Федеральное государственное автономное образовательное учреждение высшего образования

Университет ИТМО

**Отчет по лабораторной работе №1-2**

**«Администрирование систем и сетей»**

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# Адресация и маршрутизация IPv4

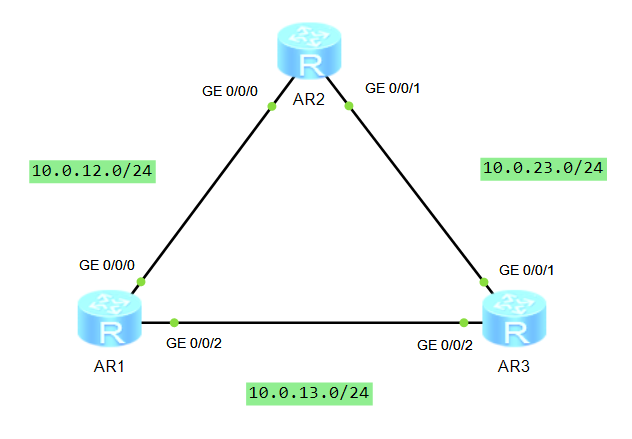
## Цели

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

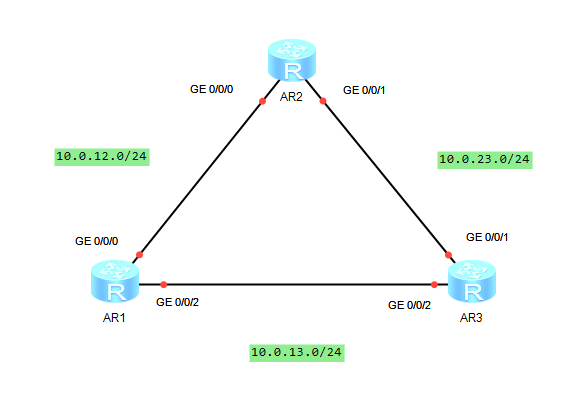
## Цели

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.