Министерство образования и науки РФ

Федеральное государственное автономное

образовательное учреждение высшего образования

«Национальный исследовательский университет ИТМО»

**факультет программной инженерии и компьютерной техники**

**ЛАБОРАТОРНАЯ РАБОТА №2**

по дисциплине

‘Администрирование систем и сетей’

***Выполнили:***

Студенты группы P34312

Соболев Иван

Верещагин Егор

***Желаемая оценка:*** 4

***Преподаватель:***

Афанасьев Дмитрий Борисович



Санкт-Петербург, 2024

Адресация и маршрутизация IPv4

[Топология 3](#_Toc176692835)

[Конфигурация 3](#_Toc176692836)

[Настройка адресов для физических интерфейсов 3](#_Toc176692837)

[Проверка связи с помощью ping 6](#_Toc176692838)

[Создание loopback-интерфейсов 7](#_Toc176692839)

[Таблица маршрутизации R1 8](#_Toc176692840)

[Проверка связи между loopback-интерфейсами 8](#_Toc176692841)

[Настройка статических маршрутов 9](#_Toc176692842)

[Таблица маршрутизации R1 9](#_Toc176692843)

[Проверка связи между loopback-интерфейсами 10](#_Toc176692844)

[Настройка маршрута от R1 к R2 через R3 в качестве резервного маршрута от LoopBack0 R1 к LoopBack0 R2 10](#_Toc176692845)

[Настройка статических маршрутов R1, R2 10](#_Toc176692846)

[Таблица маршрутизации R1 (до выключения g0/0/0) 11](#_Toc176692847)

[Отключение интерфейса GigabitEthernet0/0/0 на маршрутизаторе R1 11](#_Toc176692848)

[Таблица маршрутизации R1 (после выключения g0/0/0) 11](#_Toc176692849)

[Трассировка маршрута, по которому передаются пакеты с данными 12](#_Toc176692850)

[Настройка маршрутов по умолчанию для установления связи между интерфейсом LoopBack0 маршрутизатора R1 и LoopBack0 R2. 12](#_Toc176692851)

[Включение интерфейсов и удаление настроенных маршрутов 12](#_Toc176692852)

[Таблица маршрутизации R1 13](#_Toc176692853)

[Настройка маршрута по умолчанию на R1 13](#_Toc176692854)

[Таблица маршрутизации R1 13](#_Toc176692855)

[Проверка наличия связи между LoopBack0 маршрутизатора R1 и LoopBack0 маршрутизатора R2 14](#_Toc176692856)

[Топология 15](#_Toc176692857)

[Конфигурация 15](#_Toc176692858)

[Просмотр информации об устройстве 15](#_Toc176692859)

[Меняем имя и настраиваем IP адреса 16](#_Toc176692860)

[Включаем OSPF 17](#_Toc176692861)

[статус 17](#_Toc176692862)

[Настраиваем конфигурацию на R1 18](#_Toc176692863)

[Настраиваем аутентификацию на других роутерах 18](#_Toc176692864)

[Маршрут по умолчанию в R1 19](#_Toc176692865)

[Меняем веса так, чтобы LoobBack0 R1 ходил в R2 через R3 20](#_Toc176692866)

[Вывод 21](#_Toc176692867)

Адресация и маршрутизация IPv4

# Топология

Изображение выглядит как текст, диаграмма, снимок экрана, линия

Автоматически созданное описание

# Конфигурация

## Настройка адресов для физических интерфейсов

R1:

<R1>system-view

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

[R1]interface GigabitEthernet0/0/0

[R1-GigabitEthernet0/0/0]ip address 10.0.12.1 24

Sep 7 2024 17:23:00-08:00 Huawei %%01IFNET/4/LINK\_STATE(l)[0]:The line protocol

IP on the interface GigabitEthernet0/0/0 has entered the UP state.

[R1-GigabitEthernet0/0/0]quit

[R1]interface GigabitEthernet0/0/1

[R1-GigabitEthernet0/0/1]ip address 10.0.13.1 24

Sep 7 2024 17:26:56-08:00 Huawei %%01IFNET/4/LINK\_STATE(l)[1]:The line protocol

IP on the interface GigabitEthernet0/0/1 has entered the UP state.

[R1-GigabitEthernet0/0/1]quit

[R1]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 3

The number of interface that is DOWN in Protocol is 1

Interface IP Address/Mask Physical Protocol

GigabitEthernet0/0/0 10.0.12.1/24 up up

GigabitEthernet0/0/1 10.0.13.1/24 up up

GigabitEthernet0/0/2 unassigned down down

NULL0 unassigned up up(s)

R2:

<R2>system-view

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

[R2]interface GigabitEthernet0/0/0

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

Sep 7 2024 17:33:30-08:00 Huawei %%01IFNET/4/LINK\_STATE(l)[0]:The line protocol

IP on the interface GigabitEthernet0/0/0 has entered the UP state.

[R2-GigabitEthernet0/0/0]quit

[R2]interface GigabitEthernet0/0/1

[R2-GigabitEthernet0/0/1]ip address 10.0.23.2 24

Sep 7 2024 17:35:05-08:00 Huawei %%01IFNET/4/LINK\_STATE(l)[1]:The line protocol

IP on the interface GigabitEthernet0/0/1 has entered the UP state.

[R2-GigabitEthernet0/0/1]quit

[R2]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 3

The number of interface that is DOWN in Protocol is 1

Interface IP Address/Mask Physical Protocol

GigabitEthernet0/0/0 10.0.12.2/24 up up

GigabitEthernet0/0/1 10.0.23.2/24 up up

GigabitEthernet0/0/2 unassigned down down

NULL0 unassigned up up(s)

R3:

<R3>system-view

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

[R3]interface GigabitEthernet0/0/0

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

Sep 7 2024 17:39:15-08:00 Huawei %%01IFNET/4/LINK\_STATE(l)[0]:The line protocol

IP on the interface GigabitEthernet0/0/0 has entered the UP state.

[R3-GigabitEthernet0/0/0]quit

[R3]interface GigabitEthernet0/0/1

[R3-GigabitEthernet0/0/1]ip address 10.0.23.1 24

Sep 7 2024 17:40:09-08:00 Huawei %%01IFNET/4/LINK\_STATE(l)[1]:The line protocol

IP on the interface GigabitEthernet0/0/1 has entered the UP state.

[R3-GigabitEthernet0/0/1]quit

[R3]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 3

The number of interface that is DOWN in Protocol is 1

Interface IP Address/Mask Physical Protocol

GigabitEthernet0/0/0 10.0.13.3/24 up up

GigabitEthernet0/0/1 10.0.23.1/24 up up

GigabitEthernet0/0/2 unassigned down down

NULL0 unassigned up up(s)

|  |  |  |
| --- | --- | --- |
| **Маршрутизатор** | **Интерфейс** | **IP-адрес / маска** |
| R1 | GigabitEthernet0/0/0 | int g0/0/0 ip ad 10.0.12.1 24 |
| GigabitEthernet0/0/1 | int g0/0/2 ip ad 10.0.13.1 24 |
| R2 | GigabitEthernet0/0/0 | int g0/0/0 ip ad 10.0.12.2 24 |
| GigabitEthernet0/0/1 | int g0/0/1 ip ad 10.0.23.2 24 |
| R3 | GigabitEthernet0/0/0 | int g0/0/1 ip ad 10.0.13.3 24 |
| GigabitEthernet0/0/1 | int g0/0/2 ip ad 10.0.23.1 24 |

### Проверка связи с помощью ping

R1-R2:

<R1>ping 10.0.12.2

PING 10.0.12.2: 56 data bytes, press CTRL\_C to break

Reply from 10.0.12.2: bytes=56 Sequence=1 ttl=255 time=110 ms

Reply from 10.0.12.2: bytes=56 Sequence=2 ttl=255 time=30 ms

Reply from 10.0.12.2: bytes=56 Sequence=3 ttl=255 time=10 ms

Reply from 10.0.12.2: bytes=56 Sequence=4 ttl=255 time=10 ms

Reply from 10.0.12.2: bytes=56 Sequence=5 ttl=255 time=30 ms

--- 10.0.12.2 ping statistics ---

5 packet(s) transmitted

5 packet(s) received

0.00% packet loss

round-trip min/avg/max = 10/38/110 ms

R1-R3:

<R1>ping 10.0.13.3

PING 10.0.13.3: 56 data bytes, press CTRL\_C to break

Reply from 10.0.13.3: bytes=56 Sequence=1 ttl=255 time=30 ms

Reply from 10.0.13.3: bytes=56 Sequence=2 ttl=255 time=20 ms

Reply from 10.0.13.3: bytes=56 Sequence=3 ttl=255 time=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=30 ms

--- 10.0.13.3 ping statistics ---

5 packet(s) transmitted

5 packet(s) received

0.00% packet loss

round-trip min/avg/max = 20/24/30 ms

R2-R3:

<R2>ping 10.0.23.1

PING 10.0.23.1: 56 data bytes, press CTRL\_C to break

Reply from 10.0.23.1: bytes=56 Sequence=1 ttl=255 time=30 ms

Reply from 10.0.23.1: bytes=56 Sequence=2 ttl=255 time=40 ms

Reply from 10.0.23.1: bytes=56 Sequence=3 ttl=255 time=20 ms

Reply from 10.0.23.1: bytes=56 Sequence=4 ttl=255 time=20 ms

Reply from 10.0.23.1: bytes=56 Sequence=5 ttl=255 time=20 ms

--- 10.0.23.1 ping statistics ---

5 packet(s) transmitted

5 packet(s) received

0.00% packet loss

round-trip min/avg/max = 20/26/40 ms

## Создание loopback-интерфейсов

R1:

[R1]interface LoopBack0

[R1-LoopBack0]ip address 10.0.1.1 32

R2:

[R2]interface LoopBack0

[R2-LoopBack0]ip address 10.0.1.2 32

R3:

[R3]interface LoopBack0

[R3-LoopBack0]ip address 10.0.1.3 32

|  |  |  |
| --- | --- | --- |
| **Маршрутизатор** | **Интерфейс** | **IP-адрес / маска** |
| R1 | LoopBack0 | int LoopBack0 ip ad 10.0.1.1 32 |
| R2 | LoopBack0 | int LoopBack0 ip ad 10.0.1.2 32 |
| R3 | LoopBack0 | int LoopBack0 ip ad 10.0.1.3 32 |

#### 

### Таблица маршрутизации R1

|  |
| --- |
| <R1>display ip routing-table  Route Flags: R - relay, D - download to fib  ------------------------------------------------------------------------------  Routing Tables: Public  Destinations : 11 Routes : 11  Destination/Mask Proto Pre Cost Flags NextHop Interface  10.0.1.1/32 Direct 0 0 D 127.0.0.1 LoopBack0  10.0.12.0/24 Direct 0 0 D 10.0.12.1 GigabitEthernet  0/0/0  10.0.12.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.12.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.13.0/24 Direct 0 0 D 10.0.13.1 GigabitEthernet  0/0/1  10.0.13.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/1  10.0.13.255/32 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 |

### Проверка связи между loopback-интерфейсами

|  |
| --- |
| **[R1]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 |

## Настройка статических маршрутов

|  |
| --- |
| [R1]ip route-static 10.0.1.2 32 10.0.12.2  [R1]ip route-static 10.0.1.3 32 10.0.13.3 |
| [R2]ip route-static 10.0.1.1 32 10.0.12.1  [R2]ip route-static 10.0.1.3 32 10.0.23.1 |
| [R3]ip route-static 10.0.1.1 32 10.0.13.1  [R3]ip route-static 10.0.1.2 32 10.0.23.2 |

### Таблица маршрутизации R1

|  |
| --- |
| [R1]display ip routing-table  Route Flags: R - relay, D - download to fib  ------------------------------------------------------------------------------  Routing Tables: Public  Destinations : 13 Routes : 13  Destination/Mask Proto Pre Cost Flags NextHop Interface  10.0.1.1/32 Direct 0 0 D 127.0.0.1 LoopBack0  10.0.1.2/32 Static 60 0 RD 10.0.12.2 GigabitEthernet  0/0/0  10.0.1.3/32 Static 60 0 RD 10.0.13.3 GigabitEthernet  0/0/1  10.0.12.0/24 Direct 0 0 D 10.0.12.1 GigabitEthernet  0/0/0  10.0.12.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.12.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.13.0/24 Direct 0 0 D 10.0.13.1 GigabitEthernet  0/0/1  10.0.13.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/1  10.0.13.255/32 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 |

### Проверка связи между loopback-интерфейсами

|  |
| --- |
| **[R1]ping -a 10.0.1.1 10.0.1.2**  PING 10.0.1.2: 56 data bytes, press CTRL\_C to break  Reply from 10.0.1.2: bytes=56 Sequence=1 ttl=255 time=30 ms  Reply from 10.0.1.2: bytes=56 Sequence=2 ttl=255 time=10 ms  Reply from 10.0.1.2: bytes=56 Sequence=3 ttl=255 time=30 ms  Reply from 10.0.1.2: bytes=56 Sequence=4 ttl=255 time=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 = 10/22/30 ms  **[R1]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=30 ms  Reply from 10.0.1.3: bytes=56 Sequence=4 ttl=255 time=20 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 = 20/26/30 ms |

## Настройка маршрута от R1 к R2 через R3 в качестве резервного маршрута от LoopBack0 R1 к LoopBack0 R2

### Настройка статических маршрутов R1, R2

[R1]ip ro 10.0.1.2 32 10.0.13.3 preference 100

[R2]ip ro 10.0.1.1 32 10.0.23.1 preference 100

### Таблица маршрутизации R1 (до выключения g0/0/0)

|  |
| --- |
| [R1]display ip routing-table  Route Flags: R - relay, D - download to fib  ------------------------------------------------------------------------------  Routing Tables: Public  Destinations : 13 Routes : 13  Destination/Mask Proto Pre Cost Flags NextHop Interface  10.0.1.1/32 Direct 0 0 D 127.0.0.1 LoopBack0  10.0.1.2/32 Static 60 0 RD 10.0.12.2 GigabitEthernet  0/0/0  10.0.1.3/32 Static 60 0 RD 10.0.13.3 GigabitEthernet  0/0/1  10.0.12.0/24 Direct 0 0 D 10.0.12.1 GigabitEthernet  0/0/0  10.0.12.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.12.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.13.0/24 Direct 0 0 D 10.0.13.1 GigabitEthernet  0/0/1  10.0.13.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/1  10.0.13.255/32 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 |

### Отключение интерфейса GigabitEthernet0/0/0 на маршрутизаторе R1

|  |
| --- |
| [R1]interface GigabitEthernet0/0/0  [R1-GigabitEthernet0/0/0]shutdown  Sep 7 2024 19:06:12-08:00 R1 %%01IFPDT/4/IF\_STATE(l)[0]:Interface GigabitEthern  et0/0/0 has turned into DOWN state. |

### Таблица маршрутизации R1 (после выключения g0/0/0)

|  |
| --- |
| [R1]display ip routing-table  Route Flags: R - relay, D - download to fib  ------------------------------------------------------------------------------  Routing Tables: Public  Destinations : 10 Routes : 10  Destination/Mask Proto Pre Cost Flags NextHop Interface  10.0.1.1/32 Direct 0 0 D 127.0.0.1 LoopBack0  10.0.1.2/32 Static 100 0 RD 10.0.13.3 GigabitEthernet  0/0/1  10.0.1.3/32 Static 60 0 RD 10.0.13.3 GigabitEthernet  0/0/1  10.0.13.0/24 Direct 0 0 D 10.0.13.1 GigabitEthernet  0/0/1  10.0.13.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/1  10.0.13.255/32 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 |

### Трассировка маршрута, по которому передаются пакеты с данными

|  |
| --- |
| [R1]tracert -a 10.0.1.1 10.0.1.2  traceroute to 10.0.1.2(10.0.1.2), max hops: 30 ,packet length: 40,press CTRL\_C  to break  1 10.0.13.3 40 ms 20 ms 20 ms  2 10.0.23.2 40 ms 40 ms 10 ms |

## Настройка маршрутов по умолчанию для установления связи между интерфейсом LoopBack0 маршрутизатора R1 и LoopBack0 R2.

### Включение интерфейсов и удаление настроенных маршрутов

[R1]interface GigabitEthernet0/0/0

[R1-GigabitEthernet0/0/0]

[R1-GigabitEthernet0/0/0]undo shutdown

[R1-GigabitEthernet0/0/0]

Sep 7 2024 19:36:48-08:00 R1 %%01IFPDT/4/IF\_STATE(l)[0]:Interface GigabitEthern

et0/0/0 has turned into UP state.

[R1-GigabitEthernet0/0/0]

Sep 7 2024 19:36:48-08:00 R1 %%01IFNET/4/LINK\_STATE(l)[1]:The line protocol IP

on the interface GigabitEthernet0/0/0 has entered the UP state

[R1]undo ip ro 10.0.1.2 32 10.0.12.2

[R1]undo ip ro 10.0.1.2 32 10.0.13.3

### Таблица маршрутизации R1

|  |
| --- |
| **[R1]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 GigabitEthernet  0/0/1  10.0.12.0/24 Direct 0 0 D 10.0.12.1 GigabitEthernet  0/0/0  10.0.12.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.12.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.13.0/24 Direct 0 0 D 10.0.13.1 GigabitEthernet  0/0/1  10.0.13.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/1  10.0.13.255/32 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 |

### Настройка маршрута по умолчанию на R1

[R1]ip ro 0.0.0.0 0 10.0.12.2

### Таблица маршрутизации R1

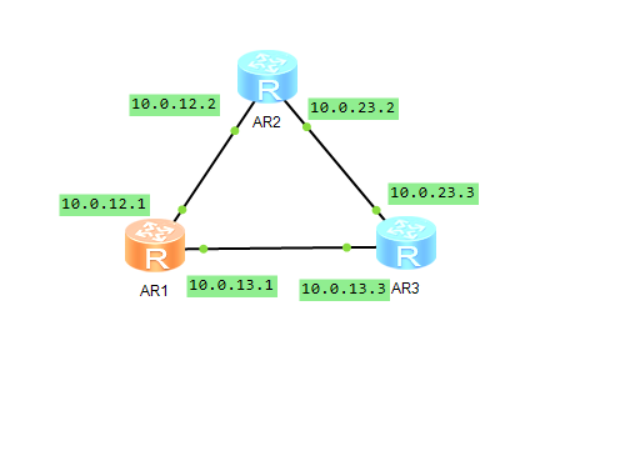
|  |
| --- |
| **[R1]display ip routing-table**  Route Flags: R - relay, D - download to fib  ------------------------------------------------------------------------------  Routing Tables: Public  Destinations : 13 Routes : 13  Destination/Mask Proto Pre Cost Flags NextHop Interface  0.0.0.0/0 Static 60 0 RD 10.0.12.2 GigabitEthernet  0/0/0  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 GigabitEthernet  0/0/1  10.0.12.0/24 Direct 0 0 D 10.0.12.1 GigabitEthernet  0/0/0  10.0.12.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.12.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.13.0/24 Direct 0 0 D 10.0.13.1 GigabitEthernet  0/0/1  10.0.13.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/1  10.0.13.255/32 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 |

### Проверка наличия связи между LoopBack0 маршрутизатора R1 и LoopBack0 маршрутизатора R2

|  |
| --- |
| **[R1]ping -a 10.0.1.1 10.0.1.2**  PING 10.0.1.2: 56 data bytes, press CTRL\_C to break  Reply from 10.0.1.2: bytes=56 Sequence=1 ttl=255 time=60 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 = 20/28/60 ms |

OSPF Routing

# Топология



# Конфигурация

## Просмотр информации об устройстве

|  |
| --- |
| **<Huawei>display version**  **Huawei Versatile Routing Platform Software**  **VRP (R) software, Version 5.130 (AR2200 V200R003C00)**  **Copyright (C) 2011-2012 HUAWEI TECH CO., LTD**  **Huawei AR2220 Router uptime is 0 week, 0 day, 0 hour, 0 minute**  **BKP 0 version information:**  **1. PCB Version : AR01BAK2A VER.NC**  **2. If Supporting PoE : No**  **3. Board Type : AR2220**  **4. MPU Slot Quantity : 1**  **5. LPU Slot Quantity : 6**  **MPU 0(Master) : uptime is 0 week, 0 day, 0 hour, 0 minute**  **MPU version information :**  **1. PCB Version : AR01SRU2A VER.A**  **2. MAB Version : 0**  **3. Board Type : AR2220**  **4. BootROM Version : 0** |

## Меняем имя и настраиваем IP адреса

|  |
| --- |
| [R1]interface GigabitEthernet0/0/1  [R1-GigabitEthernet0/0/1]ip address 10.0.13.1 24  Sep 7 2024 20:22:05-08:00 R1 %%01IFNET/4/LINK\_STATE(l)[0]:The line protocol IP  on the interface GigabitEthernet0/0/1 has entered the UP state.  [R1-GigabitEthernet0/0/1]quit  [R1]interface GigabitEthernet0/0/0  [R1-GigabitEthernet0/0/0]ip address 10.0.12.1 24  Sep 7 2024 20:27:40-08:00 R1 %%01IFNET/4/LINK\_STATE(l)[1]:The line protocol IP  on the interface GigabitEthernet0/0/0 has entered the UP state.  [R1-GigabitEthernet0/0/0]quit  [Huawei]sysname AR3  [AR3]interface GigabitEthernet 0/0/0  [AR3-GigabitEthernet0/0/0]ip address 10.0.13.3 24  Sep 7 2024 20:31:07-08:00 AR3 %%01IFNET/4/LINK\_STATE(l)[0]:The line protocol IP  on the interface GigabitEthernet0/0/0 has entered the UP state.  [AR3-GigabitEthernet0/0/0]quit  [AR3]interface GigabitEthernet 0/0/1  [AR3-GigabitEthernet0/0/1]ip address 10.0.23.3 24  Sep 7 2024 20:31:27-08:00 AR3 %%01IFNET/4/LINK\_STATE(l)[1]:The line protocol IP  on the interface GigabitEthernet0/0/1 has entered the UP state.  [AR3-GigabitEthernet0/0/1]quit  <Huawei>system-view  Enter system view, return user view with Ctrl+Z.  [Huawei]sysname AR2  [AR2]interface GigabitEthernet 0/0/0  [AR2-GigabitEthernet0/0/0]ip address 10.0.12.2 24  Sep 7 2024 20:32:53-08:00 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 GigabitEthernet 0/0/1  [AR2-GigabitEthernet0/0/1]ip address 10.0.23.2 24  Sep 7 2024 20:33:21-08:00 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]  [R1]interface LoopBack0  [R1-LoopBack0]ip address 10.0.1.1 32  [R2]interface LoopBack0  [R2-LoopBack0]ip address 10.0.1.2 32  [R3]interface LoopBack0  [R3-LoopBack0]ip address 10.0.1.3 32 |

## Включаем OSPF

|  |
| --- |
| [R1]ospf 1  [R1-ospf-1]area 0  [R1-ospf-1-area-0.0.0.0]network 10.0.12.1 0.0.0.255  [R1-ospf-1-area-0.0.0.0]network 10.0.13.1 0.0.0.255  [R1-ospf-1-area-0.0.0.0]network 10.0.1.1 0.0.0.0  [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]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 |

### статус

|  |
| --- |
| <R1>display ospf peer  OSPF Process 1 with Router ID 10.0.13.1  Neighbors  Area 0.0.0.0 interface 10.0.13.1(GigabitEthernet0/0/1)'s neighbors  Router ID: 10.0.13.3 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 32 sec  Retrans timer interval: 5  Neighbor is up for 00:00:33  Authentication Sequence: [ 0 ]  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 Slave Priority: 1  DR: 10.0.12.1 BDR: 10.0.12.2 MTU: 0  Dead timer due in 36 sec  Retrans timer interval: 5  Neighbor is up for 00:07:50  Authentication Sequence: [ 0 ]  <R1>display ip routing-table protocol ospf  Route Flags: R - relay, D - download to fib  ------------------------------------------------------------------------------  Public routing table : OSPF  Destinations : 3 Routes : 4  OSPF routing table status : <Active>  Destinations : 3 Routes : 4  Destination/Mask Proto Pre Cost Flags NextHop Interface  10.0.1.2/32 OSPF 10 1 D 10.0.12.2 GigabitEthernet  0/0/0  10.0.1.3/32 OSPF 10 1 D 10.0.13.3 GigabitEthernet  0/0/1  10.0.23.0/24 OSPF 10 2 D 10.0.12.2 GigabitEthernet  0/0/0  OSPF 10 2 D 10.0.13.3 GigabitEthernet  0/0/1  OSPF routing table status : <Inactive>  Destinations : 0 Routes : 0 |

### Настраиваем конфигурацию на R1

|  |
| --- |
| [R1]interface GigabitEthernet0/0/1  [R1-GigabitEthernet0/0/1]ospf authentication-mode md5 1 cipher HCIA-Datacom  [R1-GigabitEthernet0/0/1]quit  [R1]interface GigabitEthernet0/0/0  [R1-GigabitEthernet0/0/0]ospf authentication-mode md5 1 cipher HCIA-Datacom  [R1-GigabitEthernet0/0/0]display this  [V200R003C00]  #  interface GigabitEthernet0/0/0  ip address 10.0.12.1 255.255.255.0  ospf authentication-mode md5 1 cipher %$%$|N{)>,.nO@m;xW!r$(T:5cw1%$%$  #  Return  [R1]display ospf peer brief  OSPF Process 1 with Router ID 10.0.13.1  Peer Statistic Information  ----------------------------------------------------------------------------  Area Id Interface Neighbor id State  ---------------------------------------------------------------------------- |

## Настраиваем аутентификацию на других роутерах

|  |
| --- |
| [R2]interface GigabitEthernet0/0/1  [R2-GigabitEthernet0/0/1]ospf authentication-mode md5 1 cipher HCIA-Datacom  [R2-GigabitEthernet0/0/1]quit  [R2]interface GigabitEthernet0/0/0  [R2-GigabitEthernet0/0/0]ospf authentication-mode md5 1 cipher HCIA-Datacom  [AR2-GigabitEthernet0/0/1]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 10.0.13.1 Full  ----------------------------------------------------------------------------  [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]display ospf peer brief  OSPF Process 1 with Router ID 10.0.13.3  Peer Statistic Information  ----------------------------------------------------------------------------  Area Id Interface Neighbor id State  0.0.0.0 GigabitEthernet0/0/0 10.0.13.1 Full  0.0.0.0 GigabitEthernet0/0/1 10.0.12.2 Full  ---------------------------------------------------------------------------- |

# Маршрут по умолчанию в R1

|  |
| --- |
| [R1]  [R1]ospf  [R1-ospf-1]default-route-advertise always  [R1-ospf-1]  [AR2-GigabitEthernet0/0/1]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 GigabitEthernet  0/0/0  10.0.1.1/32 OSPF 10 1 D 10.0.12.1 GigabitEthernet  0/0/0  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 GigabitEthernet  0/0/1  10.0.12.0/24 Direct 0 0 D 10.0.12.2 GigabitEthernet  0/0/0  10.0.12.2/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.12.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.13.0/24 OSPF 10 2 D 10.0.12.1 GigabitEthernet  0/0/0  OSPF 10 2 D 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  [AR3-ospf-1-area-0.0.0.0]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 GigabitEthernet  0/0/0  10.0.1.1/32 OSPF 10 1 D 10.0.13.1 GigabitEthernet  0/0/0  10.0.1.2/32 OSPF 10 1 D 10.0.23.2 GigabitEthernet  0/0/1  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 GigabitEthernet  0/0/1  OSPF 10 2 D 10.0.13.1 GigabitEthernet  0/0/0  10.0.13.0/24 Direct 0 0 D 10.0.13.3 GigabitEthernet  0/0/0  10.0.13.3/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.13.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.23.0/24 Direct 0 0 D 10.0.23.3 GigabitEthernet  0/0/1  10.0.23.3/32 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 |

# Меняем веса так, чтобы LoobBack0 R1 ходил в R2 через R3

|  |
| --- |
| [R1]interface GigabitEthernet0/0/0  [R1-GigabitEthernet0/0/0]ospf cost 10  [R1-GigabitEthernet0/0/0]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 GigabitEthernet  0/0/1  10.0.1.3/32 OSPF 10 1 D 10.0.13.3 GigabitEthernet  0/0/1  10.0.12.0/24 Direct 0 0 D 10.0.12.1 GigabitEthernet  0/0/0  10.0.12.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.12.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/0  10.0.13.0/24 Direct 0 0 D 10.0.13.1 GigabitEthernet  0/0/1  10.0.13.1/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/1  10.0.13.255/32 Direct 0 0 D 127.0.0.1 GigabitEthernet  0/0/1  10.0.23.0/24 OSPF 10 2 D 10.0.13.3 GigabitEthernet  0/0/1  127.0.0.0/8 Direct 0 0 D 127.0.0.1 InLoopBack0  127.0.0.1/32 Direct 0 0 D 127.0.0.1 InLoopBack0  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  [R1]tracert -a 10.0.1.1 10.0.1.2  traceroute to 10.0.1.2(10.0.1.2), max hops: 30 ,packet length: 40,press CTRL\_C  to break  1 10.0.13.3 30 ms 10 ms 10 ms  2 10.0.23.2 40 ms 30 ms 10 ms |

# Вывод

В ходе выполнения лабораторной работы мы познакомились со средой eNSP и её настройкой, создали первую топологию, назначили адреса и статические маршруты и настроили OSPF.