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Отчет по лабораторной работе №1-2

«Администрирование систем и сетей»

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Оглавление

Адресация и маршрутизация IPv4

Цели

Лабораторная работа помогает получить практические навыки по изучению следующих тем:

- Процедура настройки IPv4-адреса на интерфейсе

- Функции и значение loopback-интерфейсов

- Принципы генерирования прямых маршрутов

- Процедура настройки статических маршрутов и условия, при которых используются статические маршруты

- Процедура проверки возможности установления соединения сетевого уровня с помощью инструмента ping

- Процедура настройки статических маршрутов и сценарии их применения

Топология
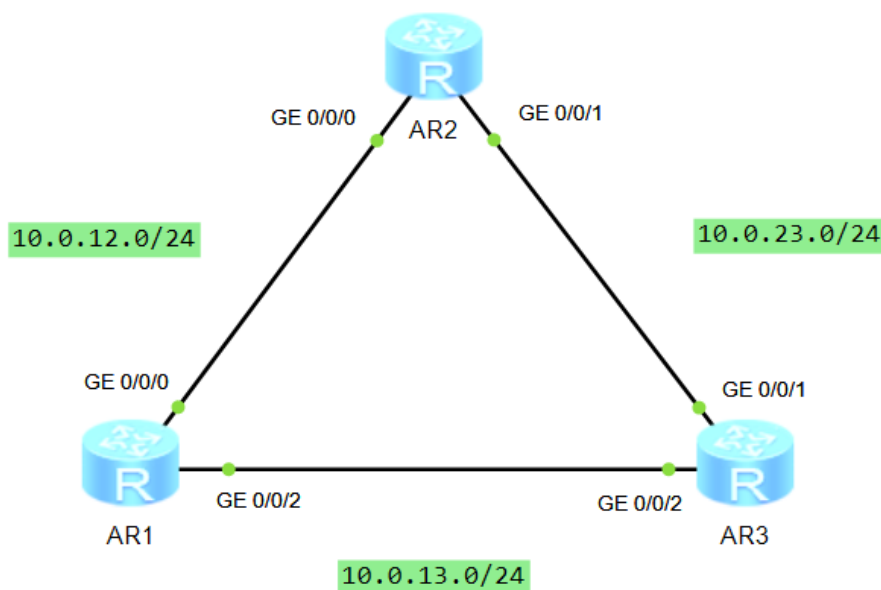
План работы

1. Настройка IP-адресов для интерфейсов на маршрутизаторах.

2. Настройка статических маршрутов для установления связи между маршрутизаторами.

Процедура конфигурирования

Шаг 1. Настройте основные параметры устройств

Задайте имена устройствам.

AR1

```
<Huawei>
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname AR1
[AR1]
```

AR2

```
<Huawei>
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname AR2
[AR2]
```

AR3

```
<Huawei>
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname AR3
[AR3]
```

Шаг 2. Выведите на экран IP-адрес текущего интерфейса и таблицу маршрутизации маршрутизатора.

Выведите на экран статус интерфейса на маршрутизаторе.

AR1

```
[AR1]display ip interface brief
*down: administratively down
^down: standby
(l): loopback
(s): spoofing
The number of interface that is UP in Physical is 3
The number of interface that is DOWN in Physical is 1
The number of interface that is UP in Protocol is 1
The number of interface that is DOWN in Protocol is 3

Interface                  IP Address/Mask    Physical   Protocol
GigabitEthernet0/0/0       unassigned         up         down
GigabitEthernet0/0/1       unassigned         down       down
GigabitEthernet0/0/2       unassigned         up         down
NULL0                      unassigned         up         up(s)
```

AR2

```
[AR2]display ip interface brief
*down: administratively down
^down: standby
(l): loopback
(s): spoofing
The number of interface that is UP in Physical is 3
The number of interface that is DOWN in Physical is 1
The number of interface that is UP in Protocol is 1
The number of interface that is DOWN in Protocol is 3

Interface                  IP Address/Mask    Physical   Protocol
GigabitEthernet0/0/0       unassigned         up         down
GigabitEthernet0/0/1       unassigned         up         down
GigabitEthernet0/0/2       unassigned         down       down
NULL0
```

AR3

```
[AR3]display ip interface brief
*down: administratively down
^down: standby
(l): loopback
(s): spoofing
The number of interface that is UP in Physical is 3
The number of interface that is DOWN in Physical is 1
The number of interface that is UP in Protocol is 1
The number of interface that is DOWN in Protocol is 3

Interface                  IP Address/Mask    Physical   Protocol
GigabitEthernet0/0/0       unassigned         down       down
GigabitEthernet0/0/1       unassigned         up         down
GigabitEthernet0/0/2       unassigned         up         down
NULL0
```

Выведите на экран таблицу маршрутизации на маршрутизаторе

AR1

```
[AR1]display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 4        Routes : 4

Destination/Mask    Proto   Pre  Cost       Flags NextHop         Interface

       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
```

AR2

```
<AR2>display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 4        Routes : 4

Destination/Mask    Proto   Pre  Cost       Flags NextHop         Interface

       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
```

AR3

```
<AR3>display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 4        Routes : 4

Destination/Mask    Proto   Pre  Cost       Flags NextHop         Interface

       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
```

Шаг 3. Настройте IP-адреса для физических интерфейсов.

\# Настройте IP-адреса для физических интерфейсов на основе следующей таблицы

Маршрутизатор	Интерфейс	IP-адрес/маска
R1	GigabitEthernet0/0/0	10.0.12.1/24
	GigabitEthernet0/0/2	10.0.13.1/24
R2	GigabitEthernet0/0/0	10.0.12.2/24
	GigabitEthernet0/0/1	10.0.23.2/24
R3	GigabitEthernet0/0/1	10.0.23.3/24
	GigabitEthernet0/0/2	10.0.13.3/24

AR1

```
[AR1]interface g0/0/0
[AR1-GigabitEthernet0/0/0]ip address 10.0.12.1 24
Nov  8 2024 07:12:19-08:00 AR1 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
 on the interface GigabitEthernet0/0/0 has entered the UP state.
[AR1-GigabitEthernet0/0/0]quit
[AR1]interface g0/0/2
[AR1-GigabitEthernet0/0/2]ip address 10.0.13.1 24
Nov  8 2024 07:14:01-08:00 AR1 %%01IFNET/4/LINK_STATE(l)[1]:The line protocol IP
 on the interface GigabitEthernet0/0/2 has entered the UP state.
[AR1-GigabitEthernet0/0/2]quit
```

AR2

```
[AR2]interface g0/0/0
[AR2-GigabitEthernet0/0/0]ip address 10.0.12.2 24
Nov  8 2024 07:16:50-08:00 AR2 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
 on the interface GigabitEthernet0/0/0 has entered the UP state.
[AR2-GigabitEthernet0/0/0]quit
[AR2]interface g0/0/1
[AR2-GigabitEthernet0/0/1]ip address 10.0.23.2 24
[AR2-GigabitEthernet0/0/1]
Nov  8 2024 07:18:01-08:00 AR2 %%01IFNET/4/LINK_STATE(l)[1]:The line protocol IP
 on the interface GigabitEthernet0/0/1 has entered the UP state.
[AR2-GigabitEthernet0/0/1]quit
```

AR3

```
[AR3]interface g0/0/1
[AR3-GigabitEthernet0/0/1]ip address 10.0.23.3 24
[AR3-GigabitEthernet0/0/1]
Nov  8 2024 07:21:41-08:00 AR3 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
 on the interface GigabitEthernet0/0/1 has entered the UP state.
[AR3-GigabitEthernet0/0/1]quit
[AR3]interface g0/0/2
[AR3-GigabitEthernet0/0/2]ip address 10.0.13.3 24
[AR3-GigabitEthernet0/0/2]
Nov  8 2024 07:22:11-08:00 AR3 %%01IFNET/4/LINK_STATE(l)[1]:The line protocol IP
 on the interface GigabitEthernet0/0/2 has entered the UP state.
[AR3-GigabitEthernet0/0/2]quit
```

Проверьте наличие связи с помощью инструмента ping.

```
[AR1]ping -c 5 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=100 ms
    Reply from 10.0.12.2: bytes=56 Sequence=2 ttl=255 time=20 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=20 ms

  --- 10.0.12.2 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 20/40/100 ms

[AR1]ping -c 5 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=90 ms
    Reply from 10.0.13.3: bytes=56 Sequence=2 ttl=255 time=30 ms
    Reply from 10.0.13.3: bytes=56 Sequence=3 ttl=255 time=20 ms
    Reply from 10.0.13.3: bytes=56 Sequence=4 ttl=255 time=20 ms
    Reply from 10.0.13.3: bytes=56 Sequence=5 ttl=255 time=20 ms

  --- 10.0.13.3 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 20/36/90 ms
```

Выведите на экран таблицу маршрутизации R1.

```
[AR1]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

      10.0.12.0/24  Direct  0    0         D     10.0.12.1       GigabitEthernet0/0/0
      10.0.12.1/32  Direct  0    0         D     127.0.0.1       GigabitEthernet0/0/0
    10.0.12.255/32  Direct  0    0         D     127.0.0.1       GigabitEthernet0/0/0
      10.0.13.0/24  Direct  0    0         D     10.0.13.1       GigabitEthernet0/0/2
      10.0.13.1/32  Direct  0    0         D     127.0.0.1       GigabitEthernet0/0/2
    10.0.13.255/32  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

[AR1]
```

Шаг 4. Создайте loopback-интерфейс

Настройте loopback-интерфейс в соответствии со следующей таблицей.

Маршрутизатор	Интерфейс	IP-адрес/маска
R1	LoopBacko	10.0.1.1/32
R2	LoopBacko	10.0.1.2/32
R3	LoopBacko	10.0.1.3/32

AR1

```
[AR1]interface LoopBack0
[AR1-LoopBack0]ip address 10.0.1.1 32
```

AR2

```
[AR2]interface LoopBack0
[AR2-LoopBack0]ip address 10.0.1.2 32
```

AR3

```
[AR3]interface LoopBack0
[AR3-LoopBack0]ip address 10.0.1.3 32
```

Выведите на экран таблицу маршрутизации на маршрутизаторе (в данном случае на примере R1).

```
[AR1]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      GigabitEthernet0/0/0
      10.0.12.1/32  Direct  0    0           D   127.0.0.1      GigabitEthernet0/0/0
    10.0.12.255/32  Direct  0    0           D   127.0.0.1      GigabitEthernet0/0/0
      10.0.13.0/24  Direct  0    0           D   10.0.13.1      GigabitEthernet0/0/2
      10.0.13.1/32  Direct  0    0           D   127.0.0.1      GigabitEthernet0/0/2
    10.0.13.255/32  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
```

Проверьте наличие связи между loopback-интерфейсами

```
[AR1]ping -a 10.0.1.1 10.0.1.2
  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
```

Шаг 5. Настройте статические маршруты.

\# На маршрутизаторе R1 настройте маршрут к интерфейсам LoopBack0 маршрутизаторов R2 и R3.

```
[AR1]ip route-static 10.0.1.2 32 10.0.12.2
[AR1]ip route-static 10.0.1.3 32 10.0.13.3
```

\# Выведите на экран таблицу маршрутизации R1.

```
[AR1]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

       10.0.1.1/32   Direct  0    0             D 127.0.0.1   LoopBack0
       10.0.1.2/32   Static  60   0            RD 10.0.12.2   GigabitEthernet0/0/0
       10.0.1.3/32   Static  60   0            RD 10.0.13.3   GigabitEthernet0/0/2
      10.0.12.0/24   Direct  0    0             D 10.0.12.1   GigabitEthernet0/0/0
      10.0.12.1/32   Direct  0    0             D 127.0.0.1   GigabitEthernet0/0/0
    10.0.12.255/32   Direct  0    0             D 127.0.0.1   GigabitEthernet0/0/0
      10.0.13.0/24   Direct  0    0             D 10.0.13.1   GigabitEthernet0/0/2
      10.0.13.1/32   Direct  0    0             D 127.0.0.1   GigabitEthernet0/0/2
    10.0.13.255/32   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
```

\# Проверьте возможность установления связи.

```
[AR1]ping -a 10.0.1.1 10.0.1.2
  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

[AR1]ping -a 10.0.1.1 10.0.1.3
  PING 10.0.1.3: 56  data bytes, press CTRL_C to break
    Request time out
    Request time out
    Request time out
    Request time out
    Request time out

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

\# На R2 добавьте маршрут к интерфейсу LoopBack0 маршрутизатора R1.

```
[AR2]ip route-static 10.0.1.1 32 10.0.12.1
```

\# Проверьте возможность установления связи.

```
[AR1]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=20 ms
    Reply from 10.0.1.2: bytes=56 Sequence=2 ttl=255 time=30 ms
    Reply from 10.0.1.2: bytes=56 Sequence=3 ttl=255 time=10 ms
    Reply from 10.0.1.2: bytes=56 Sequence=4 ttl=255 time=20 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 = 10/20/30 ms

[AR1]ping -a 10.0.1.1 10.0.1.3
  PING 10.0.1.3: 56  data bytes, press CTRL_C to break
    Request time out
    Request time out
    Request time out
    Request time out
    Request time out

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

Настройте другие необходимые маршруты.

AR2

```
[AR2]ip route-static 10.0.1.3 32 10.0.23.3
```

AR3

```
[AR3]ip route-static 10.0.1.1 32 10.0.13.1
[AR3]ip route-static 10.0.1.2 32 10.0.23.2
```

Проверьте возможность установления связи между интерфейсами LoopBack0 маршрутизаторов, следуя приведенной процедуре.

AR1

```
[AR1]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=20 ms
    Reply from 10.0.1.2: bytes=56 Sequence=2 ttl=255 time=20 ms
    Reply from 10.0.1.2: bytes=56 Sequence=3 ttl=255 time=20 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=30 ms

  --- 10.0.1.2 ping statistics ---
  5 packet(s) transmitted
  5 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 20/24/30 ms

[AR1]ping -a 10.0.1.1 10.0.1.3
  PING 10.0.1.3: 56  data bytes, press CTRL_C to break
    Reply from 10.0.1.3: bytes=56 Sequence=1 ttl=255 time=30 ms
    Reply from 10.0.1.3: bytes=56 Sequence=2 ttl=255 time=20 ms
    Reply from 10.0.1.3: bytes=56 Sequence=3 ttl=255 time=20 ms
    Reply from 10.0.1.3: bytes=56 Sequence=4 ttl=255 time=40 ms
    Reply from 10.0.1.3: bytes=56 Sequence=5 ttl=255 time=30 ms

  --- 10.0.1.3 ping statistics ---
  5 packet(s) transmitted
  5 packet(s) received
  0.00% packet loss
  round-trip min/avg/max = 20/28/40 ms
```

AR2

```
[AR2]ping -a 10.0.1.2 10.0.1.1
  PING 10.0.1.1: 56  data bytes, press CTRL_C to break
    Reply from 10.0.1.1: bytes=56 Sequence=1 ttl=255 time=30 ms
    Reply from 10.0.1.1: bytes=56 Sequence=2 ttl=255 time=20 ms
    Reply from 10.0.1.1: bytes=56 Sequence=3 ttl=255 time=20 ms
    Reply from 10.0.1.1: bytes=56 Sequence=4 ttl=255 time=30 ms
```

```
    Reply from 10.0.1.1: bytes=56 Sequence=5 ttl=255 time=20 ms

  --- 10.0.1.1 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 20/24/30 ms

[AR2]ping -a 10.0.1.2 10.0.1.3
  PING 10.0.1.3: 56  data bytes, press CTRL_C to break
    Reply from 10.0.1.3: bytes=56 Sequence=1 ttl=255 time=60 ms
    Reply from 10.0.1.3: bytes=56 Sequence=2 ttl=255 time=30 ms
    Reply from 10.0.1.3: bytes=56 Sequence=3 ttl=255 time=20 ms
    Reply from 10.0.1.3: bytes=56 Sequence=4 ttl=255 time=10 ms
    Reply from 10.0.1.3: bytes=56 Sequence=5 ttl=255 time=30 ms

  --- 10.0.1.3 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 10/30/60 ms
```

AR3

```
[AR3]ping -a 10.0.1.3 10.0.1.1
  PING 10.0.1.1: 56  data bytes, press CTRL_C to break
    Reply from 10.0.1.1: bytes=56 Sequence=1 ttl=255 time=10 ms
    Reply from 10.0.1.1: bytes=56 Sequence=2 ttl=255 time=30 ms
    Reply from 10.0.1.1: bytes=56 Sequence=3 ttl=255 time=20 ms
    Reply from 10.0.1.1: bytes=56 Sequence=4 ttl=255 time=20 ms
    Reply from 10.0.1.1: bytes=56 Sequence=5 ttl=255 time=20 ms

  --- 10.0.1.1 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 10/20/30 ms

[AR3]ping -a 10.0.1.3 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=20 ms
    Reply from 10.0.1.2: bytes=56 Sequence=2 ttl=255 time=30 ms
    Reply from 10.0.1.2: bytes=56 Sequence=3 ttl=255 time=20 ms
    Reply from 10.0.1.2: bytes=56 Sequence=4 ttl=255 time=20 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 = 20/22/30 ms
```

Шаг 6. Настройте маршрут от R1 к R2 через R3 в качестве резервного маршрута от LoopBack0 R1 к LoopBack0 R2.

Настройте статические маршруты на R1 и R2.

```
[AR1]ip route-static 10.0.1.2 32 10.0.13.3 preference 100
[AR2]ip route-static 10.0.1.1 32 10.0.23.3 preference 100
```

Выведите на экран таблицы маршрутизации R1 и R2.

AR1

```
[AR1]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

      10.0.1.1/32   Direct  0    0            D   127.0.0.1       LoopBack0
      10.0.1.2/32   Static  60   0            RD  10.0.12.2       GigabitEthernet0/0/0
      10.0.1.3/32   Static  60   0            RD  10.0.13.3       GigabitEthernet0/0/2
     10.0.12.0/24   Direct  0    0            D   10.0.12.1       GigabitEthernet0/0/0
     10.0.12.1/32   Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/0
   10.0.12.255/32   Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/0
     10.0.13.0/24   Direct  0    0            D   10.0.13.1       GigabitEthernet0/0/2
     10.0.13.1/32   Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/2
   10.0.13.255/32   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
```

AR2

```
[AR2]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

      10.0.1.1/32   Static  60   0            RD  10.0.12.1       GigabitEthernet0/0/0
      10.0.1.2/32   Direct  0    0            D   127.0.0.1       LoopBack0
      10.0.1.3/32   Static  60   0            RD  10.0.23.3       GigabitEthernet0/0/1
     10.0.12.0/24   Direct  0    0            D   10.0.12.2       GigabitEthernet0/0/0
     10.0.12.2/32   Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/0
   10.0.12.255/32   Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/0
     10.0.23.0/24   Direct  0    0            D   10.0.23.2       GigabitEthernet0/0/1
     10.0.23.2/32   Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/1
   10.0.23.255/32   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
```

Отключите интерфейс GigabitEthernet0/0/0 на маршрутизаторах R1 и R2, чтобы сделать недействительным маршрут с наивысшим приоритетом.

```
[AR1]interface g0/0/0
[AR1-GigabitEthernet0/0/0]shutdown
Nov  8 2024 09:17:51-08:00 AR1 %%01IFPDT/4/IF_STATE(l)[0]:Interface GigabitEther
net0/0/0 has turned into DOWN state.
[AR1-GigabitEthernet0/0/0]
[AR1-GigabitEthernet0/0/0]
Nov  8 2024 09:17:51-08:00 AR1 %%01IFNET/4/LINK_STATE(l)[1]:The line protocol IP
 on the interface GigabitEthernet0/0/0 has entered the DOWN state.
```

Выведите на экран таблицы маршрутизации на R1 и R2. Из командного вывода

видно, что маршруты с более низким приоритетом активируются, когда маршруты с более высоким приоритетом становятся недействительными.

AR1

```
[AR1-GigabitEthernet0/0/0]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       GigabitEthernet0/0/2
       10.0.1.3/32  Static  60   0            RD  10.0.13.3       GigabitEthernet0/0/2
      10.0.13.0/24  Direct  0    0            D   10.0.13.1       GigabitEthernet0/0/2
      10.0.13.1/32  Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/2
    10.0.13.255/32  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
```

AR2

```
[AR2]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  Static  100  0            RD  10.0.23.3       GigabitEthernet
0/0/1
       10.0.1.2/32  Direct  0    0            D   127.0.0.1       LoopBack0
       10.0.1.3/32  Static  60   0            RD  10.0.23.3       GigabitEthernet
0/0/1
      10.0.23.0/24  Direct  0    0            D   10.0.23.2       GigabitEthernet
0/0/1
      10.0.23.2/32  Direct  0    0            D   127.0.0.1       GigabitEthernet
0/0/1
    10.0.23.255/32  Direct  0    0            D   127.0.0.1       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
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
```

Проверьте возможность установления связи.

```
[AR1]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=60 ms
    Reply from 10.0.1.2: bytes=56 Sequence=2 ttl=254 time=20 ms
    Reply from 10.0.1.2: bytes=56 Sequence=3 ttl=254 time=30 ms
    Reply from 10.0.1.2: bytes=56 Sequence=4 ttl=254 time=30 ms
    Reply from 10.0.1.2: bytes=56 Sequence=5 ttl=254 time=30 ms

  --- 10.0.1.2 ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 20/34/60 ms
```

Выполните трассировку маршрута, по которому передаются пакеты данных.

```
[AR1]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 30 ms  30 ms  20 ms
2 10.0.23.2 30 ms  20 ms  20 ms
```

Шаг 7. Настройте маршруты по умолчанию для установления связи между интерфейсом LoopBack0 маршрутизатора R1 и интерфейсом LoopBack0 маршрутизатора R2.

Включите интерфейсы и удалите настроенные маршруты.

```
[AR1]interface g0/0/0
[AR1-GigabitEthernet0/0/0]undo shutdown
[AR1-GigabitEthernet0/0/0]qui
Nov  8 2024 09:23:21-08:00 AR1 %%01IFPDT/4/IF_STATE(l)[2]:Interface GigabitEther
net0/0/0 has turned into UP state.
Nov  8 2024 09:23:21-08:00 AR1 %%01IFNET/4/LINK_STATE(l)[3]:The line protocol IP
 on the interface GigabitEthernet0/0/0 has entered the UP state.
[AR1-GigabitEthernet0/0/0]quit
[AR1]undo ip route-static 10.0.1.2 32 10.0.12.2
[AR1]undo ip route-static 10.0.1.2 32 10.0.13.3
```

Выведите на экран таблицу маршрутизации R1.

```
[AR1]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

       10.0.1.1/32  Direct  0    0           D   127.0.0.1       LoopBack0
       10.0.1.3/32  Static  60   0           RD  10.0.13.3       GigabitEthernet0/0/2
      10.0.12.0/24  Direct  0    0           D   10.0.12.1       GigabitEthernet0/0/0
      10.0.12.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/0
    10.0.12.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/0
      10.0.13.0/24  Direct  0    0           D   10.0.13.1       GigabitEthernet0/0/2
      10.0.13.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/2
    10.0.13.255/32  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
```

Настройте маршрут по умолчанию на R1.

```
[AR1]ip route-static 0.0.0.0 0 10.0.12.2
```

Выведите на экран таблицу маршрутизации R1.

```
[AR1]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       GigabitEthernet0/0/0
       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       GigabitEthernet0/0/2
      10.0.12.0/24  Direct  0    0           D   10.0.12.1       GigabitEthernet0/0/0
      10.0.12.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/0
    10.0.12.255/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/0
      10.0.13.0/24  Direct  0    0           D   10.0.13.1       GigabitEthernet0/0/2
      10.0.13.1/32  Direct  0    0           D   127.0.0.1       GigabitEthernet0/0/2
    10.0.13.255/32  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
```

Проверьте наличие связи между LoopBack0 маршрутизатора R1 и LoopBack0 маршрутизатора R2.

```
[AR1]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=50 ms
    Reply from 10.0.1.2: bytes=56 Sequence=2 ttl=255 time=20 ms
    Reply from 10.0.1.2: bytes=56 Sequence=3 ttl=255 time=20 ms
    Reply from 10.0.1.2: bytes=56 Sequence=4 ttl=255 time=20 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 = 20/26/50 ms
```

Справочные конфигурации

AR1.cfg

```
[V200R003C00]
#
 sysname AR1
#
 snmp-agent local-engineid 800007DB03000000000000
 snmp-agent
#
 clock timezone China-Standard-Time minus 08:00:00
#
portal local-server load portalpage.zip
#
 drop illegal-mac alarm
#
 set cpu-usage threshold 80 restore 75
#
aaa
 authentication-scheme default
 authorization-scheme default
 accounting-scheme default
 domain default
 domain default_admin
 local-user admin password cipher %$%$K8m.Nt84DZ}e#<0`8bmE3Uw}%$%$
 local-user admin service-type http
#
firewall zone Local
 priority 15
#
interface GigabitEthernet0/0/0
 ip address 10.0.12.1 255.255.255.0
#
interface GigabitEthernet0/0/1
#
interface GigabitEthernet0/0/2
 ip address 10.0.13.1 255.255.255.0
#
interface NULL0
#
interface LoopBack0
 ip address 10.0.1.1 255.255.255.255
#
ip route-static 0.0.0.0 0.0.0.0 10.0.12.2
ip route-static 10.0.1.3 255.255.255.255 10.0.13.3
#
user-interface con 0
 authentication-mode password
user-interface vty 0 4
user-interface vty 16 20
#
wlan ac
#
return
```

AR2.cfg

```
[V200R003C00]
#
 sysname AR2
#
 snmp-agent local-engineid 800007DB03000000000000
 snmp-agent
#
 clock timezone China-Standard-Time minus 08:00:00
#
portal local-server load portalpage.zip
#
 drop illegal-mac alarm
#
 set cpu-usage threshold 80 restore 75
#
aaa
 authentication-scheme default
 authorization-scheme default
 accounting-scheme default
 domain default
 domain default_admin
 local-user admin password cipher %$%$K8m.Nt84DZ}e#<0`8bmE3Uw}%$%$
 local-user admin service-type http
#
firewall zone Local
 priority 15
#
interface GigabitEthernet0/0/0
 ip address 10.0.12.2 255.255.255.0
#
interface GigabitEthernet0/0/1
 ip address 10.0.23.2 255.255.255.0
#
interface GigabitEthernet0/0/2
#
interface NULL0
#
interface LoopBack0
 ip address 10.0.1.2 255.255.255.255
#
ip route-static 10.0.1.1 255.255.255.255 10.0.12.1
ip route-static 10.0.1.1 255.255.255.255 10.0.23.3 preference 100
ip route-static 10.0.1.3 255.255.255.255 10.0.23.3
#
user-interface con 0
 authentication-mode password
user-interface vty 0 4
user-interface vty 16 20
#
wlan ac
#
return
```

AR3.cfg

```
[V200R003C00]
#
 sysname AR3
#
 snmp-agent local-engineid 800007DB03000000000000
 snmp-agent
#
 clock timezone China-Standard-Time minus 08:00:00
#
portal local-server load portalpage.zip
#
 drop illegal-mac alarm
#
 set cpu-usage threshold 80 restore 75
#
```

```
aaa
 authentication-scheme default
 authorization-scheme default
 accounting-scheme default
 domain default
 domain default_admin
 local-user admin password cipher %$%$K8m.Nt84DZ}e#<0`8bmE3Uw}%$%$
 local-user admin service-type http
#
firewall zone Local
 priority 15
#
interface GigabitEthernet0/0/0
#
interface GigabitEthernet0/0/1
 ip address 10.0.23.3 255.255.255.0
#
interface GigabitEthernet0/0/2
 ip address 10.0.13.3 255.255.255.0
#
interface NULL0
#
interface LoopBack0
 ip address 10.0.1.3 255.255.255.255
#
ip route-static 10.0.1.1 255.255.255.255 10.0.13.1
ip route-static 10.0.1.2 255.255.255.255 10.0.23.2
#
user-interface con 0
 authentication-mode password
user-interface vty 0 4
user-interface vty 16 20
#
wlan ac
#
return
```

Маршрутизация OSPF

Цели

Лабораторная работа помогает получить практические навыки по изучению следующих тем:

- Основные команды OSPF
- Процедура проверки рабочего статуса OSPF
- Процедура настройки выбора маршрутов OSPF на основании их стоимости
- Анонсирование маршрутов по умолчанию в OSPF
- Процедура настройки аутентификации OSPF

Топология
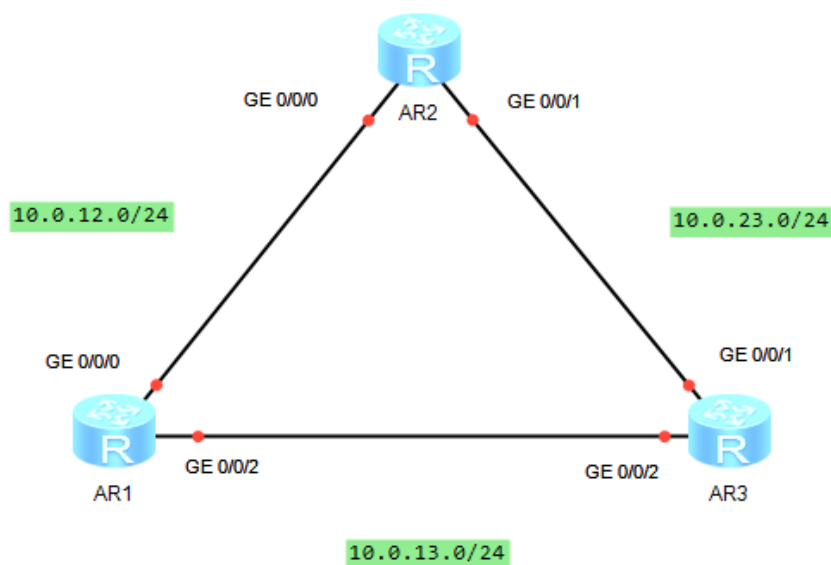
План работы

1. Создание процессов OSPF на устройствах и включение OSPF на интерфейсах.
2. Настройка аутентификации OSPF.
3. Настройка OSPF для анонсирования маршрутов по умолчанию.
4. Управление выбором маршрутов OSPF на основании их стоимости.

Процедура конфигурирования

Шаг 1. Настройте основные параметры устройств.

Выполните шаги 1, 2, 3 и 4, приведенные в лабораторной работе 1, чтобы присвоить маршрутизаторам имена и настроить IP-адреса физических интерфейсов и loopback-интерфейсов.

AR1

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname AR1

[AR1]interface g0/0/0
[AR1-GigabitEthernet0/0/0]ip address 10.0.12.1 24
Nov  8 2024 10:23:41-08:00 AR1 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
 on the interface GigabitEthernet0/0/0 has entered the UP state.
[AR1-GigabitEthernet0/0/0]quit
[AR1]interface g0/0/2
[AR1-GigabitEthernet0/0/2]ip address 10.0.13.1 24
Nov  8 2024 10:24:16-08:00 AR1 %%01IFNET/4/LINK_STATE(l)[1]:The line protocol IP
 on the interface GigabitEthernet0/0/2 has entered the UP state.
[AR1-GigabitEthernet0/0/2]quit

[AR1]interface LoopBack0
[AR1-LoopBack0]ip address 10.0.1.1 32
```

AR2

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname AR2

[AR2]interface g0/0/0
[AR2-GigabitEthernet0/0/0]ip address 10.0.12.2 24
Nov  8 2024 10:25:01-08:00 AR2 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
 on the interface GigabitEthernet0/0/0 has entered the UP state.
[AR2-GigabitEthernet0/0/0]quit
[AR2]interface g0/0/1
[AR2-GigabitEthernet0/0/1]ip address 10.0.23.2 24
Nov  8 2024 10:25:36-08:00 AR2 %%01IFNET/4/LINK_STATE(l)[1]:The line protocol IP
 on the interface GigabitEthernet0/0/1 has entered the UP state.
[AR2-GigabitEthernet0/0/1]quit

[AR2]interface LoopBack0
[AR2-LoopBack0]ip address 10.0.1.2 32
```

AR3

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname AR3

[AR3]interface g0/0/1
[AR3-GigabitEthernet0/0/1]ip address 10.0.23.3 24
[AR3-GigabitEthernet0/0/1]
Nov  8 2024 10:26:14-08:00 AR3 %%01IFNET/4/LINK_STATE(l)[0]:The line protocol IP
 on the interface GigabitEthernet0/0/1 has entered the UP state.
[AR3-GigabitEthernet0/0/1]quit
[AR3]interface g0/0/2
[AR3-GigabitEthernet0/0/2]ip address 10.0.13.3 24
Nov  8 2024 10:26:45-08:00 AR3 %%01IFNET/4/LINK_STATE(l)[1]:The line protocol IP
 on the interface GigabitEthernet0/0/2 has entered the UP state.
[AR3-GigabitEthernet0/0/2]quit

[AR3]interface LoopBack0
[AR3-LoopBack0]ip address 10.0.1.3 32
```

Выведите на экран таблицу маршрутизации на маршрутизаторе.

AR1

```
[AR1]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       GigabitEthernet0/0/0
      10.0.12.1/32  Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/0
    10.0.12.255/32  Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/0
      10.0.13.0/24  Direct  0    0            D   10.0.13.1       GigabitEthernet0/0/2
      10.0.13.1/32  Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/2
    10.0.13.255/32  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
```

AR2

```
[AR2]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

       10.0.1.2/32  Direct  0    0            D   127.0.0.1       LoopBack0
      10.0.12.0/24  Direct  0    0            D   10.0.12.2       GigabitEthernet0/0/0
      10.0.12.2/32  Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/0
    10.0.12.255/32  Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/0
      10.0.23.0/24  Direct  0    0            D   10.0.23.2       GigabitEthernet0/0/1
      10.0.23.2/32  Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/1
    10.0.23.255/32  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
```

AR3

```
[AR3]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

       10.0.1.3/32  Direct  0    0            D   127.0.0.1       LoopBack0
      10.0.13.0/24  Direct  0    0            D   10.0.13.3       GigabitEthernet0/0/2
      10.0.13.3/32  Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/2
    10.0.13.255/32  Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/2
      10.0.23.0/24  Direct  0    0            D   10.0.23.3       GigabitEthernet0/0/1
      10.0.23.3/32  Direct  0    0            D   127.0.0.1       GigabitEthernet0/0/1
    10.0.23.255/32  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
```

Шаг 2. Настройте основные параметры OSPF.

\# Создайте процесс OSPF.

```
[AR1]ospf 1
```

\# Создайте область OSPF и укажите интерфейсы, на которых необходимо включить OSPF.

AR1

```
[AR1-ospf-1]area 0
[AR1-ospf-1-area-0.0.0.0]network 10.0.12.1 0.0.0.255
[AR1-ospf-1-area-0.0.0.0]network 10.0.13.1 0.0.0.255
[AR1-ospf-1-area-0.0.0.0]network 10.0.1.1 0.0.0.0
```

AR2

```
[AR2]ospf
[AR2-ospf-1]area 0
[AR2-ospf-1-area-0.0.0.0]network 10.0.12.2 0.0.0.0
[AR2-ospf-1-area-0.0.0.0]network 10.0.23.2 0.0.0.0
[AR2-ospf-1-area-0.0.0.0]network 10.0.1.2 0.0.0.0
```

AR3

```
[AR3]ospf
[AR3-ospf-1]area 0
[AR3-ospf-1-area-0.0.0.0]network 10.0.13.3 0.0.0.0
[AR3-ospf-1-area-0.0.0.0]network 10.0.23.3 0.0.0.0
[AR3-ospf-1-area-0.0.0.0]network 10.0.1.3 0.0.0.0
```

Шаг 3. Выведите на экран рабочий статус OSPF.

Выведите на экран информацию о соседях OSPF.

```
[AR1]dis ospf peer

          OSPF Process 1 with Router ID 10.0.12.1
                    Neighbors

 Area 0.0.0.0 interface 10.0.12.1(GigabitEthernet0/0/0)'s neighbors
 Router ID: 10.0.12.2         Address: 10.0.12.2
   State: Full  Mode:Nbr is  Master  Priority: 1
   DR: 10.0.12.1  BDR: 10.0.12.2  MTU: 0
   Dead timer due in 33  sec
   Retrans timer interval: 5
   Neighbor is up for 00:02:53
   Authentication Sequence: [ 0 ]


                    Neighbors

 Area 0.0.0.0 interface 10.0.13.1(GigabitEthernet0/0/2)'s neighbors
 Router ID: 10.0.23.3         Address: 10.0.13.3
   State: Full  Mode:Nbr is  Master  Priority: 1
   DR: 10.0.13.1  BDR: 10.0.13.3  MTU: 0
   Dead timer due in 36  sec
   Retrans timer interval: 5
   Neighbor is up for 00:01:36
   Authentication Sequence: [ 0 ]
```

Выведите на экран маршруты, полученные от OSPF.

```
[AR1]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      GigabitEthernet0/0/0
       10.0.1.3/32  OSPF    10   1           D   10.0.13.3      GigabitEthernet0/0/2
      10.0.23.0/24  OSPF    10   2           D   10.0.12.2      GigabitEthernet0/0/0
                    OSPF    10   2           D   10.0.13.3      GigabitEthernet0/0/2

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

Шаг 4. Настройте аутентификацию OSPF.

Настройте на маршрутизаторе R1 аутентификацию интерфейса.

```
[AR1]interface g0/0/0
[AR1-GigabitEthernet0/0/0]ospf authentication-mode md5 1 cipher HCIA-Datacom
[AR1-GigabitEthernet0/0/0]quit
[AR1]interface g0/0/2
[AR1-GigabitEthernet0/0/2]ospf authentication-mode md5 1 cipher HCIA-Datacom
[AR1-GigabitEthernet0/0/2]display this
[V200R003C00]
#
interface GigabitEthernet0/0/2
 ip address 10.0.13.1 255.255.255.0
 ospf authentication-mode md5 1 cipher %$%$%LN,6VvjtNt*`~@e,oH*,C7(%$%$
#
return
```

Выведите на экран соседей OSPF.

```
[AR1]display ospf peer brief

          OSPF Process 1 with Router ID 10.0.12.1
                Peer Statistic Information
 ----------------------------------------------------------------
 Area Id          Interface                Neighbor id      State
 ----------------------------------------------------------------
```

Настройте аутентификацию интерфейса на маршрутизаторе R2.

```
[AR2]interface g0/0/0
[AR2-GigabitEthernet0/0/0]ospf authentication-mode md5 1 cipher HCIA-Datacom
[AR2-GigabitEthernet0/0/0]quit
[AR2]interface g0/0/1
[AR2-GigabitEthernet0/0/1]ospf authentication-mode md5 1 cipher HCIA-Datacom
```

Выведите на экран соседей OSPF на R2.

```
[AR2]display ospf peer brief

          OSPF Process 1 with Router ID 10.0.12.2
                Peer Statistic Information
 ----------------------------------------------------------------
 Area Id          Interface                Neighbor id      State
 0.0.0.0          GigabitEthernet0/0/0     10.0.12.1        Full
 ----------------------------------------------------------------
```

Настройте аутентификацию области на R3.

```
[AR3]ospf
[AR3-ospf-1]area 0
[AR3-ospf-1-area-0.0.0.0]authentication-mode md5 1 cipher HCIA-Datacom
```

Выведите на экран соседей OSPF на R3.

```
[AR3]display ospf peer brief

          OSPF Process 1 with Router ID 10.0.23.3
                Peer Statistic Information
 ----------------------------------------------------------------
 Area Id          Interface                Neighbor id      State
 0.0.0.0          GigabitEthernet0/0/1     10.0.12.2        Full
 0.0.0.0          GigabitEthernet0/0/2     10.0.12.1        Full
 ----------------------------------------------------------------
```

Шаг 5. Предположим, что R1 является граничным маршрутизатором всех сетей. Таким образом, маршрутизатор R1 анонсирует маршрут OSPF по умолчанию.

Анонсируйте маршрут по умолчанию на R1.

```
[AR1]ospf
[AR1-ospf-1]default-route-advertise always
```

Выведите на экран таблицы IP-маршрутизации R2 и R3.

AR2

```
[AR2]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     GigabitEthernet0/0/0
        10.0.1.1/32 OSPF    10   1            D    10.0.12.1     GigabitEthernet0/0/0
        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     GigabitEthernet0/0/1
       10.0.12.0/24 Direct  0    0            D    10.0.12.2     GigabitEthernet0/0/0
       10.0.12.2/32 Direct  0    0            D    127.0.0.1     GigabitEthernet0/0/0
     10.0.12.255/32 Direct  0    0            D    127.0.0.1     GigabitEthernet0/0/0
       10.0.13.0/24 OSPF    10   2            D    10.0.12.1     GigabitEthernet0/0/0
                    OSPF    10   2            D    10.0.23.3     GigabitEthernet0/0/1
       10.0.23.0/24 Direct  0    0            D    10.0.23.2     GigabitEthernet0/0/1
       10.0.23.2/32 Direct  0    0            D    127.0.0.1     GigabitEthernet0/0/1
     10.0.23.255/32 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
```

AR3

```
[AR3]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     GigabitEthernet0/0/2
        10.0.1.1/32 OSPF    10   1            D    10.0.13.1     GigabitEthernet0/0/2
        10.0.1.2/32 OSPF    10   1            D    10.0.23.2     GigabitEthernet0/0/1
        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     GigabitEthernet0/0/1
                    OSPF    10   2            D    10.0.13.1     GigabitEthernet0/0/2
       10.0.13.0/24 Direct  0    0            D    10.0.13.3     GigabitEthernet0/0/2
       10.0.13.3/32 Direct  0    0            D    127.0.0.1     GigabitEthernet0/0/2
     10.0.13.255/32 Direct  0    0            D    127.0.0.1     GigabitEthernet0/0/2
       10.0.23.0/24 Direct  0    0            D    10.0.23.3     GigabitEthernet0/0/1
       10.0.23.3/32 Direct  0    0            D    127.0.0.1     GigabitEthernet0/0/1
     10.0.23.255/32 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
```

Шаг 6. Измените значения стоимости интерфейсов на R1, чтобы LoopBack0 на R1 мог достигать LoopBack0 на R2 через R3.

\# Согласно таблице маршрутизации R1 стоимость маршрута от маршрутизатора R1 до LoopBack0 маршрутизатора R2 равна 1, а стоимость маршрута от R1 к R2 через R3 равна 2. Следовательно, необходимо только установить для стоимости маршрута от маршрутизатора R1 до LoopBack0 маршрутизатора R2 значение больше 2.

```
[AR1]display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 14        Routes : 15

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   1          D     10.0.12.2    GigabitEthernet0/0/0
       10.0.1.3/32  OSPF    10   1          D     10.0.13.3    GigabitEthernet0/0/2
      10.0.12.0/24  Direct  0    0          D     10.0.12.1    GigabitEthernet0/0/0
      10.0.12.1/32  Direct  0    0          D     127.0.0.1    GigabitEthernet0/0/0
    10.0.12.255/32  Direct  0    0          D     127.0.0.1    GigabitEthernet0/0/0
      10.0.13.0/24  Direct  0    0          D     10.0.13.1    GigabitEthernet0/0/2
      10.0.13.1/32  Direct  0    0          D     127.0.0.1    GigabitEthernet0/0/2
    10.0.13.255/32  Direct  0    0          D     127.0.0.1    GigabitEthernet0/0/2
      10.0.23.0/24  OSPF    10   2          D     10.0.12.2    GigabitEthernet0/0/0
                    OSPF    10   2          D     10.0.13.3    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
```

```
[AR1]interface g0/0/0
[AR1-GigabitEthernet0/0/0]ospf cost 10
```

\# Выведите на экран таблицу маршрутизации R1

```
[AR1]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    GigabitEthernet0/0/2
       10.0.1.3/32  OSPF    10   1          D     10.0.13.3    GigabitEthernet0/0/2
      10.0.12.0/24  Direct  0    0          D     10.0.12.1    GigabitEthernet0/0/0
      10.0.12.1/32  Direct  0    0          D     127.0.0.1    GigabitEthernet0/0/0
    10.0.12.255/32  Direct  0    0          D     127.0.0.1    GigabitEthernet0/0/0
      10.0.13.0/24  Direct  0    0          D     10.0.13.1    GigabitEthernet0/0/2
      10.0.13.1/32  Direct  0    0          D     127.0.0.1    GigabitEthernet0/0/2
    10.0.13.255/32  Direct  0    0          D     127.0.0.1    GigabitEthernet0/0/2
      10.0.23.0/24  OSPF    10   2          D     10.0.13.3    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
```

\# Проверьте результат конфигурирования с помощью команды Tracert.

```
[AR1]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 30 ms  10 ms   10 ms
```

```
2 10.0.23.2 30 ms  20 ms  10 ms
```

Справочные конфигурации

AR1

```
[V200R003C00]
#
 sysname AR1
#
 snmp-agent local-engineid 800007DB03000000000000
 snmp-agent
#
 clock timezone China-Standard-Time minus 08:00:00
#
portal local-server load portalpage.zip
#
 drop illegal-mac alarm
#
 set cpu-usage threshold 80 restore 75
#
aaa
 authentication-scheme default
 authorization-scheme default
 accounting-scheme default
 domain default
 domain default_admin
 local-user admin password cipher %$%$K8m.Nt84DZ}e#<0`8bmE3Uw}%$%$
 local-user admin service-type http
#
firewall zone Local
 priority 15
#
interface GigabitEthernet0/0/0
 ip address 10.0.12.1 255.255.255.0
 ospf cost 10
 ospf authentication-mode md5 1 cipher %$%$Y[BG%EY~W8(:z#PJ+<_%,BR1%$%$
#
interface GigabitEthernet0/0/1
#
interface GigabitEthernet0/0/2
 ip address 10.0.13.1 255.255.255.0
 ospf authentication-mode md5 1 cipher %$%$%LN,6VvjtNt*`~@e,oH*,C7(%$%$
#
interface NULL0
#
interface LoopBack0
 ip address 10.0.1.1 255.255.255.255
#
ospf 1
 default-route-advertise always
 area 0.0.0.0
  network 10.0.1.1 0.0.0.0
  network 10.0.12.0 0.0.0.255
  network 10.0.13.0 0.0.0.255
#
user-interface con 0
 authentication-mode password
user-interface vty 0 4
user-interface vty 16 20
#
wlan ac
#
return
```

AR2

```
[V200R003C00]
#
 sysname AR2
#
 snmp-agent local-engineid 800007DB03000000000000
```

```
 snmp-agent
#
 clock timezone China-Standard-Time minus 08:00:00
#
portal local-server load portalpage.zip
#
 drop illegal-mac alarm
#
 set cpu-usage threshold 80 restore 75
#
aaa
 authentication-scheme default
 authorization-scheme default
 accounting-scheme default
 domain default
 domain default_admin
 local-user admin password cipher %$%$K8m.Nt84DZ}e#<0`8bmE3Uw}%$%$
 local-user admin service-type http
#
firewall zone Local
 priority 15
#
interface GigabitEthernet0/0/0
 ip address 10.0.12.2 255.255.255.0
 ospf authentication-mode md5 1 cipher %$%$sDxl;Y=7dP\\L+/]6j@%,Ee`%$%$
#
interface GigabitEthernet0/0/1
 ip address 10.0.23.2 255.255.255.0
 ospf authentication-mode md5 1 cipher %$%$a>|#JXCOjLvj1qYP3E^$,F|H%$%$
#
interface GigabitEthernet0/0/2
#
interface NULL0
#
interface LoopBack0
 ip address 10.0.1.2 255.255.255.255
#
ospf 1
 area 0.0.0.0
  network 10.0.1.2 0.0.0.0
  network 10.0.12.2 0.0.0.0
  network 10.0.23.2 0.0.0.0
#
user-interface con 0
 authentication-mode password
user-interface vty 0 4
user-interface vty 16 20
#
wlan ac
#
return
```

AR3

```
[V200R003C00]
#
 sysname AR3
#
 snmp-agent local-engineid 800007DB03000000000000
 snmp-agent
#
 clock timezone China-Standard-Time minus 08:00:00
#
portal local-server load portalpage.zip
#
 drop illegal-mac alarm
#
 set cpu-usage threshold 80 restore 75
#
aaa
 authentication-scheme default
 authorization-scheme default
```

```
 accounting-scheme default
 domain default
 domain default_admin
 local-user admin password cipher %$%$K8m.Nt84DZ}e#<0`8bmE3Uw}%$%$
 local-user admin service-type http
#
firewall zone Local
 priority 15
#
interface GigabitEthernet0/0/0
#
interface GigabitEthernet0/0/1
 ip address 10.0.23.3 255.255.255.0
#
interface GigabitEthernet0/0/2
 ip address 10.0.13.3 255.255.255.0
#
interface NULL0
#
interface LoopBack0
 ip address 10.0.1.3 255.255.255.255
#
ospf 1
 area 0.0.0.0
  authentication-mode md5 1 cipher %$%$;{3y:R6G@S!L6AGC[1n2,H#h%$%$
  network 10.0.1.3 0.0.0.0
  network 10.0.13.3 0.0.0.0
  network 10.0.23.3 0.0.0.0
#
user-interface con 0
 authentication-mode password
user-interface vty 0 4
user-interface vty 16 20
#
wlan ac
#
return
```

Вывод

В ходе выполнения лабораторной работы мы познакомились со средой eNSP и её настройкой. В ЛР1 назначили адреса и статические маршруты IPV4, в ЛР2 настроили маршрутизацию OSPF.