

BÁO CÁO THỰC HÀNH

Môn học: Thiết bị mạng & Truyền thông ĐPT

Bài LAB 3: Cấu hình RIP - OSPF - NAT - ACL

Ngày báo cáo: 25/11/2024

1. THÔNG TIN CHUNG:

Lớp: NT121.P11

Nhóm: 01

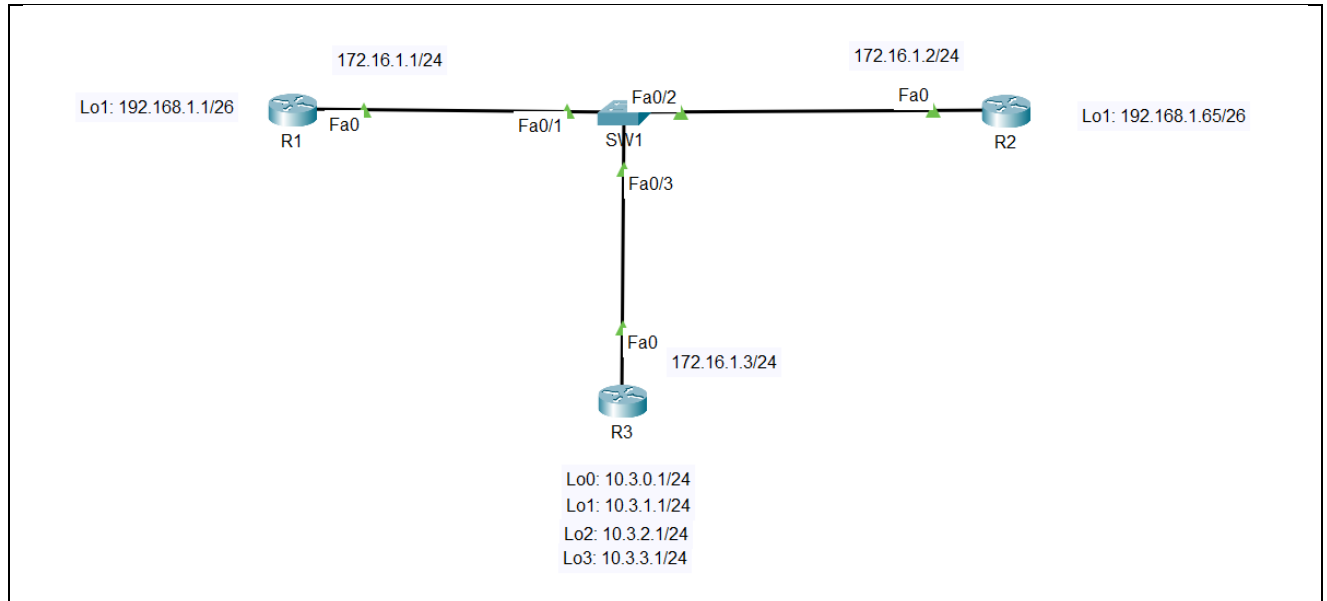
STT	Họ và tên	MSSV	Email
1	Đặng Trung Hậu	21520833	21520833@gm.uit.edu.vn
2	Lê Đoàn Trà My	21521149	21521149@gm.uit.edu.vn

2. NỘI DUNG THỰC HIỆN:¹

STT	Công việc	Kết quả tự đánh giá
1	Yêu cầu 01	100%
2	Yêu cầu 02	100%
3	Yêu cầu 03	100%
4	Yêu cầu 04	100%
5	Yêu cầu 05	100%
6	Yêu cầu 06	100%

BÁO CÁO CHI TIẾT

1. Yêu cầu 01:



1. 1. Thực hiện đấu nối dây và đặt IP trên các thiết bị theo sơ đồ mạng như hình trên

1.2. RIP:

a. Cấu hình định tuyến RIPv2 trên các thiết bị đảm bảo mạng hội tụ.

- Cấu hình cơ bản trên R1:

```
Router>
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
R1(config)#int fa0/0
R1(config-if)#ip add 172.16.1.1 255.255.255.0
R1(config-if)#no shut

R1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
```

```
R1(config-if)#int lo1
R1(config-if)#
%LINK-5-CHANGED: Interface Loopback1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback1, changed state to up
R1(config-if)#ip add 192.168.1.1 255.255.192
^
% Invalid input detected at '^' marker.

R1(config-if)#ip add 192.168.1.1 255.255.255.192
R1(config-if)#
```

- Cấu hình cơ bản trên R2:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R2
R2(config)#int fa0/0
R2(config-if)#ip add 172.16.1.2 255.255.255.0
R2(config-if)#no shut

R2(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

R2(config-if)#int lo1

R2(config-if)#
%LINK-5-CHANGED: Interface Loopback1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback1, changed state to up

R2(config-if)#ip add 192.168.1.65 255.255.255.192
R2(config-if)#no shut
R2(config-if)#
```

- Cấu hình cơ bản trên R3:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip add 172.16.1.3 255.255.255.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#int lo0
Router(config-if)#no ip add 10.3.0.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
Router(config-if)#int lo1
Router(config-if)#no ip add 10.3.1.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
Router(config-if)#int lo2
Router(config-if)#no ip add 10.3.2.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
Router(config-if)#int lo3
Router(config-if)#no ip add 10.3.2.1 255.255.255.0
Router(config-if)#
Router(config-if)#
Router(config-if)#ex
Router(config)#
```

```
Router(config)#int lo0
Router(config-if)#ip add 10.3.0.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
Router(config-if)#int lo1
Router(config-if)#ip add 10.3.1.1 255.255.255.0
Router(config-if)#
Router(config-if)#int lo2
Router(config-if)#ip add 10.3.2.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
Router(config-if)#int lo3
Router(config-if)#ip add 10.3.3.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
Router(config-if)#ex
Router(config)#hostname R3
R3(config)#
```

- Cấu hình RIPv2 trên R1:

```
R1(config)#router rip
R1(config-router)#version 2
R1(config-router)#no auto-summary
R1(config-router)#no auto-summary
R1(config-router)#network 172.16.1.0
R1(config-router)#network 192.168.1.0
R1(config-router)#ex
R1(config)#
```

- Cấu hình RIPv2 trên R2:

```
R2(config)#router rip
R2(config-router)#version 2
R2(config-router)#no auto-summary
R2(config-router)#network 172.168.1.0
R2(config-router)#network 192.168.1.0
R2(config-router)#ex
R2(config)#
```

- Cấu hình RIPv2 trên R3:

```
R3(config)#router rip
R3(config-router)#version 2
R3(config-router)#no auto-summary
R3(config-router)#network 172.16.1.0
R3(config-router)#network 10.3.0.0
R3(config-router)#ex
R3(config)#
```

b. Khảo sát cơ chế hoạt động của RIPv2.**Cơ chế hoạt động của RIPv2**

- **Cập nhật định kỳ:** RIPv2 gửi các bản cập nhật bảng định tuyến cứ mỗi 30 giây một lần, quảng bá tất cả các tuyến đường mà nó biết đến các router lân cận.
- **Sử dụng số bước nhảy (hop count):** RIPv2 sử dụng số bước nhảy làm metric, với giới hạn tối đa là 15 bước nhảy. Nếu một tuyến đường có số bước nhảy lớn hơn 15, nó được coi là không thể truy cập.
- **Tự động tổng hợp và không tổng hợp:** Trong cấu hình này, ta đã dùng no auto-summary để tắt chế độ tổng hợp địa chỉ IP tự động, cho phép RIPv2 quảng bá các tuyến đường cụ thể thay vì chỉ mạng lớp chính.
- Xem bảng định tuyến RIPv2 trên mỗi router bằng lệnh: *show ip route rip*
- Kiểm tra thông tin định tuyến RIPv2 với lệnh: *show ip rip database*
- Theo dõi các bản cập nhật RIP: Để quan sát các bản cập nhật định kỳ mà RIPv2 gửi giữa các router: *debug ip rip*

- Khảo sát cơ chế hoạt động của RIPv2 trên R1:

```
R1#show ip route rip
 10.0.0.0/24 is subnetted, 4 subnets
R    10.3.0.0 [120/1] via 172.16.1.3, 00:00:12, FastEthernet0/0
R    10.3.1.0 [120/1] via 172.16.1.3, 00:00:12, FastEthernet0/0
R    10.3.2.0 [120/1] via 172.16.1.3, 00:00:12, FastEthernet0/0
R    10.3.3.0 [120/1] via 172.16.1.3, 00:00:12, FastEthernet0/0
```

```
R1#show ip rip database
10.3.0.0/24      auto-summary
10.3.0.0/24
    [1] via 172.16.1.3, 00:00:25, FastEthernet0/0
10.3.1.0/24      auto-summary
10.3.1.0/24
    [1] via 172.16.1.3, 00:00:25, FastEthernet0/0
10.3.2.0/24      auto-summary
10.3.2.0/24
    [1] via 172.16.1.3, 00:00:25, FastEthernet0/0
10.3.3.0/24      auto-summary
10.3.3.0/24
    [1] via 172.16.1.3, 00:00:25, FastEthernet0/0
172.16.1.0/24     auto-summary
172.16.1.0/24     directly connected, FastEthernet0/0
192.168.1.0/26    auto-summary
192.168.1.0/26    directly connected, Loopback1
```

```

R1#debug ip rip
RIP protocol debugging is on
R1#RIP: sending v2 update to 224.0.0.9 via FastEthernet0/0 (172.16.1.1)
RIP: build update entries
    192.168.1.0/26 via 0.0.0.0, metric 1, tag 0
RIP: sending v2 update to 224.0.0.9 via Loopback1 (192.168.1.1)
RIP: build update entries
    10.3.0.0/24 via 0.0.0.0, metric 2, tag 0
    10.3.1.0/24 via 0.0.0.0, metric 2, tag 0
    10.3.2.0/24 via 0.0.0.0, metric 2, tag 0
    10.3.3.0/24 via 0.0.0.0, metric 2, tag 0
    172.16.1.0/24 via 0.0.0.0, metric 1, tag 0
RIP: received v2 update from 172.16.1.3 on FastEthernet0/0
    10.3.0.0/24 via 0.0.0.0 in 1 hops
    10.3.1.0/24 via 0.0.0.0 in 1 hops
    10.3.2.0/24 via 0.0.0.0 in 1 hops
    10.3.3.0/24 via 0.0.0.0 in 1 hops

```

- Khảo sát cơ chế hoạt động của RIPv2 trên R2:

```

R2#show ip rip database
192.168.1.64/26      auto-summary
192.168.1.64/26      directly connected, Loopback1
R2#
R2#debug ip rip
RIP protocol debugging is on

```

```

R2#show ip route rip
    10.0.0.0/24 is subnetted, 4 subnets
R       10.3.0.0 [120/1] via 172.16.1.3, 00:00:15, FastEthernet0/0
R       10.3.1.0 [120/1] via 172.16.1.3, 00:00:15, FastEthernet0/0
R       10.3.2.0 [120/1] via 172.16.1.3, 00:00:15, FastEthernet0/0
R       10.3.3.0 [120/1] via 172.16.1.3, 00:00:15, FastEthernet0/0
    192.168.1.0/26 is subnetted, 2 subnets
R       192.168.1.0 [120/1] via 172.16.1.1, 00:00:15, FastEthernet0/0

```

```

RIP: sending v2 update to 224.0.0.9 via FastEthernet0/0 (172.16.1.2)
RIP: build update entries
    192.168.1.64/26 via 0.0.0.0, metric 1, tag 0
RIP: sending v2 update to 224.0.0.9 via Loopback1 (192.168.1.65)
RIP: build update entries
    10.3.0.0/24 via 0.0.0.0, metric 2, tag 0
    10.3.1.0/24 via 0.0.0.0, metric 2, tag 0
    10.3.2.0/24 via 0.0.0.0, metric 2, tag 0
    10.3.3.0/24 via 0.0.0.0, metric 2, tag 0
    172.16.1.0/24 via 0.0.0.0, metric 1, tag 0
    192.168.1.0/26 via 0.0.0.0, metric 2, tag 0
RIP: received v2 update from 172.16.1.1 on FastEthernet0/0
    192.168.1.0/26 via 0.0.0.0 in 1 hops
RIP: received v2 update from 172.16.1.3 on FastEthernet0/0
    10.3.0.0/24 via 0.0.0.0 in 1 hops
    10.3.1.0/24 via 0.0.0.0 in 1 hops
    10.3.2.0/24 via 0.0.0.0 in 1 hops
    10.3.3.0/24 via 0.0.0.0 in 1 hops
RIP: sending v2 update to 224.0.0.9 via FastEthernet0/0 (172.16.1.2)
RIP: build update entries
    192.168.1.64/26 via 0.0.0.0, metric 1, tag 0
RIP: sending v2 update to 224.0.0.9 via Loopback1 (192.168.1.65)
RIP: build update entries
    10.3.0.0/24 via 0.0.0.0, metric 2, tag 0
    10.3.1.0/24 via 0.0.0.0, metric 2, tag 0
    10.3.2.0/24 via 0.0.0.0, metric 2, tag 0
    10.3.3.0/24 via 0.0.0.0, metric 2, tag 0
    172.16.1.0/24 via 0.0.0.0, metric 1, tag 0
    192.168.1.0/26 via 0.0.0.0, metric 2, tag 0

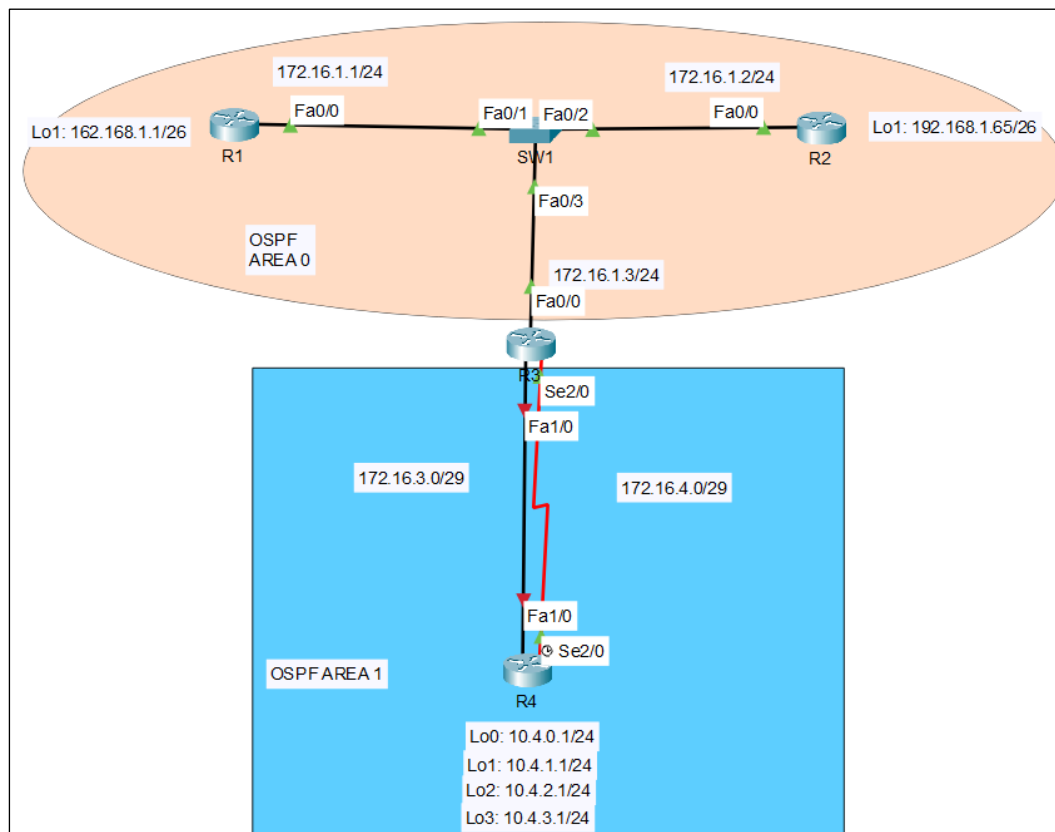
```

- Khảo sát cơ chế hoạt động của RIPv2 trên R3:

```
R3#show ip rip database
10.3.0.0/24    auto-summary
10.3.0.0/24    directly connected, Loopback0
10.3.1.0/24    auto-summary
10.3.1.0/24    directly connected, Loopback1
10.3.2.0/24    auto-summary
10.3.2.0/24    directly connected, Loopback2
10.3.3.0/24    auto-summary
10.3.3.0/24    directly connected, Loopback3
172.16.1.0/24  auto-summary
172.16.1.0/24  directly connected, FastEthernet0/0
192.168.1.0/26 auto-summary
192.168.1.0/26
    [1] via 172.16.1.1, 00:00:11, FastEthernet0/0
```

```
R3#debug ip rip
RIP protocol debugging is on
R3#
R3#RIP: received v2 update from 172.16.1.1 on FastEthernet0/0
    192.168.1.0/26 via 0.0.0.0 in 1 hops
RIP: sending v2 update to 224.0.0.9 via FastEthernet0/0 (172.16.1.3)
RIP: build update entries
    10.3.0.0/24 via 0.0.0.0, metric 1, tag 0
    10.3.1.0/24 via 0.0.0.0, metric 1, tag 0
    10.3.2.0/24 via 0.0.0.0, metric 1, tag 0
    10.3.3.0/24 via 0.0.0.0, metric 1, tag 0
RIP: sending v2 update to 224.0.0.9 via Loopback1 (10.3.1.1)
RIP: build update entries
    10.3.0.0/24 via 0.0.0.0, metric 1, tag 0
    10.3.2.0/24 via 0.0.0.0, metric 1, tag 0
    10.3.3.0/24 via 0.0.0.0, metric 1, tag 0
    172.16.1.0/24 via 0.0.0.0, metric 1, tag 0
    192.168.1.0/26 via 0.0.0.0, metric 2, tag 0
RIP: sending v2 update to 224.0.0.9 via Loopback2 (10.3.2.1)
RIP: build update entries
    10.3.0.0/24 via 0.0.0.0, metric 1, tag 0
    10.3.1.0/24 via 0.0.0.0, metric 1, tag 0
    10.3.3.0/24 via 0.0.0.0, metric 1, tag 0
    172.16.1.0/24 via 0.0.0.0, metric 1, tag 0
    192.168.1.0/26 via 0.0.0.0, metric 2, tag 0
RIP: sending v2 update to 224.0.0.9 via Loopback3 (10.3.3.1)
RIP: build update entries
    10.3.0.0/24 via 0.0.0.0, metric 1, tag 0
    10.3.1.0/24 via 0.0.0.0, metric 1, tag 0
    10.3.2.0/24 via 0.0.0.0, metric 1, tag 0
    172.16.1.0/24 via 0.0.0.0, metric 1, tag 0
    192.168.1.0/26 via 0.0.0.0, metric 2, tag 0
```


2. Yêu cầu 02:



2.1. Thực hiện đấu nối dây và đặt IP trên các thiết bị theo sơ đồ mạng như hình trên.

2.2. OSPF:

a. Cấu hình cơ bản trên các Router:

- Cấu hình cơ bản trên R1:

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname R1
R1(config)#
R1(config)#int fa0/0
R1(config-if)#ip add 172.16.1.1 255.255.255.0
R1(config-if)#no shut

R1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

R1(config-if)#int lo1
R1(config-if)#
%LINK-5-CHANGED: Interface Loopback1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback1, changed state to up

R1(config-if)#ip add 192.168.1.1 255.255.255.192
R1(config-if)#no shut
R1(config-if)#
```


- Cấu hình cơ bản trên R2:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip add 172.168.1.2 255.255.255.0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

Router(config-if)#int lo1

Router(config-if)#
%LINK-5-CHANGED: Interface Loopback1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback1, changed state to up

Router(config-if)#ip add 192.168.1.65 255.255.255.192
Router(config-if)#no shut
Router(config-if)#
Router(config-if)#hostname R2
R2(config)#
R2(config)#
```

- Cấu hình cơ bản trên R3:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R3
R3(config)#
R3(config)#int fa0/0
R3(config-if)#ip add 172.16.1.3 255.255.255.0
R3(config-if)#no shut

R3(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

R3(config-if)#int fa1/0
R3(config-if)#ip add 172.16.4.3 255.255.255.248
R3(config-if)#no shut

R3(config-if)#
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

R3(config-if)#int se2/0
R3(config-if)#ip add 176.16.3.3 255.255.255.248
R3(config-if)#no shut

%LINK-5-CHANGED: Interface Serial2/0, changed state to down
R3(config-if)#
R3(config-if)#
```

- Cấu hình cơ bản trên R4:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/1
%Invalid interface type and number
Router(config)#int fa1/0
Router(config-if)#ip add 172.16.4.4 255.255.255.248
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

Router(config-if)#int se2/0
Router(config-if)#ip add 172.16.3.4 255.255.255.248
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface Serial2/0, changed state to up

Router(config-if)#int
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up
      ^
% Invalid input detected at '^' marker.

Router(config-if)#int lo0

Router(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

Router(config-if)#ip add 10.4.0.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
```

```
Router(config-if)#
Router(config-if)#int lo1

Router(config-if)#
%LINK-5-CHANGED: Interface Loopback1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback1, changed state to up

Router(config-if)#ip add 10.4.1.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
Router(config-if)#int lo2

Router(config-if)#
%LINK-5-CHANGED: Interface Loopback2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback2, changed state to up

Router(config-if)#ip add 10.4.2.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
Router(config-if)#int lo3

Router(config-if)#
%LINK-5-CHANGED: Interface Loopback3, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback3, changed state to up

Router(config-if)#ip add 10.4.3.1 255.255.255.0
Router(config-if)#no shut
Router(config-if)#
```

b. Cấu hình OSPF và hiệu chỉnh Router-ID trên các router:

- Router-ID R1: 0.0.0.1
- Router-ID R2: 0.0.0.2
- Router-ID R3: 0.0.0.3
- Router-ID R4: 0.0.0.4

- Cấu hình trên R1:

```
R1(config)#router ospf 1
R1(config-router)#network 172.16.1.0 0.0.0.255 area 0
R1(config-router)#network 192.168.1.0 0.0.0.63 area 0
R1(config-router)#router-id 0.0.0.1
R1(config-router)#Reload or use "clear ip ospf process" command, for this to take effect
```

- Cấu hình trên R2:

```
R2(config)#router ospf 1
R2(config-router)#network 172.16.1.0 0.0.0.255 area 0
R2(config-router)#network 192.168.1.64 0.0.0.63 area 0
R2(config-router)#router-id 0.0.0.2
R2(config-router)#Reload or use "clear ip ospf process" command, for this to take effect
```

- Cấu hình trên R3:

```
R3(config)#router ospf 1
R3(config-router)#network 172.16.1.0 0.0.0.255 area 0
R3(config-router)#net
01:25:48: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.1.1 on FastEthernet0/0 from LOADING to FULL, Loading Done
% Ambiguous command: "ne"
R3(config-router)#network 172.16.4.0 0.0.0.7 area 1
R3(config-router)#network 172.16.3.0 0.0.0.7 area 1
R3(config-router)#router-id 0.0.0.3
R3(config-router)#Reload or use "clear ip ospf process" command, for this to take effect
```

- Cấu hình trên R4:

```
Router(config)#router ospf 1
Router(config-router)#network 172.16.4.0 0.0.0.7 area 1
Router(config-router)#network 172.16.3.0 0.0.0.7 area 1
Router(config-router)#network 10.4.0.0 0.0.3.255 area 1
Router(config-router)#router-id 0.0.0.4
Router(config-router)#Reload or use "clear ip ospf process" command, for this to take effect
```

c. Hiệu chỉnh vai trò DR và BDR trên các phân đoạn mạng.

- Trên phân đoạn mạng 172.16.1.0/24, R1 làm DR và R2 làm BDR.

- **Cấu hình trên R1:**

```
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#
R1(config)#int fa0/0
R1(config-if)#ip ospf priority 255
R1(config-if)#
```

- **Cấu hình trên R2:**

```
R2(config)#
R2(config)#int fa0/0
R2(config-if)#ip ospf priority 200
R2(config-if)#
R2(config-if)#
```

- Trên phân đoạn mạng 172.16.4.0/29, R3 làm DR và R4 làm BDR.

- **Cấu hình trên R3:**

```
R3#
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#int fa1/0
R3(config-if)#ip ospf priority 255
R3(config-if)#
```

- **Cấu hình trên R4:**

```
Router(config-router)#hostname R4
R4(config)#
R4(config)#int fa1/0
R4(config-if)#ip ospf priority 200
R4(config-if)#
R4(config-if)#
```

d. Hiệu chỉnh “OSPF cost”.

- Hiệu chỉnh cost trên R3 đảm bảo R3 có 2 đường đi đến các mạng loopback của R4.

- **Cấu hình trên R3:**

```
R3(config-if)#int se2/0
R3(config-if)#ip ospf cost 10
R3(config-if)#
```

- Hiệu chỉnh cost trên R4 đảm bảo R4 có 2 đường đi đến các mạng loopback của R1 và R2

- **Cấu hình trên R4:**

```
R4(config-if)#
R4(config-if)#int se2/0
R4(config-if)#ip ospf cost 20
R4(config-if)#
```

*** Kiểm tra thử cấu hình.**

- Kiểm tra database OSPF dùng lệnh: `show ip ospf database`
- Hiện thị các tuyến đường OSPF trong bảng định tuyến: `show ip route ospf`
- Hiện thị thông tin chi tiết về OSPF: `show ip ospf`

- Kiểm tra thử trên R1:

```
R1#show ip route ospf
 10.0.0.0/32 is subnetted, 4 subnets
O IA   10.4.0.1 [110/12] via 172.16.1.3, 00:06:38, FastEthernet0/0
O IA   10.4.1.1 [110/12] via 172.16.1.3, 00:06:38, FastEthernet0/0
O IA   10.4.2.1 [110/12] via 172.16.1.3, 00:06:38, FastEthernet0/0
O IA   10.4.3.1 [110/12] via 172.16.1.3, 00:06:38, FastEthernet0/0
 172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
O IA   172.16.3.0 [110/11] via 172.16.1.3, 00:06:38, FastEthernet0/0
 192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
O      192.168.1.65 [110/2] via 172.16.1.2, 00:10:23, FastEthernet0/0
R1#
```

```
R1#show ip ospf database
      OSPF Router with ID (192.168.1.1) (Process ID 1)

      Router Link States (Area 0)

Link ID      ADV Router    Age         Seq#         Checksum Link count
192.168.1.1  192.168.1.1   661        0x80000003  0x00cfb2  2
192.168.1.65 192.168.1.65  661        0x80000003  0x005f61  2
172.16.4.3    172.16.4.3    621        0x80000003  0x000a41  1

      Net Link States (Area 0)

Link ID      ADV Router    Age         Seq#         Checksum
172.16.1.1    192.168.1.1   627        0x80000002  0x002a28

      Summary Net Link States (Area 0)

Link ID      ADV Router    Age         Seq#         Checksum
172.16.3.0    172.16.4.3    437        0x80000006  0x005281
10.4.0.1      172.16.4.3    437        0x80000007  0x006e0d
10.4.1.1      172.16.4.3    437        0x80000008  0x006118
10.4.2.1      172.16.4.3    437        0x80000009  0x005423
10.4.3.1      172.16.4.3    437        0x8000000a  0x00472e
R1#
```

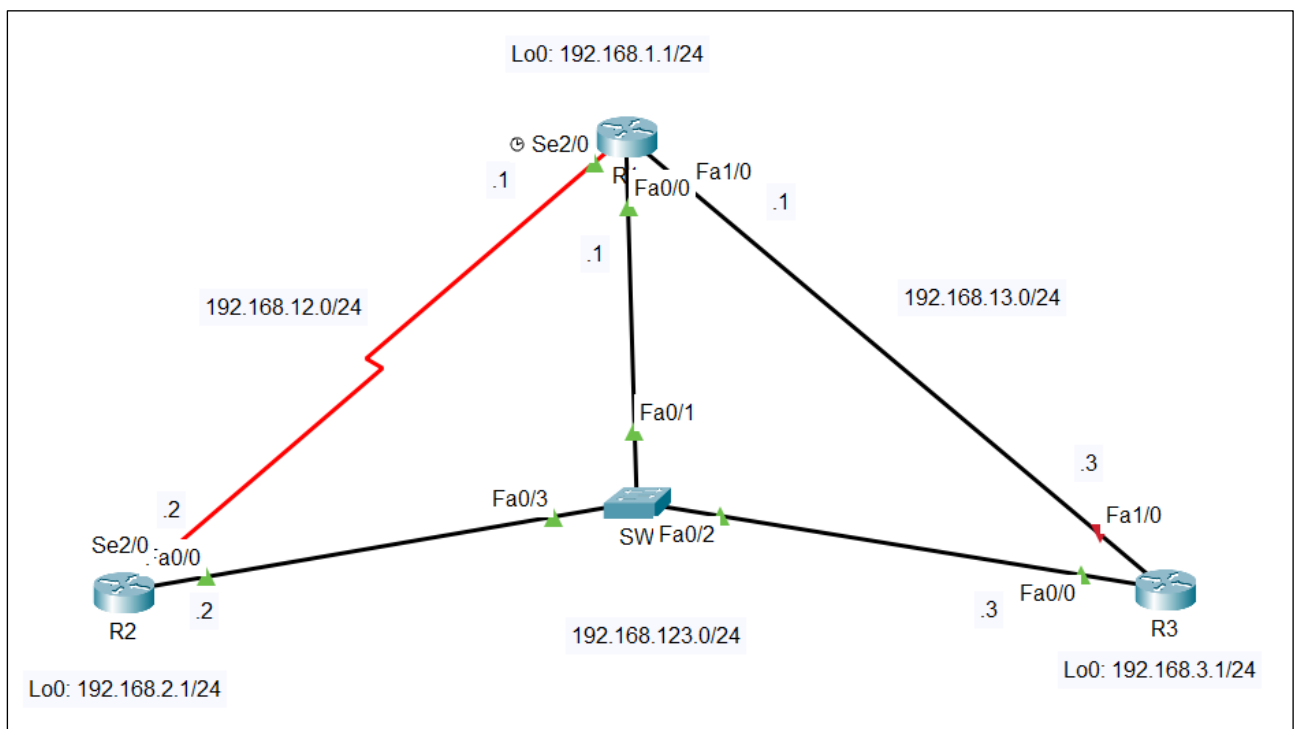
```

R1#show ip ospf int fa0/0
FastEthernet0/0 is up, line protocol is up
Internet address is 172.16.1.1/24, Area 0
Process ID 1, Router ID 192.168.1.1, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 255
Designated Router (ID) 192.168.1.1, Interface address 172.16.1.1
Backup Designated Router (ID) 192.168.1.65, Interface address 172.16.1.2
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 2, Adjacent neighbor count is 2
  Adjacent with neighbor 192.168.1.65 (Backup Designated Router)
  Adjacent with neighbor 172.16.4.3
Suppress hello for 0 neighbor(s)
R1#

```

- Có thể kiểm tra thử tương tự với các Router khác để xem thông số. Sau đó thực hiện ping giữa các router, nhóm đã làm thành công.

3. Yêu cầu 03:



3.1. Thực hiện đấu nối dây và đặt IP trên các thiết bị theo sơ đồ mạng như hình trên

3.2. OSPF:

a. Cấu hình cơ bản trên các thiết bị

- Cấu hình cơ bản trên R1:

```

Router(config)#hostname R1
R1(config)#int se2/0
R1(config-if)#ip add 192.168.12.1 255.255.255.0
R1(config-if)#int fa0/0
R1(config-if)#ip add 192.168.123.1 255.255.255.0
R1(config-if)#
R1(config-if)#int fa1/0
R1(config-if)#ip add 192.168.13.1 255.255.255.0
R1(config-if)#
R1(config-if)#int lo0

R1(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

R1(config-if)#ip add 192.168.1.1 255.255.255.0
R1(config-if)#

```

- Cấu hình cơ bản trên R2:

```

Router(config-if)#
Router(config-if)#hostname R2
R2(config)#
R2(config)#int se2/0
R2(config-if)#ip add 192.168.12.2 255.255.255.0
R2(config-if)#int fa0/0
R2(config-if)#ip add 192.168.123.2 255.255.255.0
R2(config-if)#int lo0

R2(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

R2(config-if)#ip add 192.168.2.1 255.255.255.0
R2(config-if)#
R2(config-if)#

```

- Cấu hình cơ bản trên R3:

```

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R3
R3(config)#int lo0

R3(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

R3(config-if)#ip add 192.168.3.1 255.255.255.0
R3(config-if)#int fa0/0
R3(config-if)#ip add 192.168.123.3 255.255.255.0
R3(config-if)#int fa1/0
R3(config-if)#p add 192.168.13.3 255.255.255.0
% Ambiguous command: "p add 192.168.13.3 255.255.255.0"
R3(config-if)#ip add 192.168.13.3 255.255.255.0
R3(config-if)#
R3(config-if)#

```


b. Cấu hình định tuyến OSPF Area 0 trên các router đảm bảo mọi địa chỉ IP trên hệ thống mạng thấy nhau và Hiệu chỉnh Router-ID trên các router như sau:

- Router-ID R1: 1.1.1.1
 - Router-ID R2: 2.2.2.2
 - Router-ID R3: 3.3.3.3
- **Cấu hình OSPF trên R1:**

```
R1#
R1#config t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#
R1(config)#router ospf 1
R1(config-router)#network 192.168.12.0 0.0.0.255 area 0
R1(config-router)#network 192.168.13.0 0.0.0.255 area 0
R1(config-router)#network 192.168.123.0 0.0.0.255 area 0
R1(config-router)#network 192.168.1.0 0.0.0.255 area 0
R1(config-router)#router-id 1.1.1.1
R1(config-router)#Reload or use "clear ip ospf process" command, for this to take effect
```

- **Cấu hình OSPF trên R2:**

```
R2>
R2>en
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#network 192.168.123.0 0.0.0.255 area 0
R2(config-router)#network 192.168.123.0 0.0.0.255 area 0
00:31:29: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on FastEthernet0/0 from LOADING to FULL, Loading Done
R2(config-router)#network 192.168.12.0 0.0.0.255 area 0
R2(config-router)#network 192.168.2.0 0.0.0.255 area 0
R2(config-router)#
00:31:59: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on Serial2/0 from LOADING to FULL, Loading Done
R2(config-router)#router-id 2.2.2.2
R2(config-router)#Reload or use "clear ip ospf process" command, for this to take effect
```

- **Cấu hình OSPF trên R3:**

```
R3>en
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#router ospf 1
R3(config-router)#network 192.168.13.0 0.0.0.255 area 0
R3(config-router)#network 192.168.123.0 0.0.0.255 area 0
R3(config-router)#network 192.168.3.0 0.0.0.255 area 0
R3(config-router)#router-id 3
00:33:11: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on FastEthernet0/0 from LOADING to FULL, Loading Done
00:33:11: %OSPF-5-ADJCHG: Process 1, Nbr 1.1.1.1 on FastEthernet0/0 from LOADING to FULL, Loading Do
% Incomplete command.
R3(config-router)#router-id 3.3.3.3
R3(config-router)#Reload or use "clear ip ospf process" command, for this to take effect
```

c. Hiệu chỉnh bầu chọn DR và BDR theo yêu cầu sau:

- Trên kết nối multiaccess giữa R1-R2- R3: R1 là DR, R2 là BDR và R3 là DROther.
- Cấu hình trên R1, R2, R3 lần lượt như sau:

```
R1#
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#int fa0/0
R1(config-if)#ip ospf priority 255
R1(config-if)#
R1(config-if)#
```

```
R2#
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#int fa0/0
R2(config-if)#ip ospf priority 200
R2(config-if)#
R2(config-if)#
```

```
R3 (config-router) #ex
R3 (config) #
R3 (config) #int fa0/0
R3 (config-if) #ip ospf priority 100
R3 (config-if) #
```

- Trên kết nối multiaccess giữa R1 và R3: đảm bảo R3 luôn là DR.
- **Cấu hình trên R3:**

```
R3 (config) #
R3 (config) #int fa1/0
R3 (config-if) #ip ospf priority 255
R3 (config-if) #
```

d. Hiệu chỉnh Metric (OSPF cost) trên các cổng thích hợp đảm bảo R2 đi đến loopback 0 của R1 chỉ theo đường Serial

```
R2 (config) #int fa0/0
R2 (config-if) #ip ospf cost 100
R2 (config-if) #
```

e. Kiểm thử các cấu hình

- Dùng các lệnh tương tự ở **Yêu cầu 2** để kiểm tra cấu hình OSPF trên các Router.
- Ở đây ví dụ trên R1:

```
R1>en
R1#show ip route ospf
    192.168.2.0/32 is subnetted, 1 subnets
O       192.168.2.1 [110/2] via 192.168.123.2, 00:23:28, FastEthernet0/0
    192.168.3.0/32 is subnetted, 1 subnets
O       192.168.3.1 [110/2] via 192.168.123.3, 00:21:47, FastEthernet0/0
```

```
R1>en
R1#show ip route ospf
    192.168.2.0/32 is subnetted, 1 subnets
O       192.168.2.1 [110/2] via 192.168.123.2, 00:23:28, FastEthernet0/0
    192.168.3.0/32 is subnetted, 1 subnets
O       192.168.3.1 [110/2] via 192.168.123.3, 00:21:47, FastEthernet0/0

R1#show ip ospf database
      OSPF Router with ID (1.1.1.1) (Process ID 1)

      Router Link States (Area 0)

Link ID      ADV Router    Age         Seq#         Checksum Link count
192.168.2.1  192.168.2.1    1506        0x80000005  0x00f0ad 4
1.1.1.1      1.1.1.1        1431        0x80000009  0x006bfd 4
192.168.3.1  192.168.3.1    1346        0x80000003  0x00d753 2
2.2.2.2      2.2.2.2        368         0x8000000a  0x0047b6 4

      Net Link States (Area 0)

Link ID      ADV Router    Age         Seq#         Checksum
192.168.123.2 2.2.2.2      1346        0x80000002  0x007b73

R1#
```

- Để kiểm tra xem cấu hình đã đúng và R2 chỉ đi đến loopback 0 của R1 qua Serial hay chưa:

+ Tại R2, thực hiện ping 192.168.1.1:

```
R2#ping 192.168.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:

%SYS-5-CONFIG_I: Configured from console by console
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/6/8 ms
```

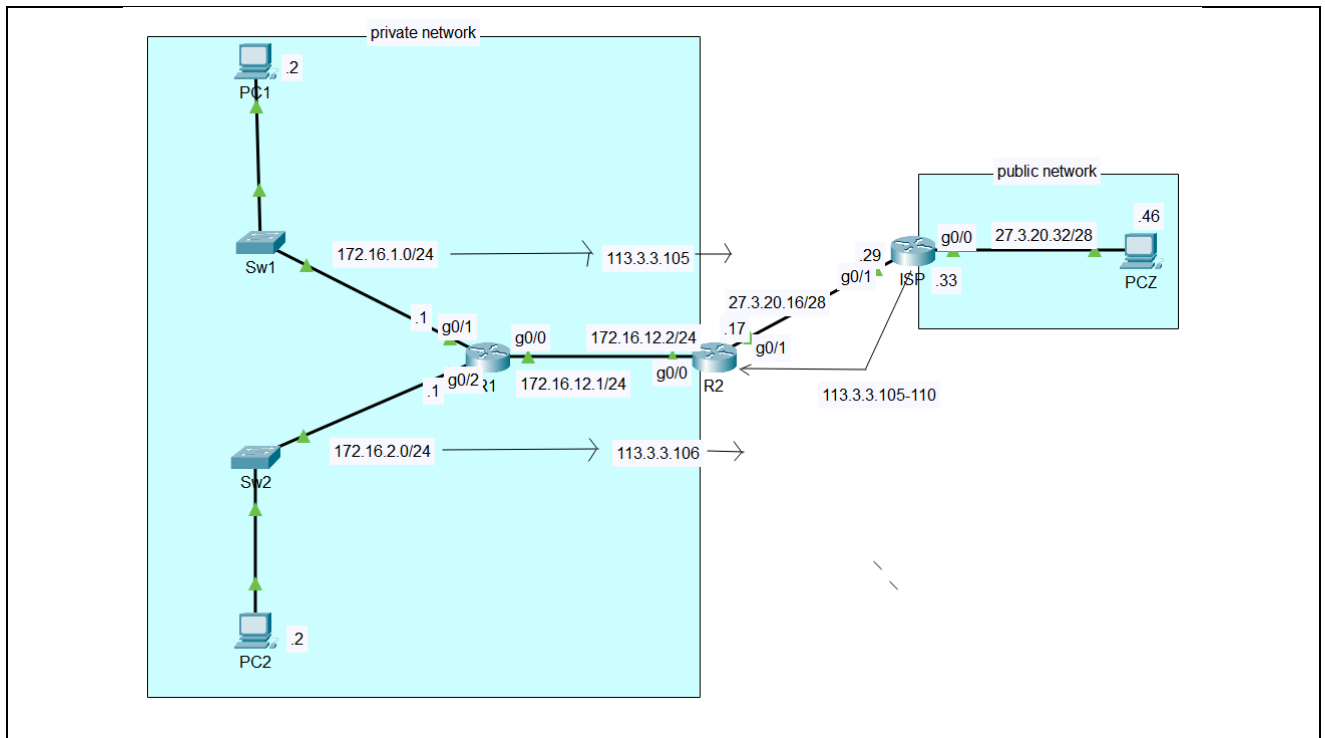
+ Sau đó dùng lệnh traceroute: Ta thấy từ R2 đến Lo0 của R1 đã đi qua IP của interface serial trên R1 là chính xác.

```
R2#traceroute 192.168.1.1
Type escape sequence to abort.
Tracing the route to 192.168.1.1

 1  192.168.12.1    10 msec   12 msec   5 msec
R2#
```

Vậy là đã hoàn thành yêu cầu số 3.

4. Yêu cầu 04:



4.1. Cấu hình cơ bản trên các thiết bị. Cấu hình cơ bản trên Router ISP cấp dải IP Public từ 113.3.3.105-110 cho khách hàng là R2.

- Cấu hình cơ bản trên R1:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
R1(config)#int g0/0
R1(config-if)#no shut

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

R1(config-if)#ip address 172.16.12.1 255.255.255.0
R1(config-if)#exit
R1(config)#int g0/1
R1(config-if)#ip address 172.16.1.1 255.255.255.0
R1(config-if)#no shut

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up

R1(config-if)#exit
R1(config)#int g0/2
R1(config-if)#ip address 172.16.2.1 255.255.255.0
R1(config-if)#no shut

R1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up
```

- Cấu hình cơ bản trên R2:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R2
R2(config)#int g0/0
R2(config-if)#ip address 172.16.12.2 255.255.255.0
R2(config-if)#no shut

R2(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

R2(config-if)#exit
R2(config)#int g0/1
R2(config-if)#ip address 27.3.20.17 255.255.255.240
R2(config-if)#no shut

R2(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
```

- Cấu hình cơ bản trên ISP:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname ISP
ISP(config)#int g0/0
ISP(config-if)#ip address 27.3.20.33 255.255.255.240
ISP(config-if)#no shut

ISP(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

ISP(config-if)#exit
ISP(config)#int g0/1
ISP(config-if)#ip address 27.3.20.29 255.255.255.240
ISP(config-if)#no shut

ISP(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
```

- Cấu hình trên ISP cấp dải IP Public từ 113.3.3.105-110 cho khách hàng là R2: định tuyến tĩnh cho các địa chỉ IP từ 113.3.3.105 đến 113.3.3.110 có thể được truy cập qua gateway 27.3.20.17, cho phép các gói tin đến và đi từ các địa chỉ IP này được định tuyến chính xác.

```
ISP(config)#no ip domain-lookup
ISP(config)#ip route 113.3.3.105 255.255.255.255 27.3.20.17
ISP(config)#ip route 113.3.3.106 255.255.255.255 27.3.20.17
ISP(config)#ip route 113.3.3.107 255.255.255.255 27.3.20.17
ISP(config)#ip route 113.3.3.108 255.255.255.255 27.3.20.17
ISP(config)#ip route 113.3.3.109 255.255.255.255 27.3.20.17
ISP(config)#ip route 113.3.3.110 255.255.255.255 27.3.20.17
```

- Cấu hình trên PC1, PC2, PCZ:

The image displays three screenshots of PC configuration windows, each showing the 'Desktop' tab with 'IP Configuration' settings for the 'FastEthernet0' interface. The settings are as follows:

PC	Interface	IP Configuration	IPv4 Address	Subnet Mask	Default Gateway	DNS Server
PC1	FastEthernet0	Static	172.16.1.2	255.255.255.0	172.16.1.1	0.0.0.0
PC2	FastEthernet0	Static	172.16.2.2	255.255.255.0	172.16.2.1	0.0.0.0
PCZ	FastEthernet0	Static	27.3.20.46	255.255.255.240	27.3.20.33	0.0.0.0

4.2. Routing: Cấu hình định tuyến trên Private Network đảm bảo mạng hội tụ.

- Trên R1:

```
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#no ip domain-lookup
R1(config)#ip route 0.0.0.0 0.0.0.0 172.16.12.2
```

- Trên R2:

```
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#no ip domain-lookup
R2(config)#ip route 172.16.1.0 255.255.255.0 172.16.12.1
R2(config)#ip route 172.16.2.0 255.255.255.0 172.16.12.1
R2(config)#ip route 0.0.0.0 0.0.0.0 27.3.20.29
```

4.3. PAT:

a. Cấu hình PAT trên R2 sao cho LAN 172.16.1.0/24 đi Internet bằng Public IP 113.3.3.105.

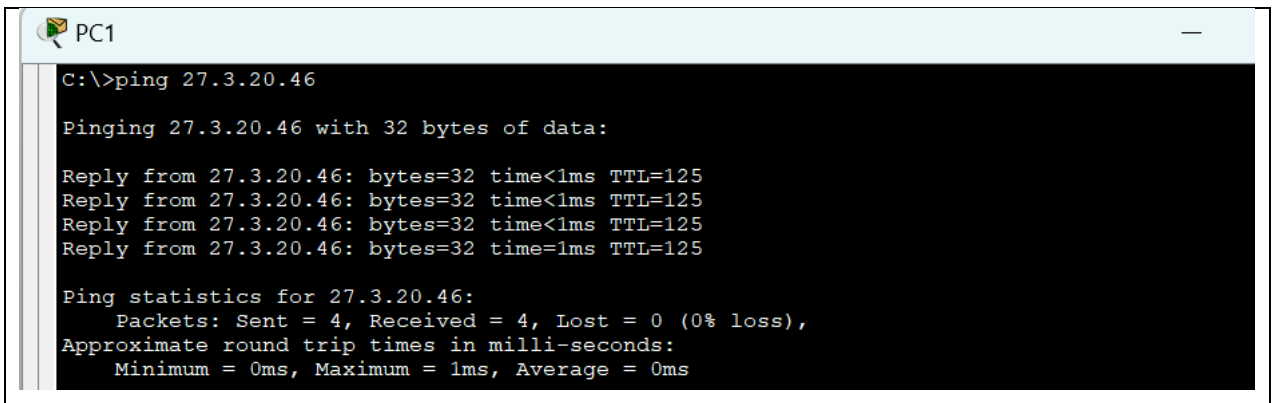
```
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#int g0/1
R2(config-if)#ip nat outside
R2(config-if)#exit
R2(config)#int g0/0
R2(config-if)#ip nat inside
R2(config-if)#exit

R2(config)#ip nat pool LAN1 113.3.3.105 113.3.3.105 netmask 255.255.255.252
R2(config)#access-list 1 permit 172.16.1.0 0.0.0.255
R2(config)#ip nat inside source list 1 pool LAN1 overload
```

b. Cấu hình PAT trên R2 sao cho LAN 172.16.2.0/24 đi Internet bằng Public IP 113.3.3.106

```
R2(config)#ip nat pool LAN2 113.3.3.106 113.3.3.106 netmask 255.255.255.252
R2(config)#access-list 2 permit 172.16.2.0 0.0.0.255
R2(config)#ip nat inside source list 2 pool LAN2 overload
```

→ **Kiểm tra:** Tại PC1 và PC2 thực hiện ping tới IP của PCZ là 27.3.20.46 rồi thực hiện kiểm tra NAT Table trên R2, thấy IP 172.16.1.2 và 172.16.2.2 trước khi gửi ra ngoài g0/1 của R2 đã được NAT thành 113.3.3.105 và 113.3.3.106 tương ứng.



```
PC1
C:\>ping 27.3.20.46

Pinging 27.3.20.46 with 32 bytes of data:

Reply from 27.3.20.46: bytes=32 time<1ms TTL=125
Reply from 27.3.20.46: bytes=32 time<1ms TTL=125
Reply from 27.3.20.46: bytes=32 time<1ms TTL=125
Reply from 27.3.20.46: bytes=32 time=1ms TTL=125

Ping statistics for 27.3.20.46:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```



```

PC2
C:\>ping 27.3.20.46

Pinging 27.3.20.46 with 32 bytes of data:

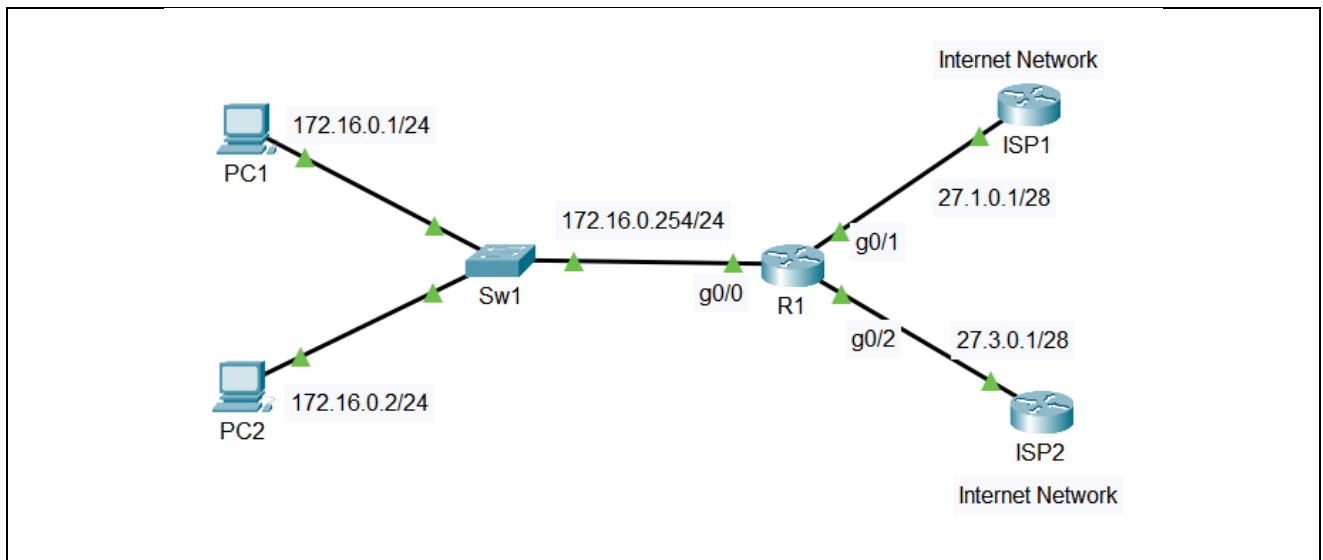
Reply from 27.3.20.46: bytes=32 time<1ms TTL=125
Reply from 27.3.20.46: bytes=32 time<1ms TTL=125
Reply from 27.3.20.46: bytes=32 time<1ms TTL=125
Reply from 27.3.20.46: bytes=32 time<1ms TTL=125

Ping statistics for 27.3.20.46:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

R2#show ip nat translation
Pro  Inside global      Inside local       Outside local      Outside global
icmp 113.3.3.105:36     172.16.1.2:36     27.3.20.46:36     27.3.20.46:36
icmp 113.3.3.105:37     172.16.1.2:37     27.3.20.46:37     27.3.20.46:37
icmp 113.3.3.105:38     172.16.1.2:38     27.3.20.46:38     27.3.20.46:38
icmp 113.3.3.105:39     172.16.1.2:39     27.3.20.46:39     27.3.20.46:39
icmp 113.3.3.106:19     172.16.2.2:19     27.3.20.46:19     27.3.20.46:19
icmp 113.3.3.106:20     172.16.2.2:20     27.3.20.46:20     27.3.20.46:20
icmp 113.3.3.106:21     172.16.2.2:21     27.3.20.46:21     27.3.20.46:21
icmp 113.3.3.106:22     172.16.2.2:22     27.3.20.46:22     27.3.20.46:22

```

5. Yêu cầu 05: Cấu hình PAT cân bằng tải qua 2 đường



5.1. Cấu hình cơ bản trên các thiết bị như hình.

- Cấu hình cơ bản trên R1:

```

Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
R1(config)#int g0/0
R1(config-if)#ip address 172.16.0.254 255.255.255.0
R1(config-if)#no shut

```

```
R1(config)#int g0/1
R1(config-if)#ip address 27.1.0.1 255.255.255.240
R1(config-if)#no shut

R1(config-if)#int g0/2
R1(config-if)#ip address 27.3.0.1 255.255.255.240
R1(config-if)#no shut
```

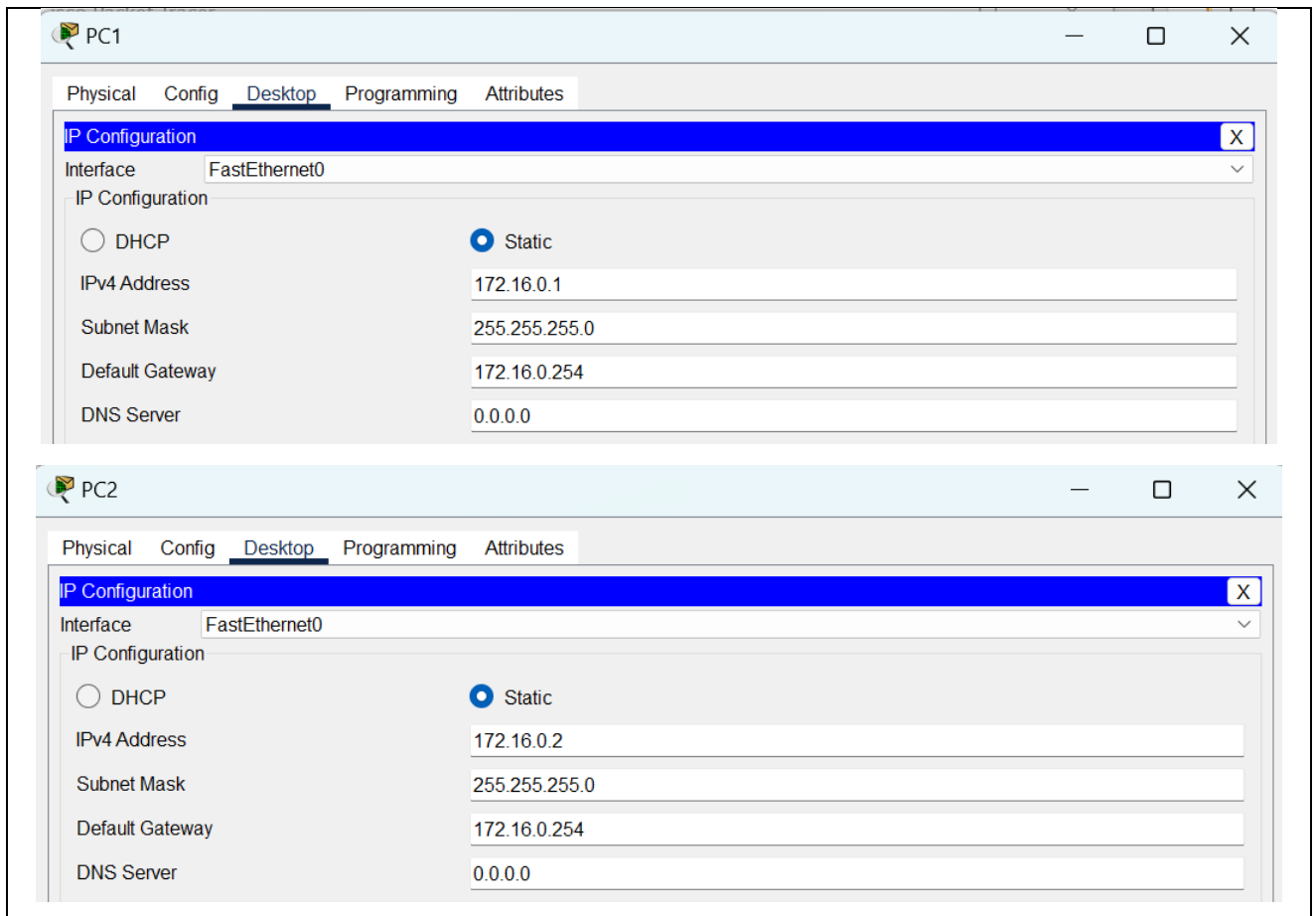
- Cấu hình cơ bản trên ISP1:

```
Router(config)#hostname ISP1
ISP1(config)#int g0/1
ISP1(config-if)#ip address 27.1.0.2 255.255.255.240
ISP1(config-if)#no shut
```

- Cấu hình cơ bản trên ISP2:

```
Router(config)#hostname ISP2
ISP2(config)#int g0/2
ISP2(config-if)#ip address 27.3.0.2 255.255.255.240
ISP2(config-if)#no shut
```

- Cấu hình trên PC1, PC2:



5.2. Cấu hình PAT cho phép mạng LAN 172.16.0.0/24 đi Internet thông qua 2 đường.

- Trên R1:

```
R1(config)#int g0/0
R1(config-if)#ip nat inside
R1(config-if)#exit
R1(config)#int g0/1
R1(config-if)#ip nat outside
R1(config-if)#exit
R1(config)#int g0/2
R1(config-if)#ip nat outside
R1(config-if)#exit
R1(config)#ip route 0.0.0.0 0.0.0.0 27.1.0.2
R1(config)#ip route 0.0.0.0 0.0.0.0 27.3.0.2

R1(config)#ip nat pool LAN1 27.1.0.1 27.1.0.1 netmask 255.255.255.252
R1(config)#access-list 1 permit 172.16.0.0 0.0.0.255
R1(config)#ip nat inside source list 1 pool LAN1 overload
R1(config)#ip nat pool LAN2 27.3.0.1 27.3.0.1 netmask 255.255.255.252
R1(config)#access-list 2 permit 172.16.0.0 0.0.0.255
R1(config)#ip nat inside source list 2 pool LAN2 overload
```

- Trên ISP1:

```
ISP1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
ISP1(config)#ip route 0.0.0.0 0.0.0.0 27.1.0.1
```

- Trên ISP2:

```
ISP2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
ISP2(config)#ip route 0.0.0.0 0.0.0.0 27.3.0.1
```

→ **Kiểm tra:** Tại PC1 và PC2 (172.16.0.0/24) thực hiện ping tới ISP1 và ISP2 rồi thực hiện kiểm tra NAT Table trên R1, thấy IP 172.16.0.1 và 172.16.0.2 trước khi gửi ra ngoài g0/1 và g0/2 của R1 đã được NAT thành 27.1.0.1.

PC1

Physical Config Desktop Programming Attributes

Command Prompt

```

C:\>ping 27.1.0.2

Pinging 27.1.0.2 with 32 bytes of data:

Reply from 27.1.0.2: bytes=32 time<1ms TTL=254
Reply from 27.1.0.2: bytes=32 time<1ms TTL=254
Reply from 27.1.0.2: bytes=32 time<1ms TTL=254
Reply from 27.1.0.2: bytes=32 time<1ms TTL=254

Ping statistics for 27.1.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 27.3.0.2

Pinging 27.3.0.2 with 32 bytes of data:

Reply from 27.3.0.2: bytes=32 time<1ms TTL=254
Reply from 27.3.0.2: bytes=32 time<1ms TTL=254
Reply from 27.3.0.2: bytes=32 time<1ms TTL=254
Reply from 27.3.0.2: bytes=32 time<1ms TTL=254

Ping statistics for 27.3.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

```

```

R1#show ip nat translation
Pro  Inside global      Inside local      Outside local      Outside global
icmp 27.1.0.1:25          172.16.0.1:25     27.1.0.2:25        27.1.0.2:25
icmp 27.1.0.1:26          172.16.0.1:26     27.1.0.2:26        27.1.0.2:26
icmp 27.1.0.1:27          172.16.0.1:27     27.1.0.2:27        27.1.0.2:27
icmp 27.1.0.1:28          172.16.0.1:28     27.1.0.2:28        27.1.0.2:28
icmp 27.1.0.1:29          172.16.0.1:29     27.3.0.2:29        27.3.0.2:29
icmp 27.1.0.1:30          172.16.0.1:30     27.3.0.2:30        27.3.0.2:30
icmp 27.1.0.1:31          172.16.0.1:31     27.3.0.2:31        27.3.0.2:31
icmp 27.1.0.1:32          172.16.0.1:32     27.3.0.2:32        27.3.0.2:32

```

PC2

Physical Config Desktop Programming Attributes

Command Prompt

```

C:\>ping 27.1.0.2

Pinging 27.1.0.2 with 32 bytes of data:

Reply from 27.1.0.2: bytes=32 time<1ms TTL=254
Reply from 27.1.0.2: bytes=32 time<1ms TTL=254
Reply from 27.1.0.2: bytes=32 time<1ms TTL=254
Reply from 27.1.0.2: bytes=32 time<1ms TTL=254

Ping statistics for 27.1.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 27.3.0.2

Pinging 27.3.0.2 with 32 bytes of data:

Reply from 27.3.0.2: bytes=32 time<1ms TTL=254
Reply from 27.3.0.2: bytes=32 time<1ms TTL=254
Reply from 27.3.0.2: bytes=32 time<1ms TTL=254
Reply from 27.3.0.2: bytes=32 time<1ms TTL=254

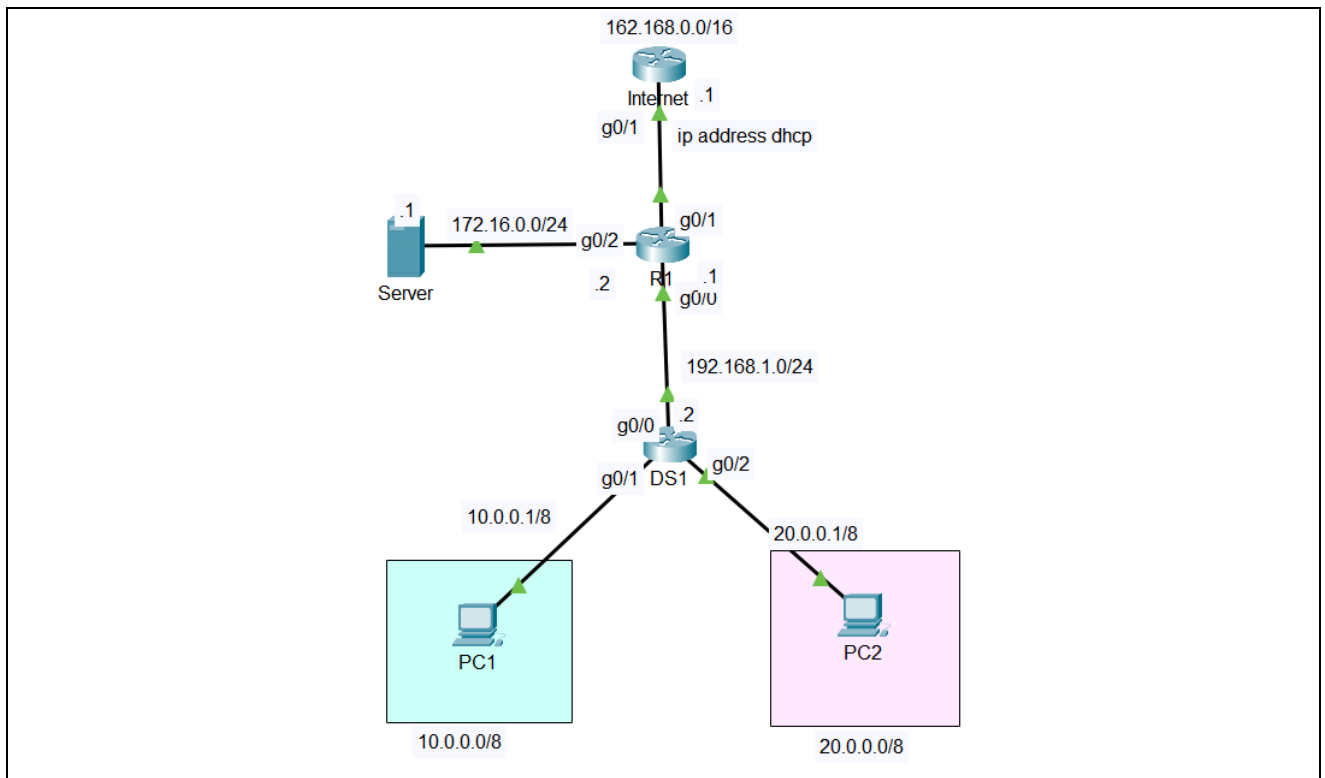
Ping statistics for 27.3.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

```

R1#show ip nat translation

Pro	Inside global	Inside local	Outside local	Outside global
icmp	27.1.0.1:17	172.16.0.2:17	27.3.0.2:17	27.3.0.2:17
icmp	27.1.0.1:18	172.16.0.2:18	27.3.0.2:18	27.3.0.2:18
icmp	27.1.0.1:19	172.16.0.2:19	27.3.0.2:19	27.3.0.2:19
icmp	27.1.0.1:20	172.16.0.2:20	27.3.0.2:20	27.3.0.2:20
icmp	27.1.0.1:21	172.16.0.2:21	27.1.0.2:21	27.1.0.2:21
icmp	27.1.0.1:22	172.16.0.2:22	27.1.0.2:22	27.1.0.2:22
icmp	27.1.0.1:23	172.16.0.2:23	27.1.0.2:23	27.1.0.2:23
icmp	27.1.0.1:24	172.16.0.2:24	27.1.0.2:24	27.1.0.2:24

6. Yêu cầu 06: Cấu hình ACL



6.1. Cấu hình cơ bản trên các thiết bị.

- Trên R1:

```
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
R1(config)#int g0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shut

R1(config)#int g0/2
R1(config-if)#ip address 172.16.0.2 255.255.255.0
R1(config-if)#no shut

R1(config)#int g0/1
R1(config-if)#ip address dhcp
R1(config-if)#no shut
```

- Trên DS1:

```

Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname DS1
DS1(config)#int g0/0
DS1(config-if)#ip address 192.168.1.2 255.255.255.0
DS1(config-if)#no shut

DS1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

DS1(config-if)#exit
DS1(config)#int g0/1
DS1(config-if)#ip address 10.0.0.1 255.0.0.0
DS1(config-if)#no shut

DS1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up

DS1(config-if)#exit
DS1(config)#int g0/2
DS1(config-if)#ip address 20.0.0.1 255.0.0.0
DS1(config-if)#no shut

```

- Trên ISP (internet):

```

Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname Internet
Internet(config)#int g0/1
Internet(config-if)#ip address 162.168.0.1 255.255.0.0
Internet(config-if)#no shut

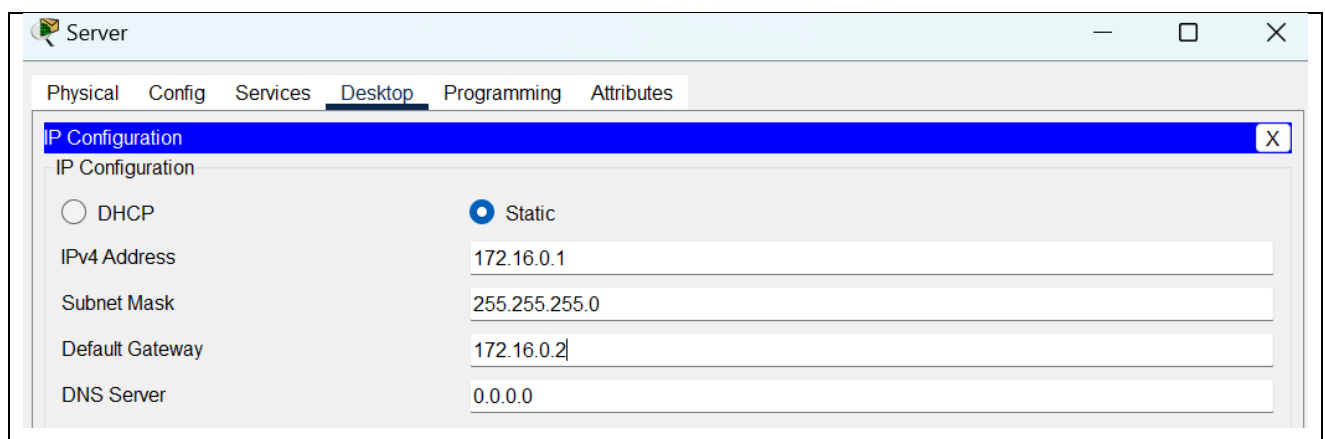
Internet(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up

Internet(config-if)#exit
Internet(config)#ip dhcp pool NET
Internet(dhcp-config)#network 162.168.0.0 255.255.0.0
Internet(dhcp-config)#default-router 162.168.0.1
Internet(dhcp-config)#exit

```

- Trên Server:



6.2. Routing: Cấu hình định tuyến trên các router đảm bảo mạng hội tụ.

- Trên R1:

```
R1(config)#router ospf 1
R1(config-router)#passive-interface g0/2
R1(config-router)#network 162.168.0.0 0.0.255.255 area 1
R1(config-router)#network 172.16.0.0 0.0.0.255 area 0
R1(config-router)#network 192.168.1.0 0.0.0.255 area 0
```

- Trên DS1:

```
DS1(config)#router ospf 1
DS1(config-router)#passive-interface g0/1
DS1(config-router)#passive-interface g0/2
DS1(config-router)#network 192.168.1.0 0.0.0.255 area 0
DS1(config-router)#network 10.0.0.
00:39:59: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.1.1 on GigabitEthernet0/0 from LOADING to FULL, Loading Done

^
% Invalid input detected at '^' marker.

DS1(config-router)#network 10.0.0.0 0.255.255.255 area 0
DS1(config-router)#network 20.0.0.0 0.255.255.255 area 0
DS1(config-router)#
```

→ Kiểm tra, trên từng Router (R1, DS1) và Server thực hiện ping qua lại với nhau:

```
R1#ping 192.168.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

R1#ping 10.0.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

R1#ping 20.0.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 20.0.0.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

R1#ping 172.16.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.1, timeout is 2 seconds:
..!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0 ms
```



```

DS1#ping 192.168.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

DS1#ping 172.16.0.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

DS1#ping 172.16.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

```

```

Server
Physical Config Services Desktop Programming Attributes
Command Prompt

Cisco Packet Tracer SERVER Command Line 1.0
C:\>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time<1ms TTL=255
Reply from 192.168.1.1: bytes=32 time<1ms TTL=255
Reply from 192.168.1.1: bytes=32 time<1ms TTL=255
Reply from 192.168.1.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 172.16.0.2

Pinging 172.16.0.2 with 32 bytes of data:

Reply from 172.16.0.2: bytes=32 time<1ms TTL=255
Reply from 172.16.0.2: bytes=32 time<1ms TTL=255
Reply from 172.16.0.2: bytes=32 time<1ms TTL=255
Reply from 172.16.0.2: bytes=32 time<1ms TTL=255

Ping statistics for 172.16.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Reply from 192.168.1.2: bytes=32 time<1ms TTL=254
Reply from 192.168.1.2: bytes=32 time<1ms TTL=254
Reply from 192.168.1.2: bytes=32 time<1ms TTL=254
Reply from 192.168.1.2: bytes=32 time<1ms TTL=254

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

```

```

Server
Physical Config Services Desktop Programming Attributes
Command Prompt

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.1.2

Pinging 192.168.1.2 with 32 bytes of data:

Reply from 192.168.1.2: bytes=32 time<1ms TTL=254
Reply from 192.168.1.2: bytes=32 time<1ms TTL=254
Reply from 192.168.1.2: bytes=32 time<1ms TTL=254
Reply from 192.168.1.2: bytes=32 time<1ms TTL=254

Ping statistics for 192.168.1.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time<1ms TTL=254
Reply from 10.0.0.1: bytes=32 time<1ms TTL=254
Reply from 10.0.0.1: bytes=32 time=8ms TTL=254
Reply from 10.0.0.1: bytes=32 time<1ms TTL=254

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 8ms, Average = 2ms

C:\>ping 20.0.0.1

Pinging 20.0.0.1 with 32 bytes of data:

Reply from 20.0.0.1: bytes=32 time<1ms TTL=254
Reply from 20.0.0.1: bytes=32 time<1ms TTL=254
Reply from 20.0.0.1: bytes=32 time<1ms TTL=254
Reply from 20.0.0.1: bytes=32 time<1ms TTL=254

Ping statistics for 20.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

```

6.3. NAT: Cấu hình PAT (NAT Overload) trên R1 đảm bảo hệ thống mạng nội bộ có thể đi Internet.

- Trên R1:

+ Cấu hình Default Route:

```

R1(config)#ip route 0.0.0.0 0.0.0.0 162.168.0.1
R1(config)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 162.168.0.1 to network 0.0.0.0

O    10.0.0.0/8 [110/2] via 192.168.1.2, 00:21:35, GigabitEthernet0/0
O    20.0.0.0/8 [110/2] via 192.168.1.2, 00:21:25, GigabitEthernet0/0
     162.168.0.0/16 is variably subnetted, 2 subnets, 2 masks
C     162.168.0.0/16 is directly connected, GigabitEthernet0/1
L     162.168.0.2/32 is directly connected, GigabitEthernet0/1
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C     172.16.0.0/24 is directly connected, GigabitEthernet0/2
L     172.16.0.2/32 is directly connected, GigabitEthernet0/2
     192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C     192.168.1.0/24 is directly connected, GigabitEthernet0/0
L     192.168.1.1/32 is directly connected, GigabitEthernet0/0
S*   0.0.0.0/0 [1/0] via 162.168.0.1

```

+ Cấu hình Standard ACL để ra Internet:

```

R1(config)#int g0/1
R1(config-if)#ip nat outside
R1(config-if)#exit
R1(config)#int g0/0
R1(config-if)#ip nat inside
R1(config-if)#exit
R1(config)#int g0/2
R1(config-if)#ip nat inside

R1(config)#access-list 1 permit 10.0.0.0 0.255.255.255
R1(config)#access-list 1 permit 20.0.0.0 0.255.255.255
R1(config)#access-list 1 permit 172.16.0.0 0.0.0.255
R1(config)#access-list 1 permit 192.168.1.0 0.0.0.255
R1(config)#ip nat inside source list 1 interface g0/1 overload

R1#show access-list
Standard IP access list 1
 10 permit 10.0.0.0 0.255.255.255
 20 permit 20.0.0.0 0.255.255.255
 30 permit 172.16.0.0 0.0.0.255 (8 match(es))
 40 permit 192.168.1.0 0.0.0.255 (10 match(es))

```

→ Kiểm tra, trên R1, DS1 và Server thực hiện ping tới ISP (Internet) 162.168.0.1:

```

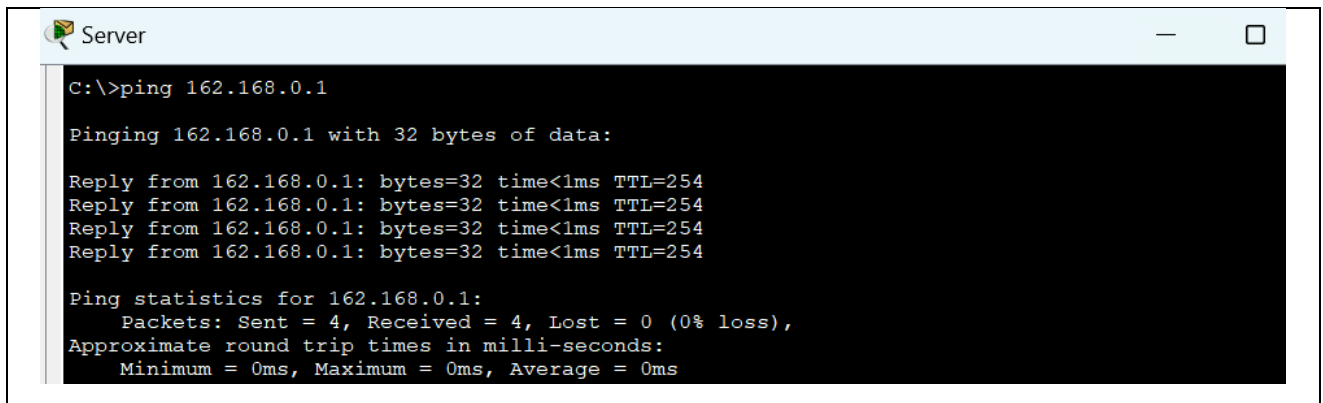
R1#ping 162.168.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 162.168.0.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

DS1>en
DS1#ping 162.168.0.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 162.168.0.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

```



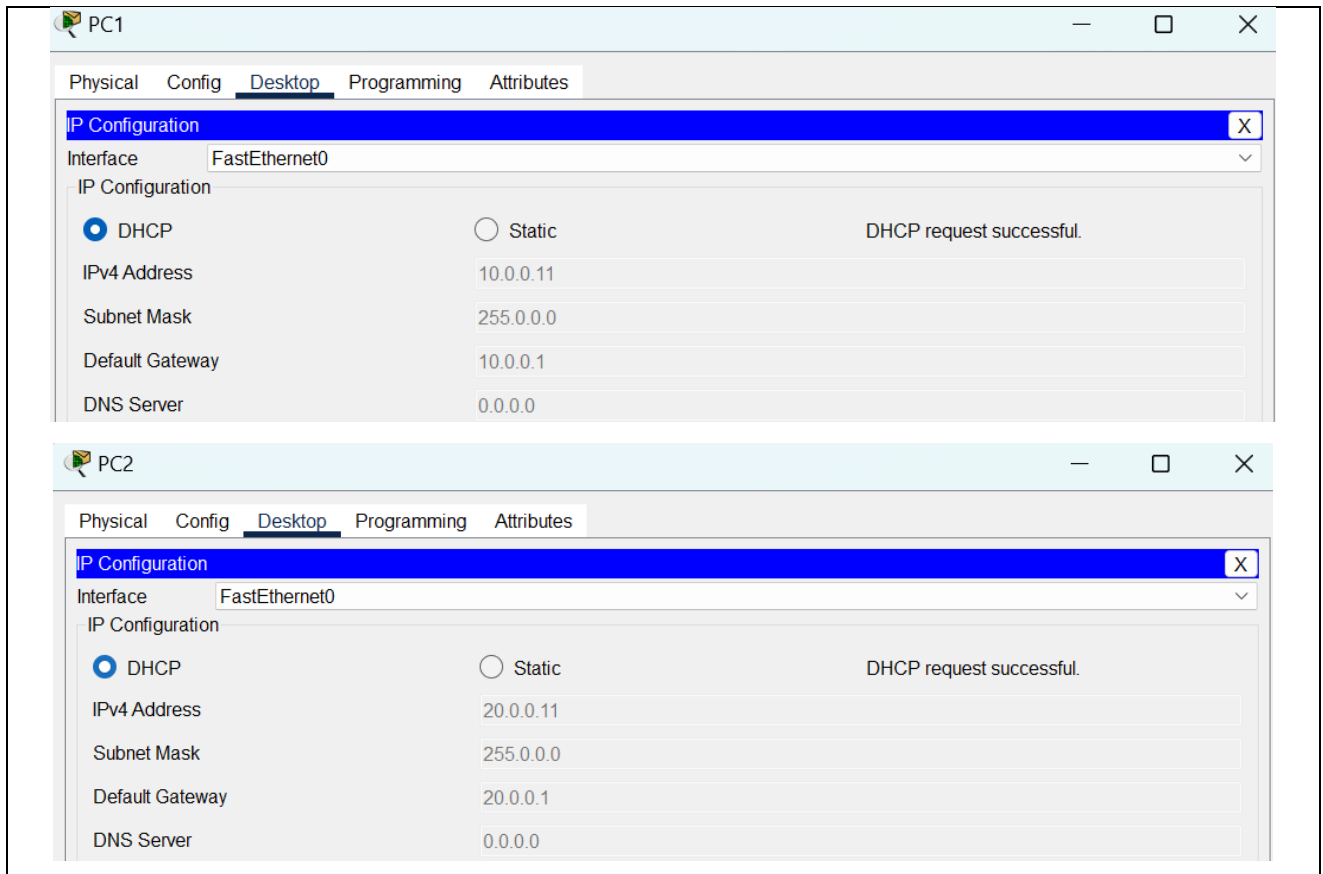
6.4. DHCP: Cấu hình DHCP Server trên DS1 cấp IP xuống cho các PC.

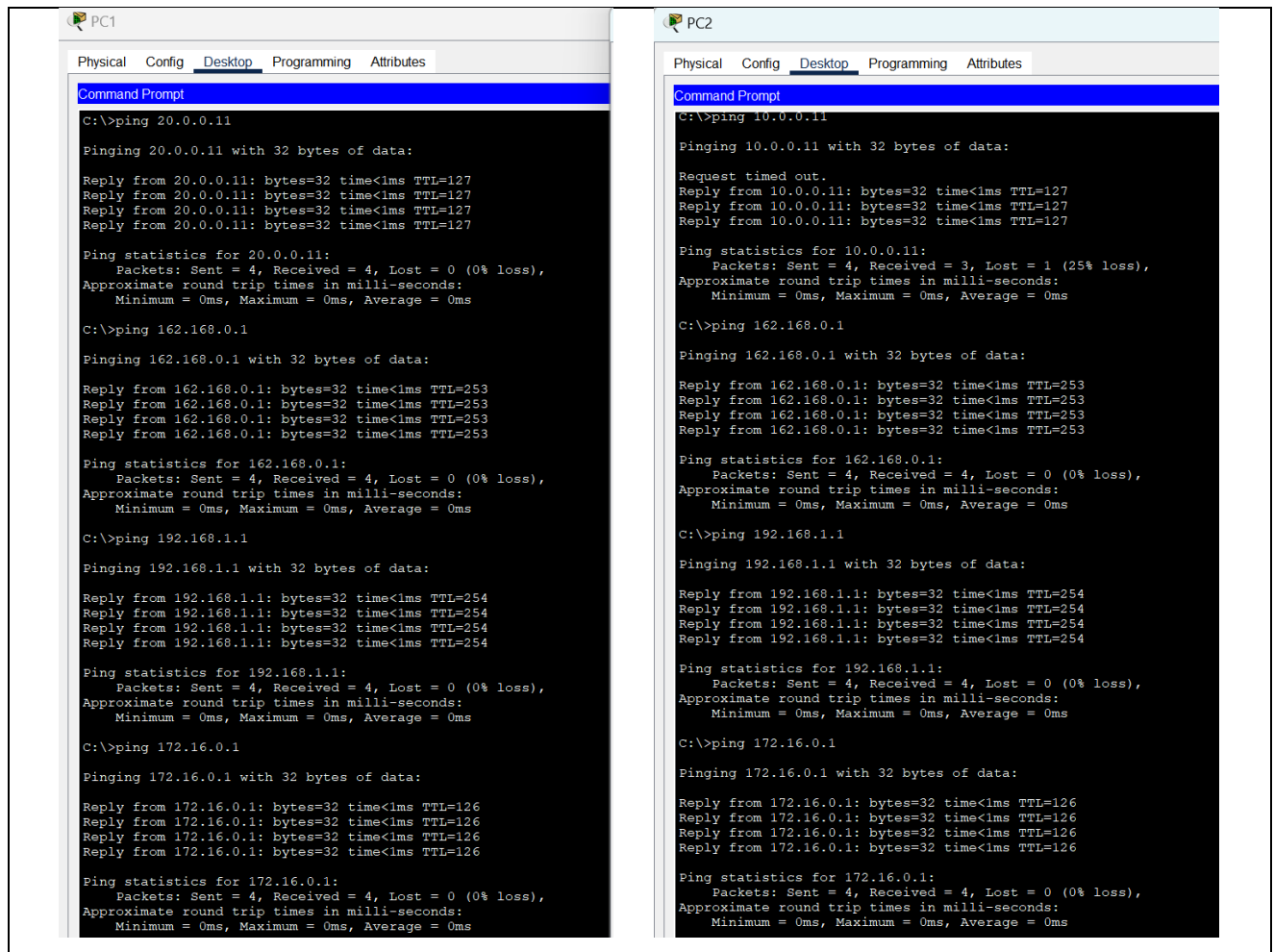
- Trên DS1:

```

DS1(config)#ip dhcp excluded-address 10.0.0.1 10.0.0.10
DS1(config)#ip dhcp excluded-address 20.0.0.1 20.0.0.10
DS1(config)#ip dhcp pool LAN1
DS1(dhcp-config)#network 10.0.0.0 255.0.0.0
DS1(dhcp-config)#default-router 10.0.0.1
DS1(dhcp-config)#exit
DS1(config)#ip dhcp pool LAN2
DS1(dhcp-config)#network 20.0.0.0 255.0.0.0
DS1(dhcp-config)#default-router 20.0.0.1
DS1(dhcp-config)#exit
  
```

→ Kiểm tra IP PC1 và PC2:





6.5. ACL:

a. Cấu hình ACL trên R1 sao cho chỉ cho phép các PC thuộc lớp mạng 10.0.0.0/8 telnet tới R1.

```

R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#access-list 100 permit tcp 10.0.0.0 0.255.255.255 any eq 23
R1(config)#access-list 100 deny tcp any any eq 23
R1(config)#access-list 100 permit ip any any
R1(config)#line vty 0 4
R1(config-line)#access-class 100 in
R1(config-line)#end
  
```

→ Kiểm tra kết nối telnet R1 từ PC1 (thuộc lớp mạng 10.0.0.0/8) thành công, từ PC2 (thuộc lớp mạng 20.0.0.0/8) và Server (172.16.0.0/24) không telnet được với R1 nhưng ping vẫn bình thường.

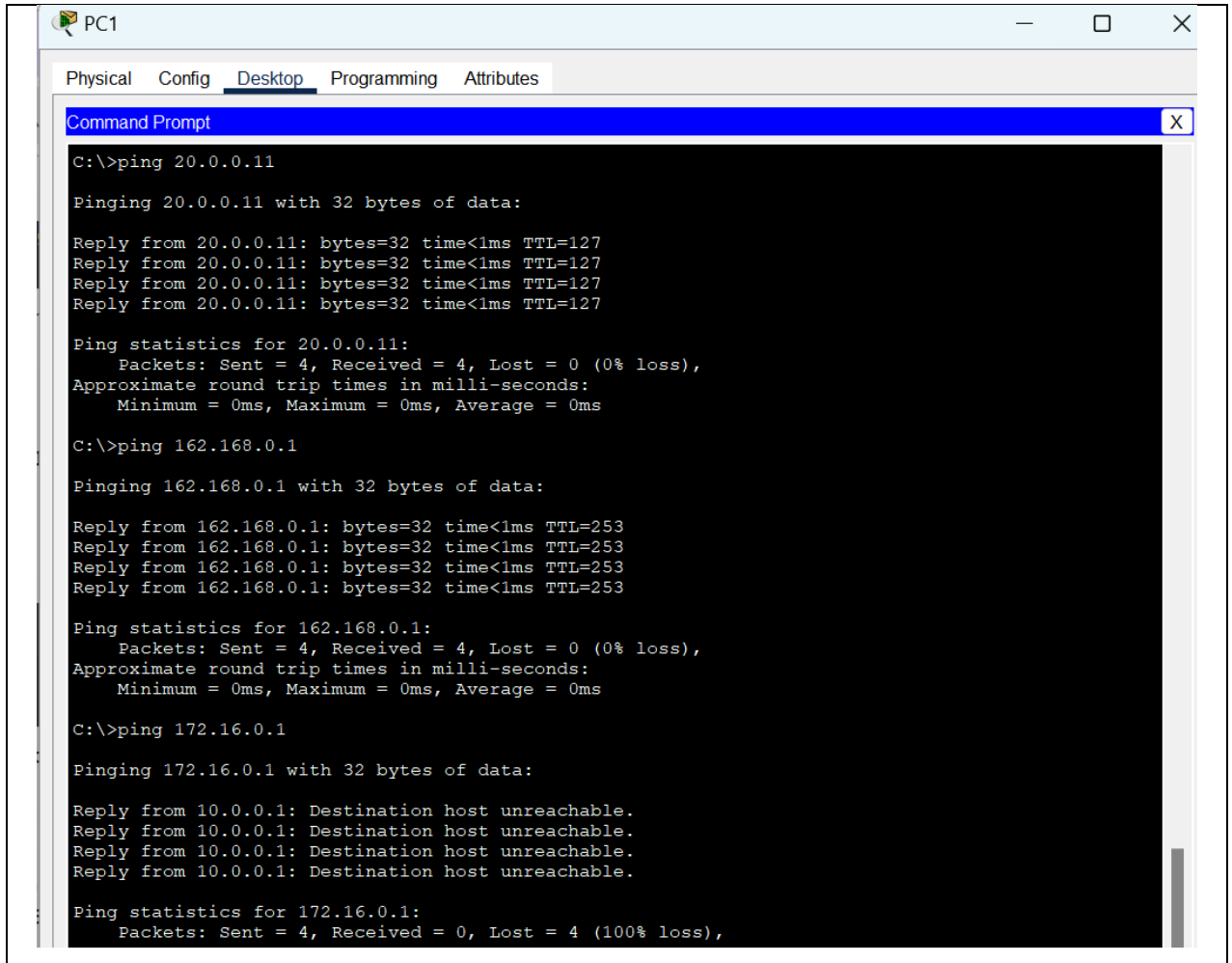
The image displays three terminal windows, each representing a different device in a network configuration. Each window shows the results of a telnet and a ping command to the IP address 192.168.1.1.

- PC1:** The telnet command is successful, opening a connection. The ping command also succeeds, showing four replies with 32 bytes of data, a time of less than 1ms, and a TTL of 254. The ping statistics show 4 packets sent, 4 received, and 0% loss.
- Server:** The telnet command is refused by the remote host. The ping command succeeds, showing four replies with 32 bytes of data, a time of less than 1ms, and a TTL of 255. The ping statistics show 4 packets sent, 4 received, and 0% loss.
- PC2:** The telnet command is refused by the remote host. The ping command succeeds, showing four replies with 32 bytes of data, a time of less than 1ms, and a TTL of 254. The ping statistics show 4 packets sent, 4 received, and 0% loss.

b. Cấu hình ACL trên DS1 sao cho các PC thuộc lớp mạng 10.0.0.0/8 không được truy cập Server, nhưng vẫn đi được Internet.

```
DS1(config)#access-list 101 deny ip 10.0.0.0 0.255.255.255 172.16.0.0 0.0.0.255
DS1(config)#access-list 101 permit ip 10.0.0.0 0.255.255.255 162.168.0.0 0.0.255.255
DS1(config)#access-list 101 permit ip 10.0.0.0 0.255.255.255 any
DS1(config)#int g0/1
DS1(config-if)#ip access-group 101 in
```

→ Kiểm tra thấy PC1 (thuộc 10.0.0.0/8) không ping được Server, nhưng có thể ping ISP (Internet) và 20.0.0.0/8.



c. Cấu hình ACL trên DS1 sao cho các PC thuộc lớp mạng 20.0.0.0/8 được truy cập Server nhưng không được truy cập Internet.

```

DS1(config)#access-list 102 deny ip 20.0.0.0 0.255.255.255 162.168.0.0 0.0.255.255
DS1(config)#access-list 102 permit ip 20.0.0.0 0.255.255.255 172.16.0.0 0.0.0.255
DS1(config)#access-list 102 permit ip 20.0.0.0 0.255.255.255 any
DS1(config)#access-list 102 permit ip any any
DS1(config)#int g0/2
DS1(config-if)#ip access-group 102 in
DS1(config-if)#end
  
```

→ Kiểm tra thấy PC2 (thuộc 20.0.0.0/8) ping được Server và R1 và 10.0.0.0/8, nhưng không ping ISP (Internet) được.


```

PC2
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time<1ms TTL=254
Reply from 192.168.1.1: bytes=32 time<1ms TTL=254
Reply from 192.168.1.1: bytes=32 time<1ms TTL=254
Reply from 192.168.1.1: bytes=32 time<1ms TTL=254

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 172.16.0.1

Pinging 172.16.0.1 with 32 bytes of data:

Reply from 172.16.0.1: bytes=32 time<1ms TTL=126
Reply from 172.16.0.1: bytes=32 time<1ms TTL=126
Reply from 172.16.0.1: bytes=32 time<1ms TTL=126
Reply from 172.16.0.1: bytes=32 time<1ms TTL=126

Ping statistics for 172.16.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 162.168.0.1

Pinging 162.168.0.1 with 32 bytes of data:

Reply from 20.0.0.1: Destination host unreachable.
Reply from 20.0.0.1: Destination host unreachable.
Reply from 20.0.0.1: Destination host unreachable.
Reply from 20.0.0.1: Destination host unreachable.

Ping statistics for 162.168.0.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 10.0.0.11

Pinging 10.0.0.11 with 32 bytes of data:

Reply from 10.0.0.11: bytes=32 time<1ms TTL=127
Reply from 10.0.0.11: bytes=32 time<1ms TTL=127
Reply from 10.0.0.11: bytes=32 time<1ms TTL=127
Reply from 10.0.0.11: bytes=32 time<1ms TTL=127

Ping statistics for 10.0.0.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

```

d. Cấu hình ACL trên DS1 sao cho chỉ cho phép PC có IP 10.0.0.100 được quyền telnet tới R1, tất cả các IP còn lại đều bị cấm

```

DS1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DS1(config)#access-list 103 permit tcp host 10.0.0.100 host 192.168.1.1 eq 23
DS1(config)#access-list 103 deny tcp any host 192.168.1.1 eq 23
DS1(config)#access-list 103 permit ip any any
DS1(config)#int g0/0
DS1(config-if)#ip access-group 103 out

```

→ Kiểm tra thấy PC (có IP 10.0.0.100) telnet được R1, nhưng PC khác (có IP không phải 10.0.0.100) thì không connect được, bị timeout và không phản hồi.

- Với IP của PC1 (10.0.0.11) và PC2 (20.0.0.11) được cấp phát tự động: tất cả các ACL trước đó vẫn hoạt động bình thường, và cả 2 PC đều không telnet được tới R1 nhưng vẫn có thể ping bình thường.

PC1

Physical Config Desktop Programming Attributes

Command Prompt

```
C:\>ping 162.168.0.1

Pinging 162.168.0.1 with 32 bytes of data:

Reply from 162.168.0.1: bytes=32 time=8ms TTL=253
Reply from 162.168.0.1: bytes=32 time<1ms TTL=253
Reply from 162.168.0.1: bytes=32 time<1ms TTL=253
Reply from 162.168.0.1: bytes=32 time<1ms TTL=253

Ping statistics for 162.168.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 8ms, Average = 2ms

C:\>ping 172.16.0.1

Pinging 172.16.0.1 with 32 bytes of data:

Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.

Ping statistics for 172.16.0.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 20.0.0.11

Pinging 20.0.0.11 with 32 bytes of data:

Reply from 20.0.0.11: bytes=32 time<1ms TTL=127
Reply from 20.0.0.11: bytes=32 time<1ms TTL=127
Reply from 20.0.0.11: bytes=32 time<1ms TTL=127
Reply from 20.0.0.11: bytes=32 time<1ms TTL=127

Ping statistics for 20.0.0.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time<1ms TTL=254
Reply from 192.168.1.1: bytes=32 time<1ms TTL=254
Reply from 192.168.1.1: bytes=32 time<1ms TTL=254
Reply from 192.168.1.1: bytes=32 time<1ms TTL=254

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>telnet 192.168.1.1
Trying 192.168.1.1 ...
% Connection timed out; remote host not responding
```

PC2

Physical Config Desktop Programming Attributes

Command Prompt

```
C:\>ping 162.168.0.1

Pinging 162.168.0.1 with 32 bytes of data:

Reply from 20.0.0.1: Destination host unreachable.
Reply from 20.0.0.1: Destination host unreachable.
Reply from 20.0.0.1: Destination host unreachable.
Reply from 20.0.0.1: Destination host unreachable.

Ping statistics for 162.168.0.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 10.0.0.11

Pinging 10.0.0.11 with 32 bytes of data:

Reply from 10.0.0.11: bytes=32 time=9ms TTL=127
Reply from 10.0.0.11: bytes=32 time<1ms TTL=127
Reply from 10.0.0.11: bytes=32 time<1ms TTL=127
Reply from 10.0.0.11: bytes=32 time<1ms TTL=127

Ping statistics for 10.0.0.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 9ms, Average = 2ms

C:\>ping 172.16.0.1

Pinging 172.16.0.1 with 32 bytes of data:

Reply from 172.16.0.1: bytes=32 time<1ms TTL=126
Reply from 172.16.0.1: bytes=32 time<1ms TTL=126
Reply from 172.16.0.1: bytes=32 time<1ms TTL=126
Reply from 172.16.0.1: bytes=32 time<1ms TTL=126

Ping statistics for 172.16.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time<1ms TTL=254
Reply from 192.168.1.1: bytes=32 time<1ms TTL=254
Reply from 192.168.1.1: bytes=32 time<1ms TTL=254
Reply from 192.168.1.1: bytes=32 time<1ms TTL=254

Ping statistics for 192.168.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>telnet 192.168.1.1
Trying 192.168.1.1 ...
% Connection timed out; remote host not responding
```

- Sửa IP của PC1 về static và đặt thành (10.0.0.100): tất cả các ACL trước đó vẫn hoạt động bình thường, và PC có thể telnet được tới R1

PC1

Physical Config Desktop Programming Attributes

Command Prompt

```

C:\>ipconfig

FastEthernet0 Connection: (default port)

    Connection-specific DNS Suffix.:
    Link-local IPv6 Address.....: FE80::210:11FF:FE95:43B7
    IPv6 Address.....: ::
    IPv4 Address.....: 10.0.0.100
    Subnet Mask.....: 255.0.0.0
    Default Gateway.....: ::
                        10.0.0.1

Bluetooth Connection:

    Connection-specific DNS Suffix.:
    Link-local IPv6 Address.....: ::
    IPv6 Address.....: ::
    IPv4 Address.....: 0.0.0.0
    Subnet Mask.....: 0.0.0.0
    Default Gateway.....: ::
                        0.0.0.0

C:\>ping 162.168.0.1

Pinging 162.168.0.1 with 32 bytes of data:

Request timed out.
Reply from 162.168.0.1: bytes=32 time<1ms TTL=253
Reply from 162.168.0.1: bytes=32 time<1ms TTL=253

Ping statistics for 162.168.0.1:
    Packets: Sent = 3, Received = 2, Lost = 1 (34% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

Control-C
^C
C:\>ping 172.16.0.1

Pinging 172.16.0.1 with 32 bytes of data:

Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.

Ping statistics for 172.16.0.1:
    Packets: Sent = 3, Received = 0, Lost = 3 (100% loss),

Control-C
^C

```

PC1

Physical Config Desktop Programming Attributes

Command Prompt

```

Control-C
^C
C:\>ping 172.16.0.1

Pinging 172.16.0.1 with 32 bytes of data:

Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.
Reply from 10.0.0.1: Destination host unreachable.

Ping statistics for 172.16.0.1:
    Packets: Sent = 3, Received = 0, Lost = 3 (100% loss),

Control-C
^C
C:\>ping 20.0.0.11

Pinging 20.0.0.11 with 32 bytes of data:

Request timed out.
Reply from 20.0.0.11: bytes=32 time<1ms TTL=127
Reply from 20.0.0.11: bytes=32 time<1ms TTL=127

Ping statistics for 20.0.0.11:
    Packets: Sent = 3, Received = 2, Lost = 1 (34% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

Control-C
^C
C:\>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time<1ms TTL=254
Reply from 192.168.1.1: bytes=32 time<1ms TTL=254

Ping statistics for 192.168.1.1:
    Packets: Sent = 2, Received = 2, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

Control-C
^C
C:\>telnet 192.168.1.1
Trying 192.168.1.1 ...Open

[Connection to 192.168.1.1 closed by foreign host]
C:\>

```

--- HẾT ---