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Кафедра «Прикладная математика и фундаментальная информатика»

**Лабораторная работа №5**  
по дисциплине «Компьютерные сети»

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## Решение

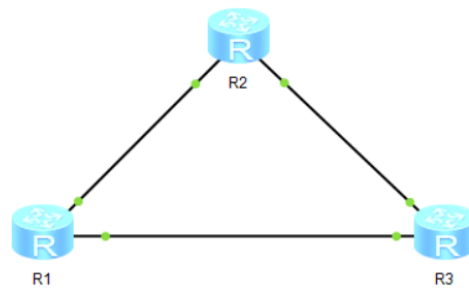


Рис. 1: Схема роутеров

```
<Huawei>
<Huawei>sys
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname R1
[R1]int
[R1]interface Gi
[R1]interface GigabitEthernet 0/0/0
[R1-GigabitEthernet0/0/0]ip add
[R1-GigabitEthernet0/0/0]ip address 10
Dec 28 2022 19:19:01-08:00 R1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 1, the ch
ange loop count is 0, and the maximum number of records is 4095..0.13.1 24
[R1-GigabitEthernet0/0/0]
Dec 28 2022 19:19:06-08:00 R1 %01IFNET/4/LINK_STATE(1)[0]:The line protocol IP
on the interface GigabitEthernet0/0/0 has entered the UP state.quit
[R1]
Dec 28 2022 19:19:11-08:00 R1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 2, the ch
ange loop count is 0, and the maximum number of records is 4095.int
[R1]interface Gig
[R1]interface GigabitEthernet 0/0/2
[R1-GigabitEthernet0/0/2]ip add
[R1-GigabitEthernet0/0/2]ip address 10.0.12.1 24
[R1-GigabitEthernet0/0/2]
Dec 28 2022 19:19:22-08:00 R1 %01IFNET/4/LINK_STATE(1)[1]:The line protocol IP
on the interface GigabitEthernet0/0/2 has entered the UP state.quit
[R1]
Dec 28 2022 19:19:31-08:00 R1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 3, the ch
ange loop count is 0, and the maximum number of records is 4095.
```

Рис. 2: Установка IP-адреса на роутер R1

```

<Huawei>
<Huawei>sys
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname R2
[R2]int
[R2]interface Gig
[R2]interface GigabitEthernet
Dec 28 2022 19:22:31-08:00 R2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 1, the ch
ange loop count is 0, and the maximum number of records is 4095.0/0/0
[R2-GigabitEthernet0/0/0]ip add
[R2-GigabitEthernet0/0/0]ip address 10.0.12.2 24
[R2-GigabitEthernet0/0/0]
Dec 28 2022 19:22:43-08:00 R2 %01IFNET/4/LINK_STATE(1)[0]:The line protocol IP
on the interface GigabitEthernet0/0/0 has entered the UP state.quit
[R2]int
[R2]interface G
Dec 28 2022 19:22:51-08:00 R2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 2, the ch
ange loop count is 0, and the maximum number of records is 4095.ig
[R2]interface GigabitEthernet 0/0/1
[R2-GigabitEthernet0/0/1]ip add
[R2-GigabitEthernet0/0/1]ip address 10.0.23.2 24
[R2-GigabitEthernet0/0/1]
Dec 28 2022 19:23:01-08:00 R2 %01IFNET/4/LINK_STATE(1)[1]:The line protocol IP
on the interface GigabitEthernet0/0/1 has entered the UP state.
Dec 28 2022 19:23:01-08:00 R2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 3, the ch
ange loop count is 0, and the maximum number of records is 4095.quit
[R2]

```

Рис. 3: Установка IP-адреса на роутер R2

```

<Huawei>sys
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]sysname R3
[R3]int
[R3]interface Gi
[R3]interface GigabitEthernet 0/0
Dec 28 2022 19:23:42-08:00 R3 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 1, the ch
ange loop count is 0, and the maximum number of records is 4095./1
[R3-GigabitEthernet0/0/1]ip add
[R3-GigabitEthernet0/0/1]ip address 10.0.13.3 24
[R3-GigabitEthernet0/0/1]
Dec 28 2022 19:23:53-08:00 R3 %01IFNET/4/LINK_STATE(1)[0]:The line protocol IP
on the interface GigabitEthernet0/0/1 has entered the UP state.quit
[R3]int
[R3]interface Gi
[R3]interface GigabitEthernet 0/0/2
[R3-GigabitEthernet0/0/2]ip add
Dec 28 2022 19:24:02-08:00 R3 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 2, the ch
ange loop count is 0, and the maximum number of records is 4095.
[R3-GigabitEthernet0/0/2]ip address 10.0.23.3 24
[R3-GigabitEthernet0/0/2]
Dec 28 2022 19:24:06-08:00 R3 %01IFNET/4/LINK_STATE(1)[1]:The line protocol IP
on the interface GigabitEthernet0/0/2 has entered the UP state.quit
[R3]

```

Рис. 4: Установка IP-адреса на роутер R3

```
[R1]interface Loo
[R1]interface LoopBack 0
[R1-LoopBack0]ip add
[R1-LoopBack0]ip address
Dec 28 2022 19:24:41-08:00 R1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 4, the ch
ange loop count is 0, and the maximum number of records is 4095.10.0.1.1 32
[R1-LoopBack0]quit
[R1]
```

Рис. 5: Установка loopback на роутер R1

```
[R2]int
[R2]interface Loo
[R2]interface LoopBack 0
[R2-LoopBack0]ip ad
[R2-LoopBack0]ip address 10.0.
Dec 28 2022 19:25:01-08:00 R2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 4, the ch
ange loop count is 0, and the maximum number of records is 4095.
[R2-LoopBack0]ip address 10.0.1.2 32
[R2-LoopBack0]
```

Рис. 6: Установка loopback на роутер R2

```
[R3]
Dec 28 2022 19:24:12-08:00 R3 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 3, the ch
ange loop count is 0, and the maximum number of records is 4095.int
[R3]interface Loo
[R3]interface LoopBack 0
[R3-LoopBack0]ip add
[R3-LoopBack0]ip address 10.0.1.3 32
[R3-LoopBack0]
```

Рис. 7: Установка loopback на роутер R3

```
[R1]ip rou
[R1]ip route-s
[R1]ip route-static 10.0.1.2 32 10.0.12.2
[R1]ip route-static 10.0.1.2 32 10.0.
Dec 28 2022 19:27:12-08:00 R1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 6, the ch
ange loop count is 0, and the maximum number of records is 4095.
[R1]ip route-static 10.0.1.3 32 10.0.13.3
[R1]
```

Activate Windows

Рис. 8: Установка статического IP-адреса на роутер R1

```
[R2]ip route-s
[R2]ip route-static 10.0.1.1 10.0.12.1 ^
Error:Incomplete command found at '^' position.
[R2]ip route-static 10.0.1.1 32 10.0.12.1
[R2]ip route-static 10.0.1.1 3
Dec 28 2022 19:28:32-08:00 R2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 6, the ch
ange loop count is 0, and the maximum number of records is 409
[R2]ip route-static 10.0.1.3 32 10.0.23.3
[R2]
```

Activate Windows

Рис. 9: Установка статического IP-адреса на роутер R2

```
[R3]ip route-s
[R3]ip route-static 10.0.1.1 32 10.0.13.1
[R3]ip route-static 10.0.1.1 32 10.0.23.2
Dec 28 2022 19:29:12-08:00 R3 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 6, the ch
ange loop count is 0, and the maximum number of records is 4095
[R3]ip route-static 10.0.1.2 32 10.0.23.2
[R3]
```

Рис. 10: Установка статического IP-адреса на роутер R3

```
[R1]display ip routing-table
Route Flags: R - relay, D - download to fib
-----
Routing Tables: Public
      Destinations : 9          Routes : 9

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
0/0/2
10.0.1.3/32         Static   60    0             RD 10.0.13.3         GigabitEthernet
0/0/0
10.0.12.0/24        Direct   0     0             D  10.0.12.1         GigabitEthernet
0/0/2
10.0.12.1/32        Direct   0     0             D  127.0.0.1         GigabitEthernet
0/0/2
10.0.13.0/24        Direct   0     0             D  10.0.13.1         GigabitEthernet
0/0/0
10.0.13.1/32        Direct   0     0             D  127.0.0.1         GigabitEthernet
0/0/0
127.0.0.0/8         Direct   0     0             D  127.0.0.1         InLoopBack0
127.0.0.1/32        Direct   0     0             D  127.0.0.1         InLoopBack0
```

Рис. 11: Таблица IP-адресов на роутере R1

```
[R1]ospf 1
[R1-ospf-1]re
Dec 28 2022 19:31:52-08:00 R1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 8, the ch
ange loop count is 0, and the maximum number of records is 4095
[R1-ospf-1]area 0
[R1-ospf-1-area-0.0.0.0]network 10.0.12.1 0.0.0.
Dec 28 2022 19:32:02-08:00 R1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 9, the ch
ange loop count is 0, and the maximum number of records is 4095
[R1-ospf-1-area-0.0.0.0]network 10.0.12.1 0.0.0.256
^
Error: Wrong parameter found at '^' position.
[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]
Dec 28 2022 19:32:32-08:00 R1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 11, the c
hange loop count is 0, and the maximum number of records is 4095
[R1-ospf-1-area-0.0.0.0]network 10.0.1.1 0.0.0.255
[R1-ospf-1-area-0.0.0.0]
```

Рис. 12: Установка OSPF на роутер R1

```
[R2]ospf
[R2-ospf-1]area
Dec 28 2022 19:33:22-08:00 R2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 8, the ch
ange loop count is 0, and the maximum number of records is 4095. 0
[R2-ospf-1-area-0.0.0.0]network 10.0.12.2 0.0.0.0
[R2-ospf-1-area-0.0.0.0]network 10.0.12.2 0.0.0.0
Dec 28 2022 19:33:32-08:00 R2 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 10, the c
hange loop count is 0, and the maximum number of records is
[R2-ospf-1-area-0.0.0.0]network 10.0.23.2 0.0.0.0
[R2-ospf-1-area-0.0.0.0]network 10.0.1.2 0.0.0.0
[R2-ospf-1-area-0.0.0.0]
```

Рис. 13: Установка OSPF на роутер R2

```
[R3]ospf
[R3-ospf-1]area 0
[R3-ospf-1-area-0.0.0.0]
Dec 28 2022 19:34:22-08:00 R3 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 9, the ch
ange loop count is 0, and the maximum number of records is 4095.network 10.0.13.
3
[R3-ospf-1-area-0.0.0.0]network 10.0.13.3 0.0.0.0
[R3-ospf-1-area-0.0.0.0]network 10.0.23.3 0.0.0.0
[R3-ospf-1-area-0.0.0.0]network 10.0.1
```

Рис. 14: Установка OSPF на роутер R3

```
[R1]display ospf peer

OSPF Process 1 with Router ID 10.0.13.1
[R1]int
[R1]interface Gig
[R1]interface GigabitEthernet 0/0/0
[R1-GigabitEthernet0/0/0]os
[R1-GigabitEthernet0/0/0]ospf au
[R1-GigabitEthernet0/0/0]ospf authentication-mode md
[R1-GigabitEthernet0/0/0]ospf authentication-mode md5 1 cip
[R1-GigabitEthernet0/0/0]ospf authentication-mode md5 1 cipher HCIA-Datacom
[R1-GigabitEthernet0/0/0]quit
[R1]
Dec 28 2022 19:36:12-08:00 R1 DS/4/DATASYNC_CFGCHANGE:OID 1.3.6.1.4.1.2011.5.25.
191.3.1 configurations have been changed. The current change number is 13, the c
hange loop count is 0, and the maximum number of records is 4095.os
[R1]int
[R1]interface Gig
[R1]interface GigabitEthernet 0/0/2
[R1-GigabitEthernet0/0/2]os
[R1-GigabitEthernet0/0/2]ospf aut
[R1-GigabitEthernet0/0/2]ospf authentication-mode md
[R1-GigabitEthernet0/0/2]ospf authentication-mode md5 1 cu
[R1-GigabitEthernet0/0/2]ospf authentication-mode md5 1 ci
[R1-GigabitEthernet0/0/2]ospf authentication-mode md5 1 cipher HCIA-Datacom
[R1-GigabitEthernet0/0/2]
```

Рис. 15: Установка аутентификации OSPF

## Вопросы

Какой маршрут будет использоваться на шаге 6 маршрутизатором R2 для возврата пакетов ICMP на маршрутизатор R1? - через 10.0.13.3 и 10.0.23.2, так как минимальная стоимость.