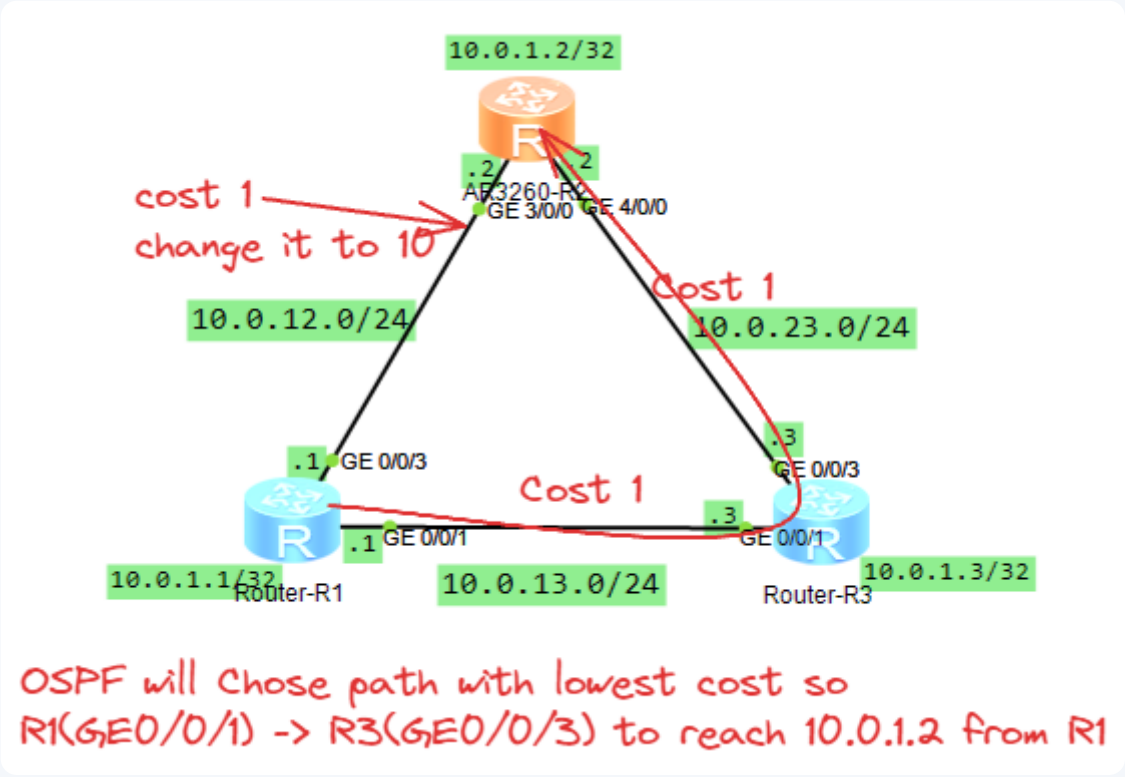
```
[R3]display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 15        Routes : 16

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

        0.0.0.0/0   O_ASE   150  1           D   10.0.13.1       GigabitEthernet0/0/1
       10.0.1.1/32  OSPF    10   1           D   10.0.13.1       GigabitEthernet0/0/1
       10.0.1.2/32  OSPF    10   1           D   10.0.23.2       GigabitEthernet0/0/3
       10.0.1.3/32  Direct  0    0           D   127.0.0.1       LoopBack0
      10.0.12.0/24  OSPF    10   2           D   10.0.23.2       GigabitEthernet0/0/3
                    OSPF    10   2           D   10.0.13.1       GigabitEthernet0/0/1
      10.0.13.0/24  Direct  0    0           D   10.0.13.3       GigabitEthernet0/0/1
      10.0.13.3/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/1
    10.0.13.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/1
      10.0.23.0/24  Direct  0    0           D   10.0.23.3       GigabitEthernet0/0/3
      10.0.23.3/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/3
    10.0.23.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/3
```

2.7 Adjusting OSPF Costs

To influence route selection:

Markdown

```
[R1]int gi0/0/3
[R1-GigabitEthernet0/0/3]ospf cost 10
```



Change the cost values of interfaces on R1 so that LoopBack0 on R1 can reach LoopBack0 on R2 via R3.

Check routing table with:

Markdown

```
[R1]display ip routing-table
```

```
[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

        10.0.1.1/32  Direct  0    0           D  127.0.0.1       LoopBack0
        10.0.1.2/32  OSPF    10   2           D  10.0.13.3       GigabitEthernet0/0/1
        10.0.1.3/32  OSPF    10   1           D  10.0.13.3       GigabitEthernet0/0/1
       10.0.12.0/24  Direct  0    0           D  10.0.12.1       GigabitEthernet0/0/3
       10.0.12.1/32  Direct  0    0           D  127.0.0.1       GigabitEthernet0/0/3
     10.0.12.255/32  Direct  0    0           D  127.0.0.1       GigabitEthernet0/0/3
       10.0.13.0/24  Direct  0    0           D  10.0.13.1       GigabitEthernet0/0/1
       10.0.13.1/32  Direct  0    0           D  127.0.0.1       GigabitEthernet0/0/1
     10.0.13.255/32  Direct  0    0           D  127.0.0.1       GigabitEthernet0/0/1
       10.0.23.0/24  OSPF    10   2           D  10.0.13.3       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
```

And verify path with traceroute:

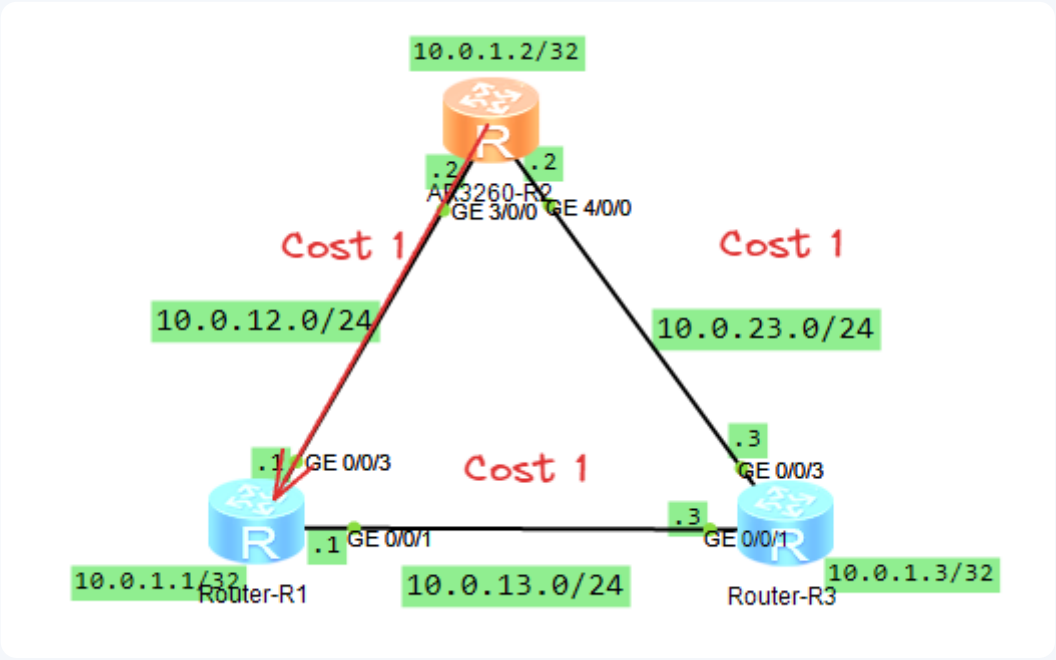
```
Markdown
1 [R1]tracert –a 10.0.1.1 10.0.1.2
```

```
[R1]tracert –a 10.0.1.1 10.0.1.2

traceroute to  10.0.1.2(10.0.1.2), max hops: 30 ,packet length: 40,press CTRL_C to break

1 10.0.13.3 40 ms  50 ms  50 ms

2 10.0.23.2 60 ms  110 ms  70 ms
```

2.8 Quiz Question Review

Question

Question: What is the path for R2 to return ICMP packets to R1?



✓ Success

Answer:

It will be through `GE0/0/3` , ip `10.0.12.2` since the change of cost is only for router 1 and it will not affect router 2 and router 3 so router 2 will choice path `GE0/0/3` with cost = 1 with lowest cost path