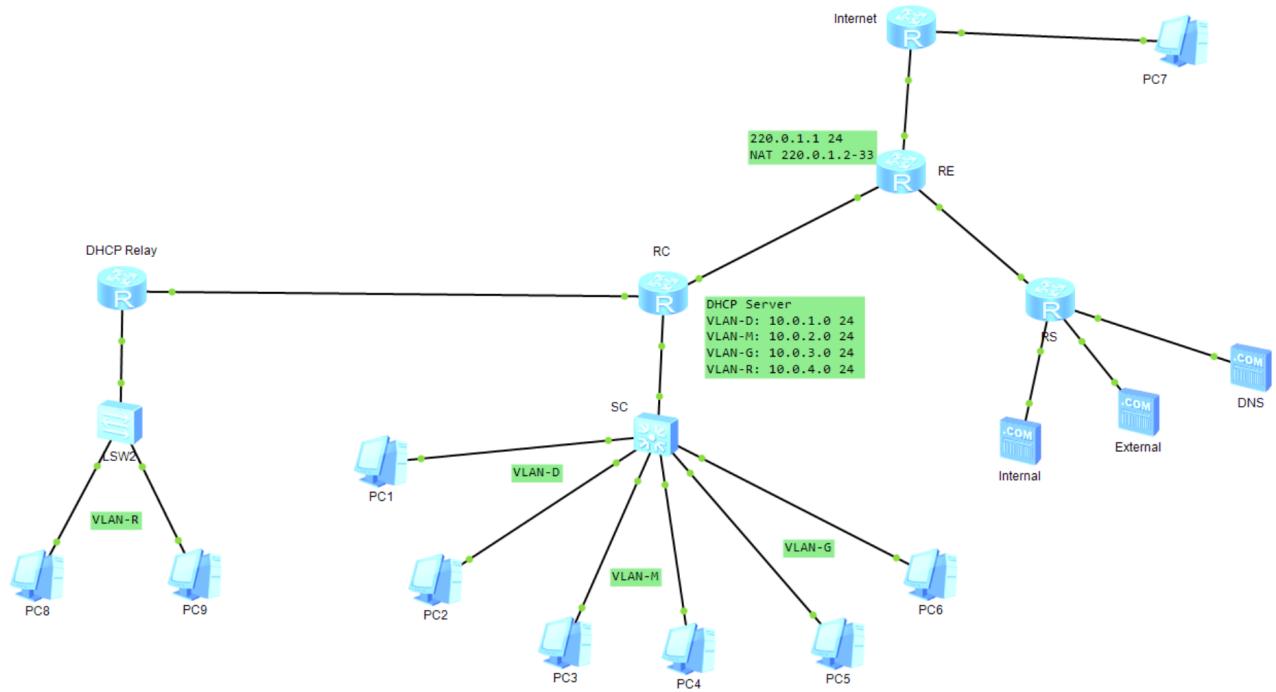


Lab Assignment 2

该企业的网络拓扑图为, 其中PC7是外网终端



Part2-1 (10pt)

Server Name / VLAN Name	Private IP / Subnet Mask	Gateway	Public IP / Subnet Mask	Static/Dynamic Mapping for NAT/NAPT
VLAN-D	10.0.1.0/24	10.0.1.254	220.0.1.4-32/24	Dynamic NAT
VLAN-M	10.0.2.0/24	10.0.2.254	220.0.1.33/24	NAPT
VLAN-G	10.0.3.0/24	10.0.3.254	220.0.1.33/24	NAPT
VLAN-R (DHCP Relay)	10.0.4.0/24	10.0.4.252	/	/
S-DNS	172.16.1.101/24	172.16.1.254	220.0.1.2/24	Static NAT
S-E	172.16.2.102/24	172.16.2.254	220.0.1.3/24	Static NAT
S-I	172.16.3.103/24	172.16.3.254	/	/

Part2-2 (50pt)

DHCP Service

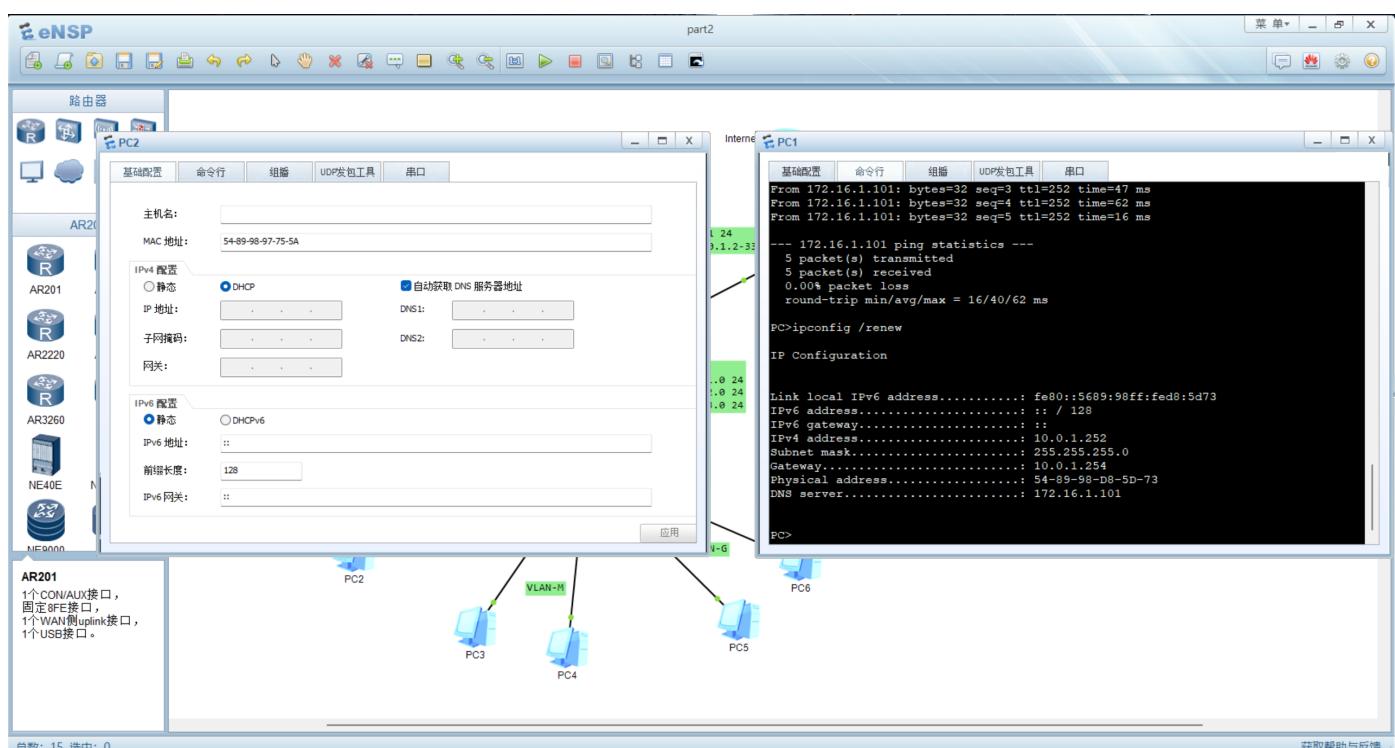
路由器**RC**作为DHCP服务器, 与交换机**SC**连接, 单臂路由聚合连接, 配置如下

```

[Huawei]int gi0/0/0.1
[Huawei-GigabitEthernet0/0/0.1]dis this
[V200R003C00]
#
interface GigabitEthernet0/0/0.1
dot1q termination vid 12
ip address 10.0.1.254 255.255.255.0
arp broadcast enable
dhcp select global
#
return
[Huawei-GigabitEthernet0/0/0.1]int gi0/0/0.2
[Huawei-GigabitEthernet0/0/0.2]dis this
[V200R003C00]
#
interface GigabitEthernet0/0/0.2
dot1q termination vid 34
ip address 10.0.2.254 255.255.255.0
arp broadcast enable
dhcp select global
#
return
[Huawei-GigabitEthernet0/0/0.2]int gi0/0/0.3
[Huawei-GigabitEthernet0/0/0.3]dis this
[V200R003C00]
#
interface GigabitEthernet0/0/0.3
dot1q termination vid 56
ip address 10.0.3.254 255.255.255.0
arp broadcast enable
dhcp select global
#
return
[Huawei-GigabitEthernet0/0/0.3]

```

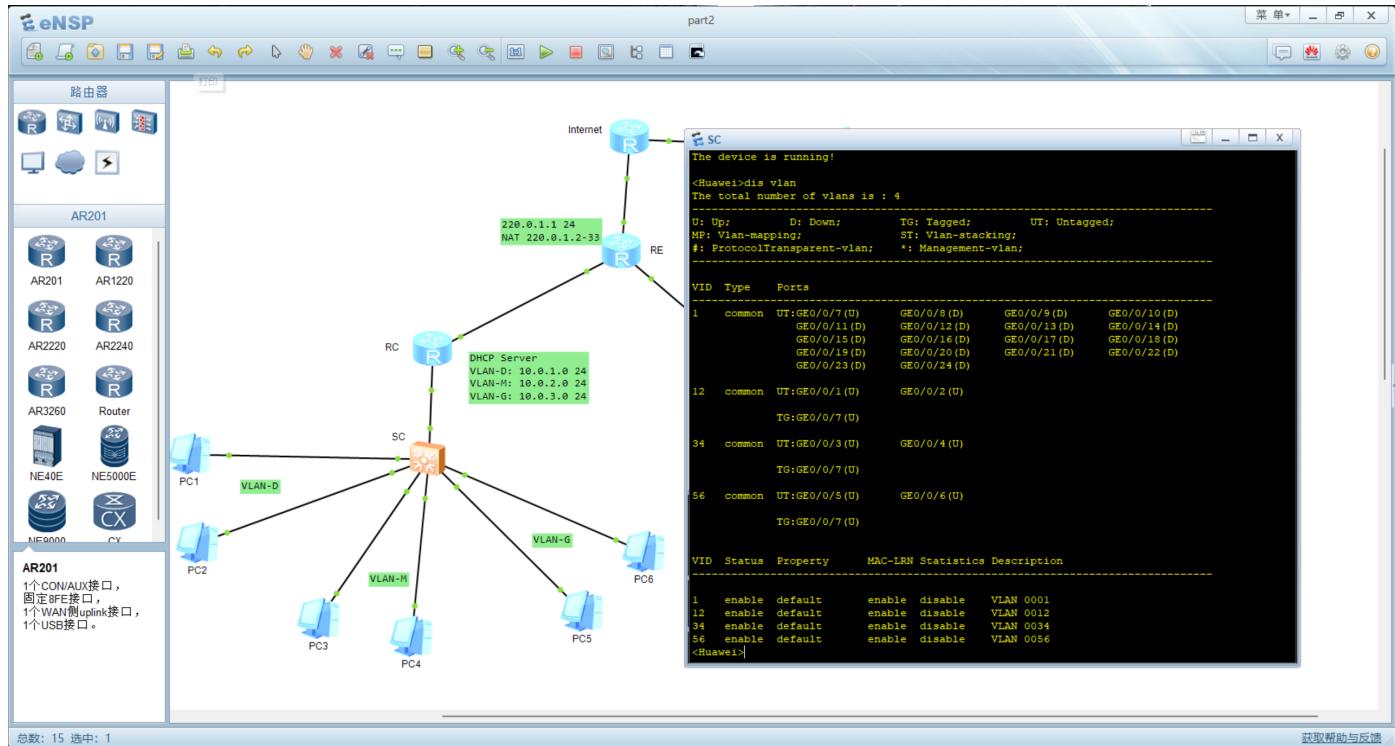
PC1-6配置为DHCP Client，通过 ipconfig /renew 向DHCP Server请求



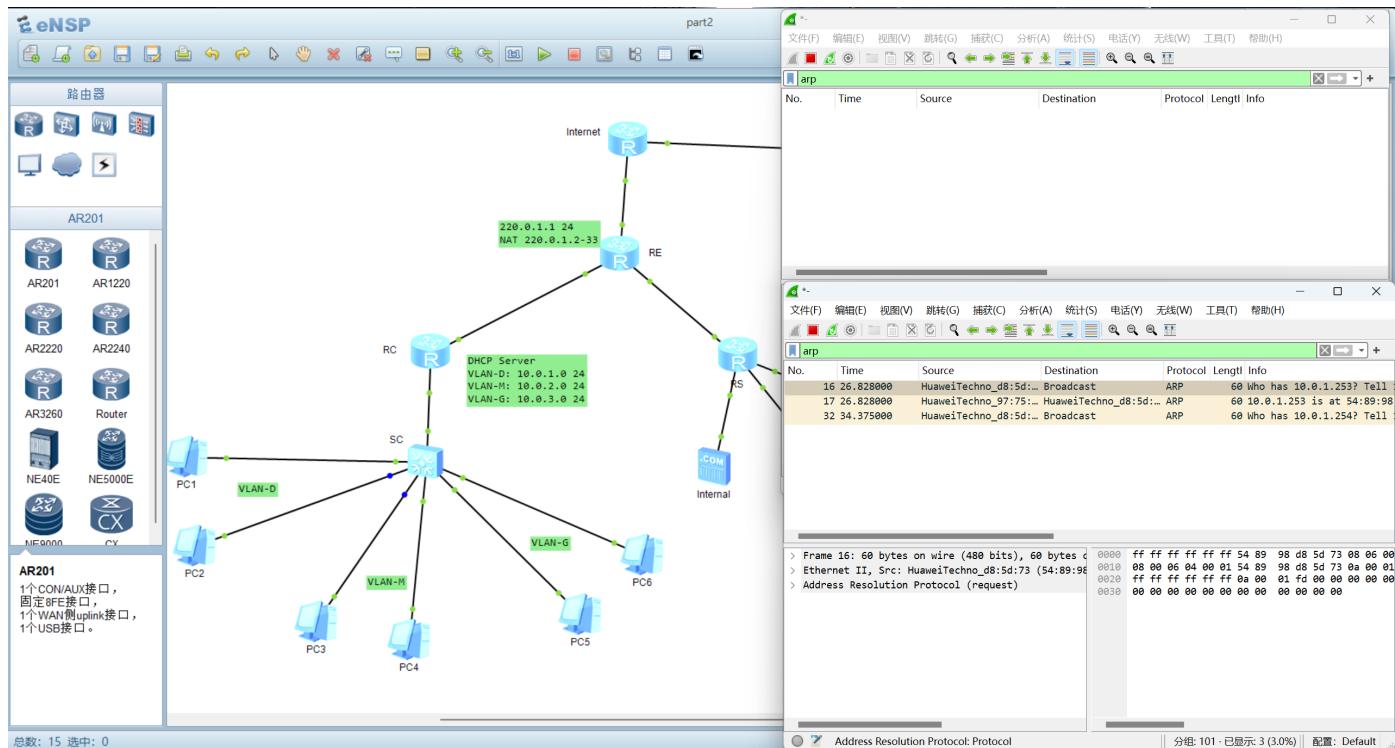
DNS Server的地址也由DHCP自动获取，节省了手动配置的时间。

VLAN

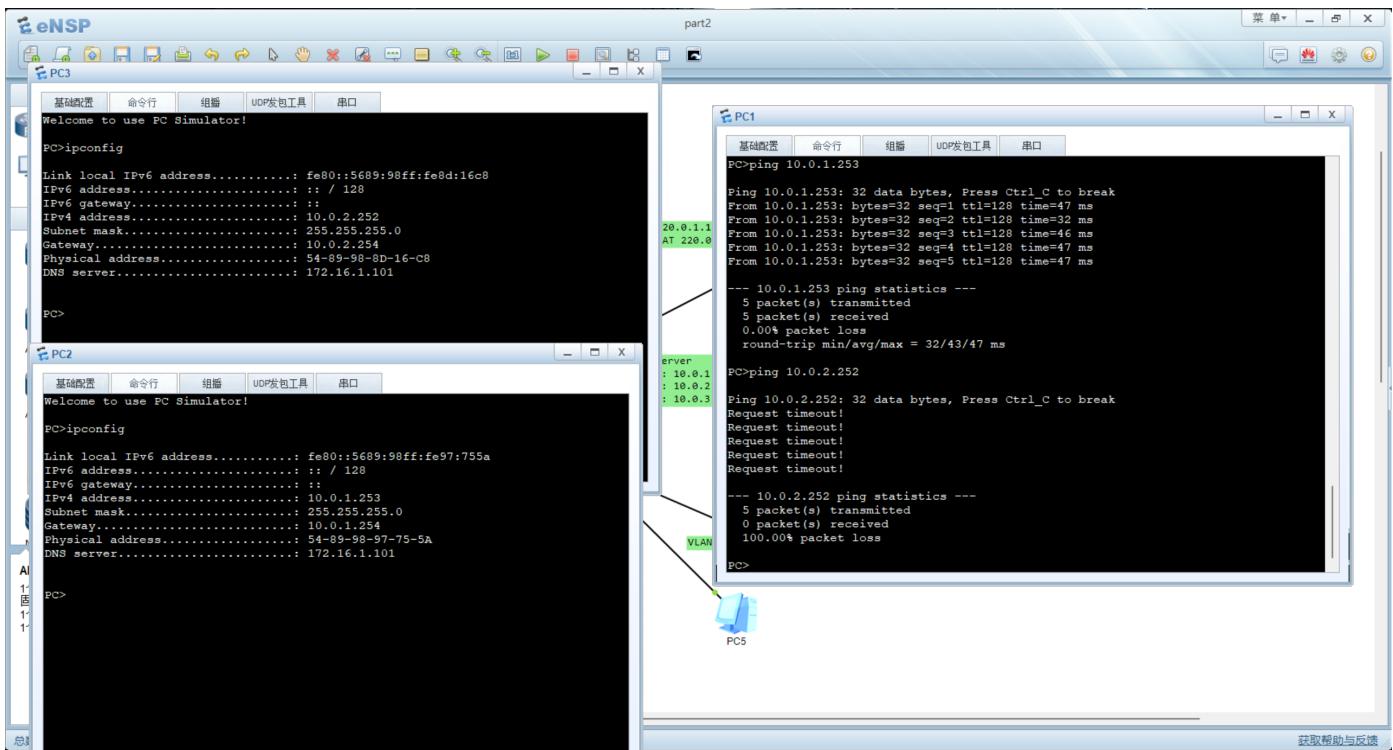
VLAN在SC中创建，并分配到对应的物理接口，其中PC1和PC2属于VLAN-D，PC3和PC4属于VLAN-M，PC5和PC6属于VLAN-G。



下图为PC1执行 `arp -d` 后PC1和PC3（不同VLAN）抓包结果，PC3无法接收ARP广播，而同一VLAN内的PC2可以收到。

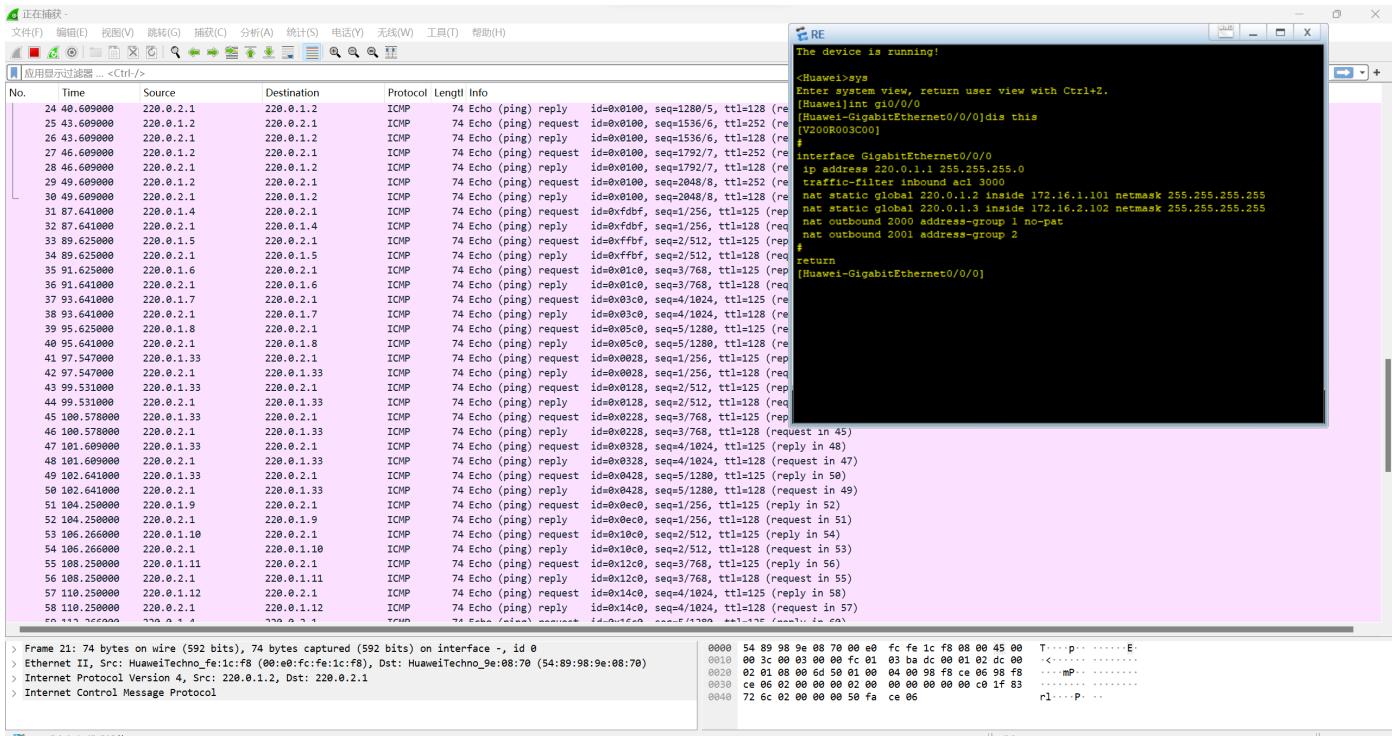


按照要求不同VLAN不能互通，但由于不同VLAN的Network ID不同，终端属于不同子网，交换机会转发报文。因此不做任何配置的情况下，不同VLAN是可以互通的，需要进行使用 `ac1` 访问控制。下图为联通性测试。



NAT/NAPT Static/Dynamic

NAT配置和PC7（外网终端）的抓包结果如下图所示



外部终端可以直接通过Static NAT访问SE, 而不能访问采用NAPT和Dynamic NAT的Clients

ACL1 & 2

RS和RE的配置如下图所示。RS在与Internal Server相连的接口做outbound限制，只允许来自VLAN-D和VLAN-M的IP出口。RE在连接外网的接口做inbound限制，禁止一切发向Internal Server的报文。由于DNS Server没有做NAT，因此外部无法访问，同时RE默认禁止一切目标为内网IP的报文发送。

The image shows two terminal windows side-by-side. The left window is titled 'RS' and the right is 'RE'. Both show the message 'The device is running!' at the top. Below this, they display their respective ACL configurations.

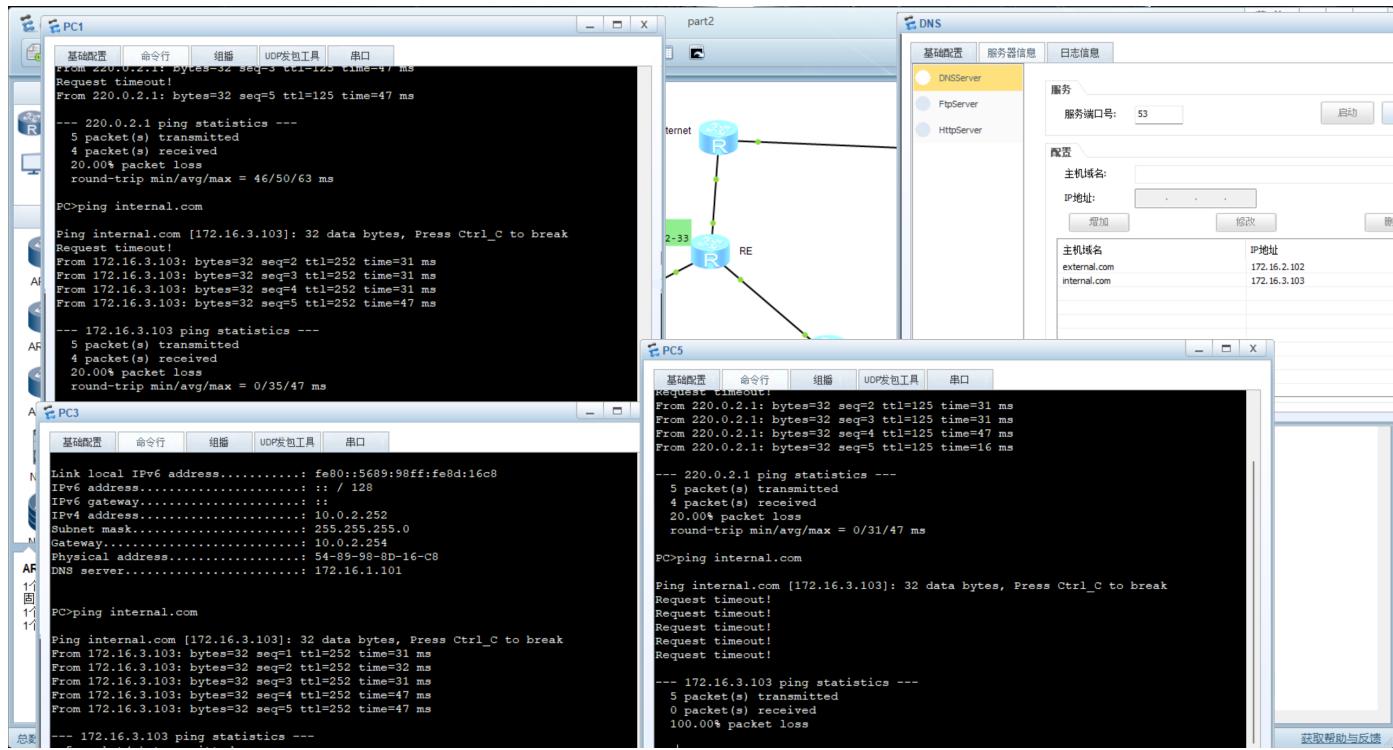
RS Configuration:

```
<Huawei>sys
Enter system view, return user view with Ctrl+Z.
[Huawei]acl 3000
[Huawei-acl-adv-3000]dis this
[V200R003C00]
#
acl number 3000
rule 1 permit ip source 10.0.1.0 0.0.0.255 destination 172.16.3.103 0
rule 2 permit ip source 10.0.2.0 0.0.0.255 destination 172.16.3.103 0
rule 3 deny ip destination 172.16.3.103 0
#
return
[Huawei-acl-adv-3000]
```

RE Configuration:

```
<Huawei>sys
Enter system view, return user view with Ctrl+Z.
[Huawei]acl 3000
[Huawei-acl-adv-3000]dis this
[V200R003C00]
#
acl number 3000
rule 5 deny ip destination 220.0.1.2 0
#
return
[Huawei-acl-adv-3000]
```

内网Clients能正常访问DNS服务器，并正常解析。其中internal.com解析为Internal Server的IP地址。如图所示，PC1 (VLAN-D) 和PC3 (VLAN-M) 能访问Internal Server，PC5 (VLAN-G) 不能访问。



下图为PC1 (VLAN-D) 和PC3 (VLAN-M) 访问Internal Server的抓包结果，正常访问

Wireshark Network Traffic Analyzer

File(F) Edit(E) View(V) Navigate(G) Capture(C) Analyze(A) Statistics(S) Callouts(Y) Wireless(W) Tools(T) Help(H)

icmp

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	10.0.1.252	172.16.3.103	ICMP	74	Echo (ping) request id=0x26c1, seq=1/256, ttl=125 (reply ...)
2	0.000000	172.16.3.103	10.0.1.252	ICMP	74	Echo (ping) reply id=0x26c1, seq=1/256, ttl=255 (request ...)
3	1.031000	10.0.1.252	172.16.3.103	ICMP	74	Echo (ping) request id=0x27c1, seq=2/512, ttl=125 (reply ...)
4	1.031000	172.16.3.103	10.0.1.252	ICMP	74	Echo (ping) reply id=0x27c1, seq=2/512, ttl=255 (request ...)
5	2.093000	10.0.1.252	172.16.3.103	ICMP	74	Echo (ping) request id=0x28c1, seq=3/768, ttl=125 (reply ...)
6	2.093000	172.16.3.103	10.0.1.252	ICMP	74	Echo (ping) reply id=0x28c1, seq=3/768, ttl=255 (request ...)
7	3.125000	10.0.1.252	172.16.3.103	ICMP	74	Echo (ping) request id=0x29c1, seq=4/1024, ttl=125 (reply ...)
8	3.125000	172.16.3.103	10.0.1.252	ICMP	74	Echo (ping) reply id=0x29c1, seq=4/1024, ttl=255 (request ...)
9	4.171000	10.0.1.252	172.16.3.103	ICMP	74	Echo (ping) request id=0x2ac1, seq=5/1280, ttl=125 (reply ...)
10	4.171000	172.16.3.103	10.0.1.252	ICMP	74	Echo (ping) reply id=0x2ac1, seq=5/1280, ttl=255 (request ...)
11	6.375000	10.0.2.252	172.16.3.103	ICMP	74	Echo (ping) request id=0x2cc1, seq=1/256, ttl=125 (reply ...)
12	6.375000	172.16.3.103	10.0.2.252	ICMP	74	Echo (ping) reply id=0x2cc1, seq=1/256, ttl=255 (request ...)
13	7.390000	10.0.2.252	172.16.3.103	ICMP	74	Echo (ping) request id=0x2dc1, seq=2/512, ttl=125 (reply ...)
14	7.390000	172.16.3.103	10.0.2.252	ICMP	74	Echo (ping) reply id=0x2dc1, seq=2/512, ttl=255 (request ...)
15	8.437000	10.0.2.252	172.16.3.103	ICMP	74	Echo (ping) request id=0x2ec1, seq=3/768, ttl=125 (reply ...)
16	8.437000	172.16.3.103	10.0.2.252	ICMP	74	Echo (ping) reply id=0x2ec1, seq=3/768, ttl=255 (request ...)
17	9.468000	10.0.2.252	172.16.3.103	ICMP	74	Echo (ping) request id=0x2fc1, seq=4/1024, ttl=125 (reply ...)
18	9.468000	172.16.3.103	10.0.2.252	ICMP	74	Echo (ping) reply id=0x2fc1, seq=4/1024, ttl=255 (request ...)
19	10.531000	10.0.2.252	172.16.3.103	ICMP	74	Echo (ping) request id=0x30c1, seq=5/1280, ttl=125 (reply ...)
20	10.531000	172.16.3.103	10.0.2.252	ICMP	74	Echo (ping) reply id=0x30c1, seq=5/1280, ttl=255 (request ...)

Internet Control Message Protocol: Protocol

分组: 21 · 已显示: 20 (95.2%)

配置: Default

外网Client可以通过Static NAT地址访问External Server，但不能访问Internal Server。

ZeNsp Network Simulator

File(F) 编辑(E) 视图(V) 跳转(G) 捕获(C) 分析(A) 统计(S) 电话(Y) 无线(W) 工具(T) 帮助(H)

icmp

PC7

Welcome to use PC Simulator!

PC>ping 220.0.1.3

Ping 220.0.1.3: 32 data bytes, Press Ctrl_C to break

From 220.0.1.3: bytes=32 seq=1 ttl=252 time=16 ms

From 220.0.1.3: bytes=32 seq=2 ttl=252 time=31 ms

From 220.0.1.3: bytes=32 seq=3 ttl=252 time=31 ms

From 220.0.1.3: bytes=32 seq=4 ttl=252 time=16 ms

From 220.0.1.3: bytes=32 seq=5 ttl=252 time=31 ms

AR2

--- 220.0.1.3 ping statistics ---

5 packet(s) transmitted

5 packet(s) received

0.0% packet loss

round-trip min/avg/max = 16/25/31 ms

PC>ping 220.0.1.2

Ping 220.0.1.2: 32 data bytes, Press Ctrl_C to break

Request timeout!

Request timeout!

Request timeout!

Request timeout!

Request timeout!

NE4

--- 220.0.1.2 ping statistics ---

5 packet(s) transmitted

0 packet(s) received

100.0% packet loss

AR20

1个CPU, 固定带宽: 100Mbps, 1个WAN侧上联接口, 1个USB接口。

PC3 PC4 PC5

> Frame 2: 74 bytes on wire (592 bits), 74 bytes captured

> Ethernet II, Src: HuaweiTechno_6d:05:96 (00:e0:fc:6d:05:96), Dst: 172.16.2.102 (220.0.2.1)

> Internet Protocol Version 4, Src: 220.0.2.1, Dst: 172.16.2.102

> Internet Control Message Protocol

0000 00 e0 fc 5a 7d 75 00 e0 fc 6d 05 96 08 00 45 00

0010 00 3c c1 8a 40 00 7e 01 ae be dc 00 02 01 ac 00

0020 02 66 08 fb bb 8a c1 00 01 08 09 0a 0b 0c 0d

0030 0e 0f 10 11 12 13 14 15 16 17 18 19 1a 1b 1c 1d

0040 1e 1f 20 21 22 23 24 25 26 27

Internet Control Message Protocol: Protocol

分组: 17 · 已显示: 10 (58.8%) 配置: Default

Part2-3 (20pt)

VLAN Interflow

从拓扑图可以得知，在RC外增加了一个**Relay**服务器，负责路由**VLAN-R**。VLAN-R由交换机创建，并由于Network ID与其他VLAN都不同，可以正常通信。下图为ping命令测试结果。

The screenshot shows a terminal window titled "PC8". The tab bar at the top includes "基础配置", "命令行", "组播", "UDP发包工具", and "串口", with "命令行" currently selected. The main area displays two ping command outputs:

```
PC>ping 10.0.1.252
Ping 10.0.1.252: 32 data bytes, Press Ctrl_C to break
Request timeout!
From 10.0.1.252: bytes=32 seq=2 ttl=126 time=63 ms
From 10.0.1.252: bytes=32 seq=3 ttl=126 time=78 ms
From 10.0.1.252: bytes=32 seq=4 ttl=126 time=93 ms
From 10.0.1.252: bytes=32 seq=5 ttl=126 time=79 ms

--- 10.0.1.252 ping statistics ---
5 packet(s) transmitted
4 packet(s) received
20.00% packet loss
round-trip min/avg/max = 0/78/93 ms

PC>ping 10.0.2.252
Ping 10.0.2.252: 32 data bytes, Press Ctrl_C to break
Request timeout!
From 10.0.2.252: bytes=32 seq=2 ttl=126 time=78 ms
From 10.0.2.252: bytes=32 seq=3 ttl=126 time=94 ms
From 10.0.2.252: bytes=32 seq=4 ttl=126 time=78 ms
From 10.0.2.252: bytes=32 seq=5 ttl=126 time=78 ms

--- 10.0.2.252 ping statistics ---
5 packet(s) transmitted
4 packet(s) received
20.00% packet loss
round-trip min/avg/max = 0/82/94 ms
```

In the bottom left corner of the terminal window, there is a cursor placeholder "PC>".

DHCP Relay

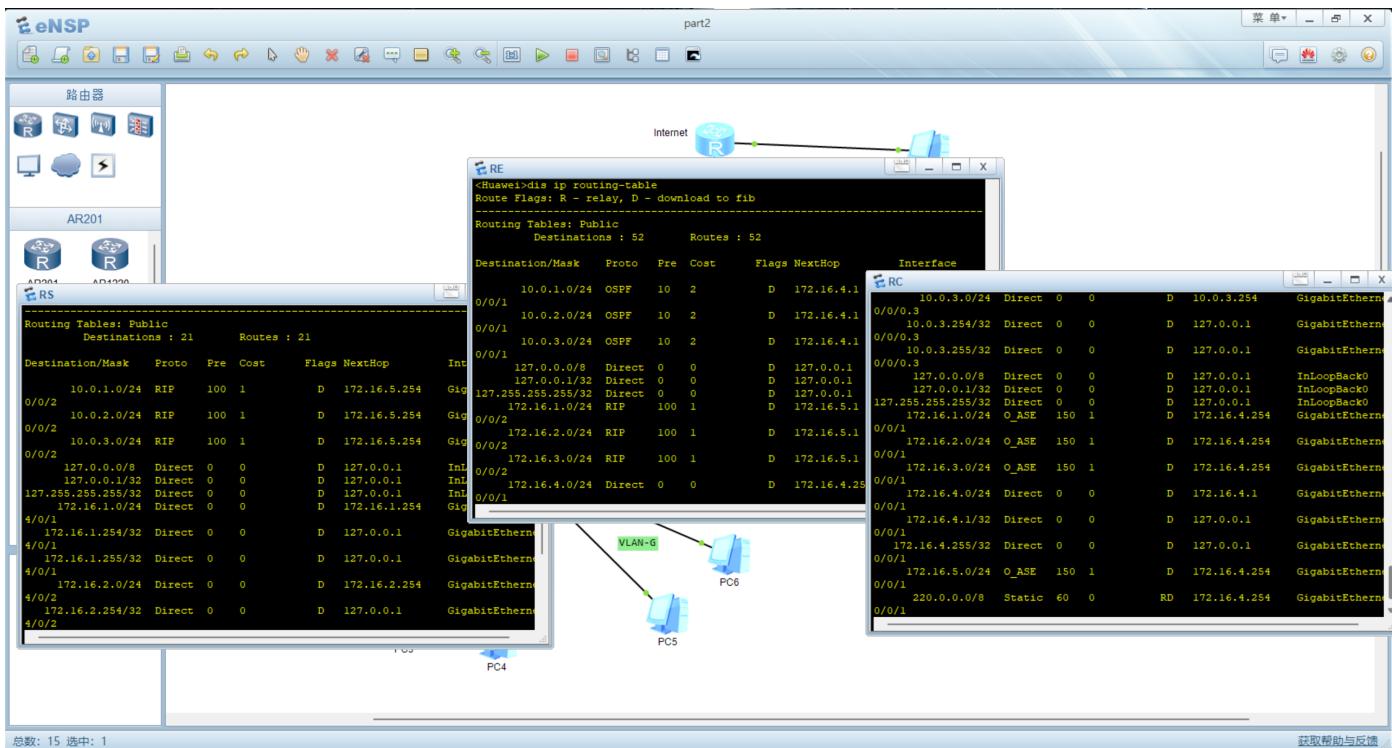
Relay服务器作为DHCP中继服务器，负责转发VLAN-R的DHCP请求。具体配置由下图所示

```
DHCP Relay
[Huawei]q
<Huawei>save
The current configuration will be written to the device.
Are you sure to continue? (y/n) [n]:y
It will take several minutes to save configuration file, please wait.....
Configuration file had been saved successfully
Note: The configuration file will take effect after being activated
<Huawei>
<Huawei>
<Huawei>sys
Enter system view, return user view with Ctrl+Z.
[Huawei]int gi0/0/1.1
[Huawei-GigabitEthernet0/0/1.1]dis this
[V200R003C00]
#
interface GigabitEthernet0/0/1.1
dot1q termination vid 89
ip address 10.0.4.254 255.255.255.0
arp broadcast enable
dhcp select relay
dhcp relay server-select admin
#
return
[Huawei-GigabitEthernet0/0/1.1]
```

DHCP服务器为**RC**，已预先分配好IP池，因此Relay服务器只需开启DHCP服务，将与VLAN连接的接口设为relay模式并指定DHCP服务器的IP即可。

Interflow between RIP & OSPF

拓扑图的左半边（RC和Relay）使用OSPF，右半边（RS）使用RIP，因此二者的交流需要通过中间的RE进行。RE同时打开OSPF和RIP，并在二者的配置中加入`import-route`命令，使二者路由信息进行交换。图中类型为`o_ASE`的项即为外部引入的路由。



Telnet

由于PC上没有telnet程序，只能通过路由器远程控制其他路由器。结果如下图所示，将RC的认证模式打开并设置密码，即可通过RE和其他路由器在User View下通过telnet连接RC。RE的console中显示的是RC的信息。

