| 课程名 | 路由技术原理与应用 | 任课教师 | 程琨 |
|---|---|---|---|
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| 成绩 | | | |

# 题目 1：

- RIP 协议：首先路由器**学习自己的直连路由**，并将其**更新到路由表**。当**更新周期**到时，路由器向相邻的其它路由器发送路由表；当下一个更新周期又到来时路由表又可以将自己学习到的路由表又转发给邻居。这样不断的学习更新，就可以达到一致的状态。

- OSPF 协议：采用链路状态协议算法，每个路由器维护一个相同的链路状态数据库，保存整个自治系统的拓扑结构。 一旦每个路由器有了完整的链路状态数据库，该路由器就可以自己为根，构造最短路径树，然后再根据最短路径构造路由表。

- BGP 协议：BGP 使用 TCP 作为其承载协议来保证可靠性，封装建立邻居关系，端口号为179，而 TCP 采用单播建立连接。此外，单播建立连接也使 BGP 只能手动指定邻居。

- 三者不同：
  1. RIP：采用距离向量路由选择算法，较简单。在路径较多时收敛速度慢，广播路由信息时占用的带宽资源较多,适用于网络拓扑结构相对简单且数据链路故障率极低的小型网络中，在大型网络中，一般不使用 RIP。
  2. OSPF：采用链路状态路由选择技术，开放最短路径优先算法。适用于规模庞大、环境复杂的互联网。能够在自己的链路状态数据库内表示整个网络，极大地减少了收敛时间，并且支持大型异构网络的互联。提供了一个异构网络间通过同一种协议交换网络信息的途径，并且不容易出现错误的路由信息。
  3. BGP：是一种外部路由协议，与 OSPF、RIP 不同，其着眼点不在于发现和计算路由，而在于控制路由的传播和选择最好路由。使用 TCP 作为其传输层协议，提高了协议的可靠性。端口号 179。BGP 更新时只发送增量路由，减少了 BGP 传播路由占用的带宽。

# 题目 2：（包含网络拓扑图，接口 IP 地址规划，配置命令截图，验证结果截图等。注意设备名前面加学号，截图包含学号有效。）

## 一、在各设备上配置对应名称并进行 IP 规划

### 1.1 IP 规划

| 序号 | 设备名 | 接口 | 地址 | 连接 |
|------|--------|--------|-------------|------|
| 1 | R-1 | GE 0/0/0 | 12.1.1.2/30 | R-2 |
| 2 | R-1 | GE 0/0/1 | 13.1.1.1/30 | R-3 |
| 3 | R-1 | loopback0 | 1.1.1.1/32 | |
| 4 | R-2 | GE 0/0/0 | 12.1.1.1/30 | R-1 |
| 5 | R-2 | GE 0/0/2 | 23.1.1.1/30 | R-3 |
| 6 | R-2 | loopback0 | 2.2.2.2/32 | |
| 7 | R-3 | GE 0/0/1 | 13.1.1.1/30 | R-1 |
| 8 | R-3 | GE 0/0/2 | 23.1.1.2/30 | R-2 |
| 9 | R-3 | GE 0/0/3 | 35.1.1.1/30 | R-4 |
| 10 | R-3 | loopback0 | 3.3.3.3/32 | |
| 11 | R-4 | GE 0/0/1 | 35.1.1.2/30 | R-3 |
| 12 | R-4 | loopback0 | 5.5.5.5/32 | |
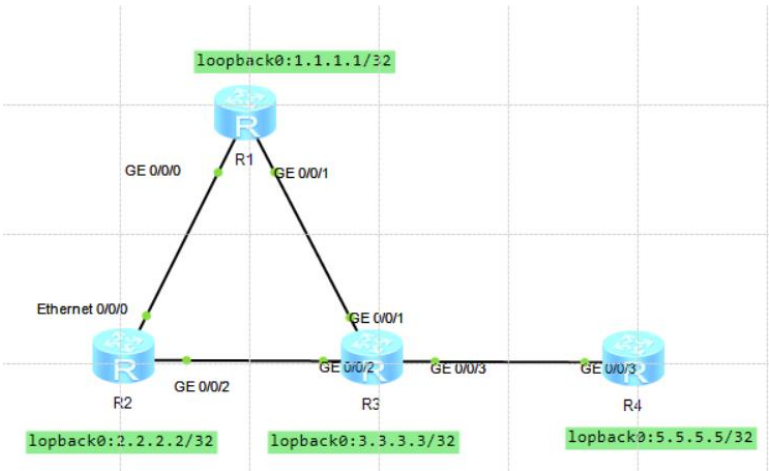
## 1.2 配置设备

### 1.2.1 配置 R-1

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]undo info-center enable
Info: Information center is disabled.
[Huawei]sysname 202010420211-R-1
[202010420211-R-1]
[202010420211-R-1]interface GigabitEthernet 0/0/0
[202010420211-R-1-GigabitEthernet0/0/0]ip address 12.1.1.2 30
[202010420211-R-1-GigabitEthernet0/0/0]quit
[202010420211-R-1]interface GigabitEthernet 0/0/1
[202010420211-R-1-GigabitEthernet0/0/1]ip address 13.1.1.1 30
[202010420211-R-1-GigabitEthernet0/0/1]quit
[202010420211-R-1]interface loopback0
[202010420211-R-1-LoopBack0]ip address 1.1.1.1 32
[202010420211-R-1-LoopBack0]quit
[202010420211-R-1]
[202010420211-R-1]
[202010420211-R-1]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

       13.1.1.0/30   Direct  0    0           D   13.1.1.1       GigabitEthernet
0/0/1
       13.1.1.1/32   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

[202010420211-R-1]
[202010420211-R-1]quit
<202010420211-R-1>save
The current configuration will be written to the device.
Are you sure to continue?[Y/N]y
```

### 1.2.2 配置 R-2

```
[Huawei]sysname 202010420211-R-2
[202010420211-R-2]
[202010420211-R-2]interface GigabitEthernet 0/0/0
[202010420211-R-2-GigabitEthernet0/0/0]ip address 12.1.1.1 30
[202010420211-R-2-GigabitEthernet0/0/0]quit
[202010420211-R-2]interface GigabitEthernet 0/0/2
[202010420211-R-2-GigabitEthernet0/0/2]ip address 23.1.1.1 30
[202010420211-R-2-GigabitEthernet0/0/2]quit
[202010420211-R-2]interface loopback0
[202010420211-R-2-LoopBack0]ip address 2.2.2.2 32
[202010420211-R-2-LoopBack0]quit
[202010420211-R-2]
[202010420211-R-2]
[202010420211-R-2]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

        2.2.2.2/32   Direct  0    0           D   127.0.0.1      LoopBack0
       23.1.1.0/30   Direct  0    0           D   23.1.1.1       GigabitEthernet
0/0/2
       23.1.1.1/32   Direct  0    0           D   127.0.0.1      GigabitEthernet
0/0/2
      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

[202010420211-R-2]
```

## 1.2.3 配置 R-3

```
Enter system view, return user view with Ctrl+Z.
[Huawei]undo info-center enable
Info: Information center is disabled.
[Huawei]sysname 202010420211-R-3
[202010420211-R-3]
[202010420211-R-3]interface GigabitEthernet 0/0/1
[202010420211-R-3-GigabitEthernet0/0/1]ip address 13.1.1.1 30
[202010420211-R-3-GigabitEthernet0/0/1]quit
[202010420211-R-3]interface GigabitEthernet 0/0/2
[202010420211-R-3-GigabitEthernet0/0/2]ip address 23.1.1.2 30
[202010420211-R-3-GigabitEthernet0/0/2]quit
[202010420211-R-3]interface GigabitEthernet 0/0/3
[202010420211-R-3-GigabitEthernet0/0/3]ip address 35.1.1.1 30
[202010420211-R-3-GigabitEthernet0/0/3]quit
[202010420211-R-3]interface loopback0
[202010420211-R-3-LoopBack0]ip address 3.3.3.3 32
[202010420211-R-3-LoopBack0]quit
[202010420211-R-3]
[202010420211-R-3]
[202010420211-R-3]display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 6        Routes : 6

Destination/Mask    Proto   Pre  Cost      Flags NextHop        Interface

        3.3.3.3/32  Direct  0    0         D     127.0.0.1      LoopBack0
       23.1.1.0/30  Direct  0    0         D     23.1.1.2       GigabitEthernet
0/0/2
       23.1.1.2/32  Direct  0    0         D     127.0.0.1      GigabitEthernet
0/0/2
       35.1.1.0/30  Direct  0    0         D     35.1.1.1       GigabitEthernet
0/0/3
       35.1.1.1/32  Direct  0    0         D     127.0.0.1      GigabitEthernet
0/0/3
      127.0.0.0/8   Direct  0    0         D     127.0.0.1      InLoopBack0
      127.0.0.1/32  Direct  0    0         D     127.0.0.1      InLoopBack0
```

## 1.2.4 配置 R-4

```
<Huawei>system-view
Enter system view, return user view with Ctrl+Z.
[Huawei]undo info-center enable
Info: Information center is disabled.
[Huawei]sysname 202010420211-R-4
[202010420211-R-4]
[202010420211-R-4]interface GigabitEthernet 0/0/3
[202010420211-R-4-GigabitEthernet0/0/3]ip address 35.1.1.2 30
[202010420211-R-4-GigabitEthernet0/0/3]quit
[202010420211-R-4]
[202010420211-R-4]interface loopback0
[202010420211-R-4-LoopBack0]ip address 5.5.5.5 32
[202010420211-R-4-LoopBack0]quit
[202010420211-R-4]
[202010420211-R-4]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

       35.1.1.0/30  Direct  0    0         D     35.1.1.2       GigabitEthernet
0/0/3
       35.1.1.2/32  Direct  0    0         D     127.0.0.1      GigabitEthernet
0/0/3
      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
```

## 二、在 R-1 R-2 R-3 上配置 OSPF

### 2.1 配置设备 R-1

```
<202010420211-R-1>system-view
Enter system view, return user view with Ctrl+Z.
[202010420211-R-1]ospf 1
[202010420211-R-1-ospf-1]area 0
[202010420211-R-1-ospf-1-area-0.0.0.0]network 12.1.1.2 0.0.0.3
[202010420211-R-1-ospf-1-area-0.0.0.0]network 1.1.1.1 0.0.0.0
[202010420211-R-1-ospf-1-area-0.0.0.0]quit
[202010420211-R-1-ospf-1]
[202010420211-R-1-ospf-1]area 2
[202010420211-R-1-ospf-1-area-0.0.0.2]network 13.1.1.1  0.0.0.3
[202010420211-R-1-ospf-1-area-0.0.0.2]quit
[202010420211-R-1-ospf-1]
[202010420211-R-1-ospf-1]quit
[202010420211-R-1]quit
<202010420211-R-1>save
The current configuration will be written to the device.
Are you sure to continue?[Y/N]y
Now saving the current configuration to the slot 17.
Save the configuration successfully.
<202010420211-R-1>dis
<202010420211-R-1>display ip ro
<202010420211-R-1>display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------------
Routing Tables: Public
        Destinations : 5        Routes : 5

Destination/Mask    Proto   Pre  Cost      Flags NextHop        Interface

        1.1.1.1/32  Direct  0    0         D     127.0.0.1      LoopBack0
        13.1.1.0/30 Direct  0    0         D     13.1.1.1       GigabitEthernet
0/0/1
        13.1.1.1/32 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
```

### 2.2 配置设备 R-2

```
<202010420211-R-2>system-view
Enter system view, return user view with Ctrl+Z.
[202010420211-R-2]ospf 1
[202010420211-R-2-ospf-1]area 0
[202010420211-R-2-ospf-1-area-0.0.0.0]network 12.1.1.1 0.0.0.
[202010420211-R-2-ospf-1-area-0.0.0.0]network 2.2.2.2 0.0.0.
[202010420211-R-2-ospf-1-area-0.0.0.0]quit
[202010420211-R-2-ospf-1]
[202010420211-R-2-ospf-1]area 1
[202010420211-R-2-ospf-1-area-0.0.0.1]network 23.1.1.1 0.0.0
[202010420211-R-2-ospf-1-area-0.0.0.1]quit
[202010420211-R-2-ospf-1]
[202010420211-R-2-ospf-1]quit
[202010420211-R-2]quit
<202010420211-R-2>save
The current configuration will be written to the device.
Are you sure to continue?[Y/N]y
Now saving the current configuration to the slot 17.
Save the configuration successfully.
```

### 2.3 配置设备 R-3

```
Save the configuration successfully.
<202010420211-R-3>
<202010420211-R-3>system-view
Enter system view, return user view with Ctrl+Z.
[202010420211-R-3]ospf 1
[202010420211-R-3-ospf-1]area 0
[202010420211-R-3-ospf-1-area-0.0.0.0]network 23.1.1.2 0.0.0.3
[202010420211-R-3-ospf-1-area-0.0.0.0]network 3.3.3.3 0.0.0.0
[202010420211-R-3-ospf-1-area-0.0.0.0]quit
[202010420211-R-3-ospf-1]
[202010420211-R-3-ospf-1]area 2
[202010420211-R-3-ospf-1-area-0.0.0.2]network 13.1.1.1 0.0.0.3
[202010420211-R-3-ospf-1-area-0.0.0.2]quit
[202010420211-R-3-ospf-1]
[202010420211-R-3-ospf-1]quit
[202010420211-R-3]quit
<202010420211-R-3>save
The current configuration will be written to the device.
Are you sure to continue?[Y/N]y
Now saving the current configuration to the slot 17.
Save the configuration successfully.
```

# 三、在 R-3、R-4 上配置 RIP，在 R-3 上将 RIP 引入 OSPF

## 3.1 R-3 配置 RIP 引入 OSPF

```
<202010420211-R-3>system-view
Enter system view, return user view with Ctrl+Z.
[202010420211-R-3]rip 1
[202010420211-R-3-rip-1]version 2
[202010420211-R-3-rip-1]network 35.0.0.0
[202010420211-R-3-rip-1]import-route ospf 1 cost 3
[202010420211-R-3-rip-1]quit
[202010420211-R-3]
[202010420211-R-3]quit
<202010420211-R-3>save
The current configuration will be written to the device.
Are you sure to continue?[Y/N]y
Now saving the current configuration to the slot 17.
Save the configuration successfully.
<202010420211-R-3>
```

```
[202010420211-R-3-rip-1]display this
#
rip 1
 version 2
 network 35.0.0.0
 import-route ospf 1 cost 3
#
return
```

## 3.2 R-4 配置 RIP

```
<202010420211-R-4>system-view
Enter system view, return user view with Ctrl+Z.
[202010420211-R-4]rip 1
[202010420211-R-4-rip-1]version 2
[202010420211-R-4-rip-1]network 35.0.0.0
[202010420211-R-4-rip-1]quit
[202010420211-R-4]
[202010420211-R-4]quit
<202010420211-R-4>save
The current configuration will be written to the device.
Are you sure to continue?[Y/N]y
Now saving the current configuration to the slot 17.
Save the configuration successfully.
<202010420211-R-4>
<202010420211-R-4>
<202010420211-R-4>display ip routing-table
Route Flags: R - relay, D - download to fib
------------------------------------------------------------------------
Routing Tables: Public
         Destinations : 7        Routes : 7

Destination/Mask    Proto   Pre  Cost      Flags NextHop         Interface

        3.3.3.3/32  RIP     100  4           D   35.1.1.1        GigabitEthernet
0/0/3
        5.5.5.5/32  Direct  0    0           D   127.0.0.1       LoopBack0
        23.1.1.0/30 RIP     100  4           D   35.1.1.1        GigabitEthernet
0/0/3
        35.1.1.0/30 Direct  0    0           D   35.1.1.2        GigabitEthernet
0/0/3
        35.1.1.2/32 Direct  0    0           D   127.0.0.1       GigabitEthernet
0/0/3
        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
```

### 3.3 在 R-2 上引入 R-3 的 RIP



## 四、在 R-2 上配置缺省路由，下一跳为 loopback0 并引入 OSPF 中

# 1.在各设备上配置对应名称

---

# 2.IP规划

---

### R-1

```
system-view
undo info-center enable
sysname 202010420211-R-1

interface GigabitEthernet 0/0/0
ip address 12.1.1.2 30
quit
interface GigabitEthernet 0/0/1
ip address 13.1.1.1 30
quit
interface loopback0
ip address 1.1.1.1 32
quit


display ip routing-table

quit
save
y
```

### R-2

```
system-view
undo info-center enable
sysname 202010420211-R-2

interface GigabitEthernet 0/0/0
```

```
ip address 12.1.1.1 30
quit
interface GigabitEthernet 0/0/2
ip address 23.1.1.1 30
quit
interface loopback0
ip address 2.2.2.2 32
quit



display ip routing-table


quit
save
y
```

## R-3

```
system-view
undo info-center enable
sysname 202010420211-R-3

interface GigabitEthernet 0/0/1
ip address 13.1.1.1 30
quit
interface GigabitEthernet 0/0/2
ip address 23.1.1.2 30
quit
interface GigabitEthernet 0/0/3
ip address 35.1.1.1 30
quit
interface loopback0
ip address 3.3.3.3 32
quit



display ip routing-table


quit
save
y
```

## R-4

```
system-view
undo info-center enable
sysname 202010420211-R-4

interface GigabitEthernet 0/0/3
ip address 35.1.1.2 30
quit

interface loopback0
ip address 5.5.5.5 32
quit

display ip routing-table

quit
save
y
```

# 3.在R-1 R-2 R-3 上配置OSPF

## R-1

```
system-view
ospf 1
area 0
network 12.1.1.2 0.0.0.3
network 1.1.1.1 0.0.0.0
quit

area 2
network 13.1.1.1  0.0.0.3
quit

quit
quit
save
y
```

## R-2

```
system-view
ospf 1
area 0
network 12.1.1.1 0.0.0.3
network 2.2.2.2 0.0.0.0
quit

area 1
network 23.1.1.1 0.0.0.3
quit

quit
quit
save
y
```

## R-3

```
system-view
ospf 1
area 0
network 23.1.1.2 0.0.0.3
network 3.3.3.3 0.0.0.0
quit

area 2
network 13.1.1.1 0.0.0.3
quit

quit
quit
save
y
```

# 4.在R-3、R-4上配置RIP，在R-3上将RIP引入OSPF

## R-3配置RIP GE0/0/3 引入OSPF

```
rip 1
version 2
network 35.0.0.0
import-route ospf 1 cost 3
quit

quit
save
y


display ip routing-table
```

## R-4配置RIP

```
rip 1
version 2
network 35.0.0.0
quit

quit
save
y


display ip routing-table
```

## 在R-2上引入R-3 的RIP

```
system-view
ospf 1
area 1
import-route rip 1
```

## 5.在R-2上配置缺省路由，下一跳为loopback0并引入OSPF中

```
system-view
ip route-static 0.0.0.0 0.0.0.0 1.1.1.1
ip route-static 0.0.0.0 0.0.0.0 3.3.3.3
ospf 1
area 0
network 0.0.0.0 0.0.0.0
quit
```