



BÁO CÁO THỰC HÀNH

Bài thực hành số 01: ROUTING CONCEPTS AND STATIC ROUTING

Môn học: Quản trị mạng và hệ thống

Lớp: NT132.P11.ANTT.2

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10

ĐÁNH GIÁ KHÁC:

Tổng thời gian thực hiện	2 tuần
Phân chia công việc	
Ý kiến (nếu có) + Khó khăn + Đề xuất, kiến nghị	

Phần bên dưới của báo cáo này là báo cáo chi tiết của nhóm thực hiện

MỤC LỤC

A. BÁO CÁO CHI TIẾT	3
1. Task 1: Tìm hiểu tổng quan về router và các khái niệm về routing (1đ)	3
2. Task 2: Cấu hình router cơ bản và định tuyến tĩnh (3đ)	3
3. Task 3: Chia mạng con (subnetting) và định tuyến (4đ)	8
4. Task 3: Mở rộng (2đ)	33
a. Task 3.1:.....	34
b. Task 3.2:.....	35
B. TÀI LIỆU THAM KHẢO.....	37

A. BÁO CÁO CHI TIẾT

1. Task 1: Tìm hiểu tổng quan về router và các khái niệm về routing (1đ)

2. Task 2: Cấu hình router cơ bản và định tuyến tĩnh (3đ)

Yêu cầu: Xây dựng mô hình mạng gồm các thiết bị như trong sơ đồ mạng trên phần mềm Packet Tracer và thực hiện các yêu cầu sau:

1. Đặt hostname tương ứng cho các thiết bị như trong mô hình.

- R1:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
R1(config)#
```

- R2:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R2
R2(config)#
```

- R3:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R3
R3(config)#
```

2. Trên Router, đặt mật khẩu cho các mode privileged EXEC, user EXEC và Telnet remote access là uitscisco, mã hóa các mật khẩu này.

- R1:

```
R1(config)#enable secret uitscisco
R1(config)#line console 0
R1(config-line)#password uitscisco
R1(config-line)#login
R1(config-line)#exit
R1(config)#line vty 0 4
R1(config-line)#password uitscisco
R1(config-line)#login
R1(config-line)#exit
R1(config)#service password-encryption
```

- R2:

```
R2(config)#enable secret uitscisco
R2(config)#line console 0
R2(config-line)#password uitscisco
R2(config-line)#login
R2(config-line)#exit
R2(config)#line vty 0 4
R2(config-line)#password uitscisco
R2(config-line)#login
R2(config-line)#exit
R2(config)#service password-encryption
```

- R3:

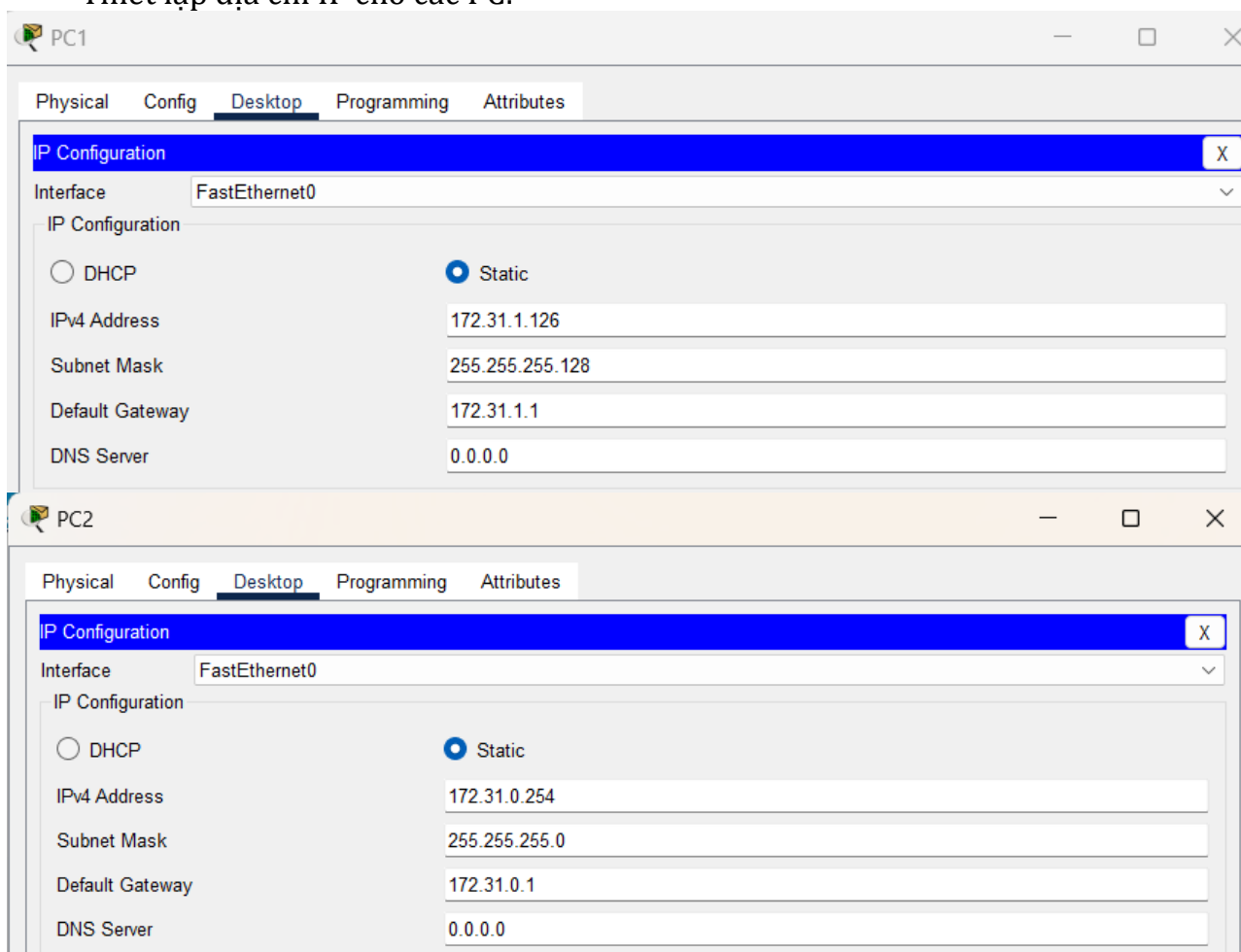
```
R3(config)#enable secret uitscisco
R3(config)#line console 0
R3(config-line)#password uitscisco
R3(config-line)#login
R3(config-line)#exit
R3(config)#line vty 0 4
R3(config-line)#password uitscisco
R3(config-line)#login
R3(config-line)#exit
R3(config)#service password-encryption
```

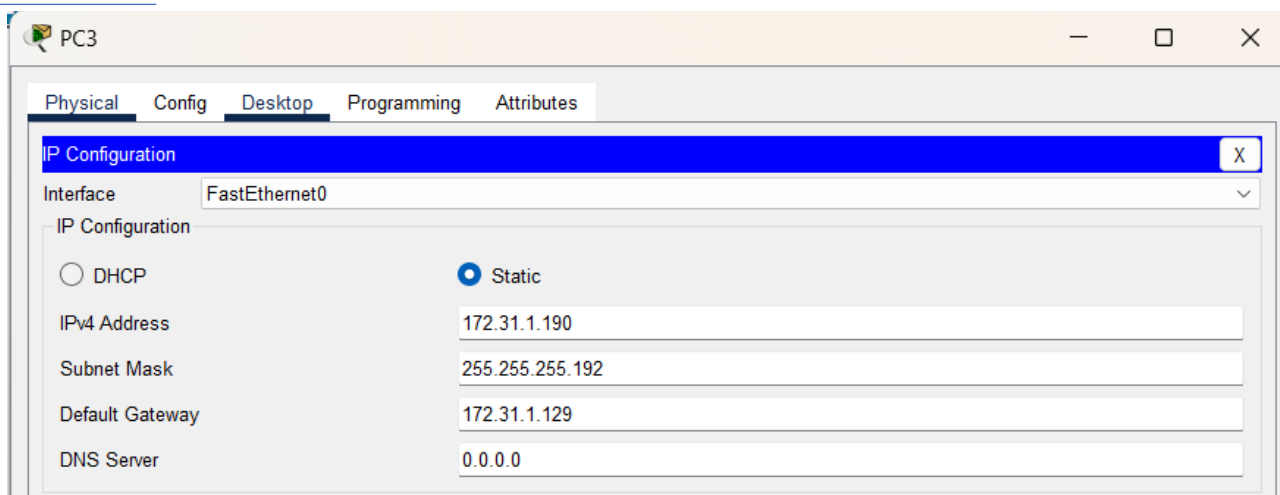
3. Cấu hình Banner Motd cho các Router với nội dung **“Warning: Authorized Access Only on Router Rx”** (x là số Router tương ứng)

```
R1(config)#
R1(config)#banner motd $ Warning: Authorized Access Only on Router R1 $
R2(config)#banner motd $ Warning: Authorized Access Only on Router R2 $
R3(config)#
R3(config)#banner motd $ Warning: Authorized Access Only on Router R3 $
```

4. Đặt thông tin IP cho các thiết bị như mô tả trong sơ đồ mạng và bảng trên.

- Thiết lập địa chỉ IP cho các PC:





- Thiết lập địa chỉ IP cho các interface của router:

+ R1:

```
R1(config)#int g0/0
R1(config-if)#ip address 172.31.1.1 255.255.255.128
R1(config-if)#no shut

R1(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
exit
R1(config)#int se0/0/0
R1(config-if)#ip address 172.31.1.194 255.255.255.252
R1(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to down
```

+ R2:

```
R2(config)#int g0/0
R2(config-if)#ip address 172.31.0.1 255.255.255.0
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
ex
R2(config)#int se0/0/0
R2(config-if)#ip address 172.31.1.193 255.255.255.252
R2(config-if)#no shut

R2(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
exit
R2(config)#int se0/0/1
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

R2(config-if)#ip address 172.31.1.197 255.255.255.252
R2(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
```

+ R3:

```
R3(config)#int g0/0
R3(config-if)#ip address 172.31.1.129 255.255.255.192
R3(config-if)#no shut

R3(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
ex
R3(config)#int se0/0/1
R3(config-if)#ip address 172.31.1.198 255.255.255.252
R3(config-if)#no shut

R3(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/1, changed state to up
```

5. Thực hiện định tuyến tĩnh trên các Router sao cho các PC và Router có thể gửi/nhận dữ liệu với nhau. Trong đó, cấu hình Default Static Route tại R3 và Static Route bình thường tại R1, R2.

- R1:

```
R1(config)#ip route 172.31.0.0 255.255.255.0 s0/0/0
%Default route without gateway, if not a point-to-point interface, may impact performance
R1(config)#
R1(config)#ip route 172.31.1.128 255.255.255.192 s0/0/0
%Default route without gateway, if not a point-to-point interface, may impact performance

sh ip rout
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 not set

172.31.0.0/16 is variably subnetted, 6 subnets, 5 masks
S       172.31.0.0/24 is directly connected, Serial0/0/0
C       172.31.1.0/25 is directly connected, GigabitEthernet0/0
L       172.31.1.1/32 is directly connected, GigabitEthernet0/0
S       172.31.1.128/26 is directly connected, Serial0/0/0
C       172.31.1.192/30 is directly connected, Serial0/0/0
L       172.31.1.194/32 is directly connected, Serial0/0/0
```

- R2:

```
R2(config)#ip route 172.31.1.0 255.255.255.128 s0/0/0
%Default route without gateway, if not a point-to-point interface, may impact performance
R2(config)#ip route 172.31.1.128 255.255.255.192 s0/0/1
%Default route without gateway, if not a point-to-point interface, may impact performance
R2(config)#ex
R2#
%SYS-5-CONFIG_I: Configured from console by console
sh ip rout
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 not set

    172.31.0.0/16 is variably subnetted, 8 subnets, 5 masks
C       172.31.0.0/24 is directly connected, GigabitEthernet0/0
L       172.31.0.1/32 is directly connected, GigabitEthernet0/0
S       172.31.1.0/25 is directly connected, Serial0/0/0
S       172.31.1.128/26 is directly connected, Serial0/0/1
C       172.31.1.192/30 is directly connected, Serial0/0/0
L       172.31.1.193/32 is directly connected, Serial0/0/0
C       172.31.1.196/30 is directly connected, Serial0/0/1
L       172.31.1.197/32 is directly connected, Serial0/0/1
```

- R3:

```
R3(config)#ip route 0.0.0.0 0.0.0.0 s0/0/1
%Default route without gateway, if not a point-to-point interface, may impact performance
R3(config)#ex
R3#
%SYS-5-CONFIG_I: Configured from console by console
sh ip rout
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 0.0.0.0 to network 0.0.0.0

    172.31.0.0/16 is variably subnetted, 4 subnets, 3 masks
C       172.31.1.128/26 is directly connected, GigabitEthernet0/0
L       172.31.1.129/32 is directly connected, GigabitEthernet0/0
C       172.31.1.196/30 is directly connected, Serial0/0/1
L       172.31.1.198/32 is directly connected, Serial0/0/1
S*    0.0.0.0/0 is directly connected, Serial0/0/1
```

6. Sao lưu thông tin cấu hình của các thiết bị.

```
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#

R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#

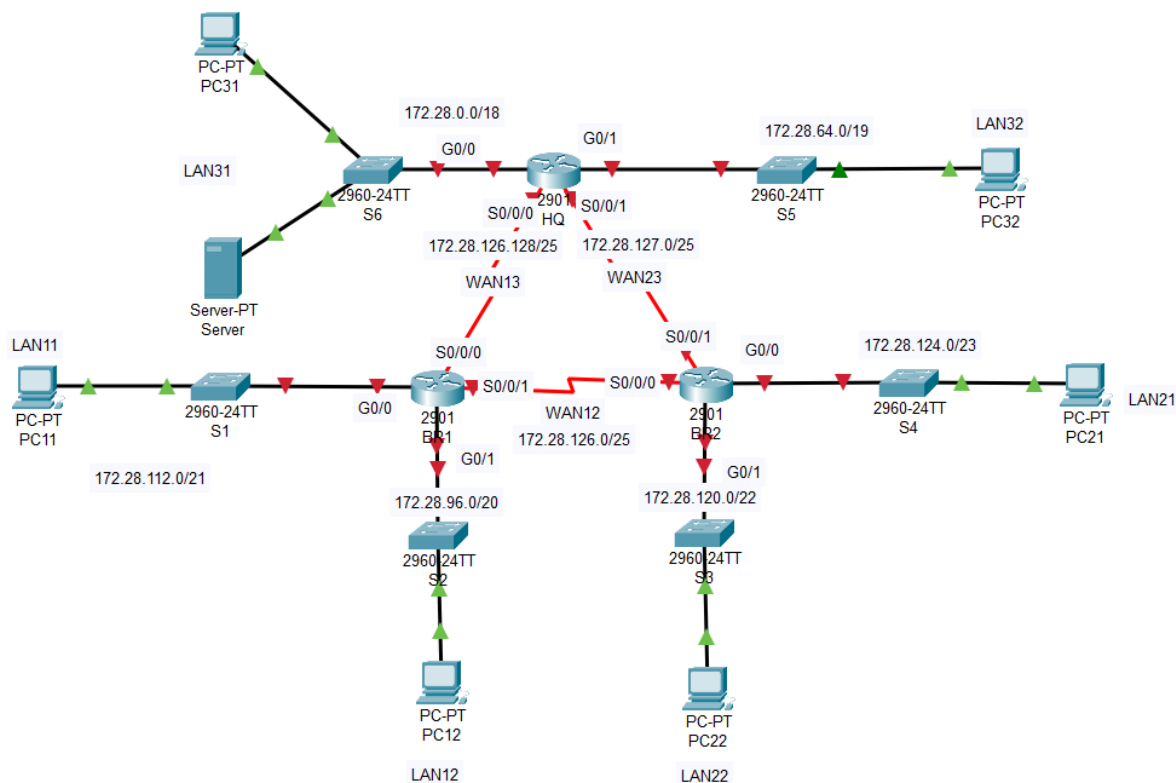
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#
```

3. Task 3: Chia mạng con (subnetting) và định tuyến (4đ)

Yêu cầu: Sinh viên thực hiện chia mạng con để đáp ứng yêu cầu của mô hình và thực hiện cấu hình router, định tuyến tĩnh để các thiết bị trong mạng có thể thấy nhau.

Thực hiện theo các bước với những yêu cầu cụ thể sau:

Bước 1: Sử dụng Packet Tracer, sinh viên xây dựng mô hình mạng gồm các thiết bị như trên.



Trình bày các chia mạng con cụ thể, sau đó điền vào bảng theo mẫu:

Subnet	Network Address/CIDR	First IP Address	Broadcast Address
LAN31	172.28.0.0/18	172.28.0.1	172.28.63.255
LAN32	172.28.64.0/19	172.28.64.1	172.28.95.255
LAN12	172.28.96.0/20	172.28.96.1	172.28.111.255
LAN11	172.28.112.0/21	172.28.112.1	172.28.119.255
LAN22	172.28.120.0/22	172.28.120.1	172.28.123.255
LAN21	172.28.124.0/23	172.28.124.1	172.28.125.255
WAN12	172.28.126.0/25	172.28.126.1	172.28.126.127
WAN13	172.28.126.128/25	172.28.126.129	172.28.127.255
WAN23	172.28.127.0/25	172.28.127.1	172.28.127.127

Bước 2: Cấu hình cơ bản cho các Router như trong mô hình:

- o Đặt **hostname** cho các router như mô hình.

- o Đặt **banner motd** cho các router: “**Warning: Authorized Access Only on**

Router X” (x là tên Router tương ứng)

- o Đặt các **password** (privileged EXEC, user EXEC và Telnet remote access) cho các Router trên là “**uitcisco**”

1. Cấu hình cơ bản cho Router HQ:

- Cài đặt hostname cho router HQ:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname HQ
HQ(config)#
```

- Cài đặt password cho privileged EXEC, User EXEC và telnet remote access cho router HQ:

```
HQ(config)#
HQ(config)#enable secret uitcisco
HQ(config)#line console 0
HQ(config-line)#password uitcisco
HQ(config-line)#login
HQ(config-line)#exit
HQ(config)#line vty 0 4
HQ(config-line)#password uitcisco
HQ(config-line)#login
HQ(config-line)#exit
HQ(config)#service password-encryption
```

- Cài đặt banner motd cho router HQ:

```
HQ(config)#banner motd $ Warning: Authorized Access Only on Router HQ $
HQ(config)#ex
HQ#
%SYS-5-CONFIG_I: Configured from console by console
copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
HQ#
```

2. Cấu hình cơ bản cho Router BR1:

- Cài đặt hostname cho router BR1:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname BR1
BR1(config)#
```

- Cài đặt password cho privileged EXEC, User EXEC và telnet remote access cho router BR1:

```
BR1(config)#
BR1(config)#enable secret uitcisco
BR1(config)#line console 0
BR1(config-line)#password uitcisco
BR1(config-line)#login
BR1(config-line)#exit
BR1(config)#line vty 0 4
BR1(config-line)#password uitcisco
BR1(config-line)#login
BR1(config-line)#exit
BR1(config)#service password-encryption
```

- Cài đặt banner motd cho router BR1:

```
BR1(config)#banner motd $ Warning: Authorized Access Only on Router BR1 $
BR1(config)#exit
BR1#
%SYS-5-CONFIG_I: Configured from console by console
copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BR1#
```

3. Cấu hình cơ bản cho Router BR2:

- Cài đặt hostname cho router BR2:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname BR2
BR2(config)#
```

- Cài đặt password cho privileged EXEC, User EXEC và telnet remote access cho router BR2:

```
BR2(config)#enable secret uitscisco
BR2(config)#line console 0
BR2(config-line)#password uitscisco
BR2(config-line)#login
BR2(config-line)#exit
BR2(config)#line vty 0 4
BR2(config-line)#password uitscisco
BR2(config-line)#login
BR2(config-line)#exit
BR2(config)#service password-encryption
```

- Cài đặt banner motd cho router BR2:

```
BR2(config)#banner motd $ Warning: Authorized Access Only on Router BR2 $
BR2(config)#exit
BR2#
%SYS-5-CONFIG_I: Configured from console by console
copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BR2#
```

Bước 3: Gán IP cho các Interface của các thiết bị, trong đó:

- Địa chỉ IP đầu tiên dành cho interface trên Router.
- Các địa chỉ IP cuối cùng dành cho interface trên PC/Server. Điền thông tin IP vào bảng như sau, sau đó thực hiện cấu hình trên Packet Tracer.

Device	Interface	IP Address	Subnet Mask	Default Gateway
HQ	S0/0/0	172.28.126.129	255.255.255.128	N/A
	S0/0/1	172.28.127.1	255.255.255.128	N/A
	G0/0	172.28.0.1	255.255.192.0	N/A
	G0/1	172.28.64.1	255.255.224.0	N/A
BR1	S0/0/0	172.28.126.130	255.255.255.128	N/A
	S0/0/1	172.28.126.1	255.255.255.128	N/A
	G0/0	172.28.112.1	255.255.248.0	N/A
	G0/1	172.28.96.1	255.255.240.0	N/A
BR2	S0/0/0	172.28.126.2	255.255.255.128	N/A
	S0/0/1	172.28.127.2	255.255.255.128	N/A
	G0/0	172.28.124.1	255.255.254.0	N/A
	G0/1	172.28.120.1	255.255.252.0	N/A
PC11 (LAN11)	Fa0	172.28.119.254	255.255.248.0	172.28.112.1
PC12 (LAN12)	Fa0	172.28.111.254	255.255.240.0	172.28.96.1
PC21 (LAN21)	Fa0	172.28.125.254	255.255.254.0	172.28.124.1
PC22 (LAN22)	Fa0	172.28.123.254	255.255.252.0	172.28.120.1
PC31 (LAN31)	Fa0	172.28.63.254	255.255.192.0	172.28.0.1
PC32 (LAN32)	Fa0	172.28.95.254	255.255.224.0	172.28.64.1
Server (LAN31)	Fa0	172.28.63.253	255.255.192.0	172.28.0.1

1. Gán địa chỉ IP cho PC và Server:

The image displays three screenshots of a network configuration interface, likely from a Packet Tracer simulation, showing the configuration of three PCs (PC11, PC12, and PC21) for static IP addressing. Each window has tabs for Physical, Config, Desktop, Programming, and Attributes. The 'Desktop' tab is selected, and the 'IP Configuration' section is expanded. The 'Interface' dropdown is set to 'FastEthernet0'. The 'Static' radio button is selected for IP configuration.

PC	IPv4 Address	Subnet Mask	Default Gateway	DNS Server
PC11	172.28.119.254	255.255.248.0	172.28.112.1	0.0.0.0
PC12	172.28.111.254	255.255.240.0	172.28.96.1	0.0.0.0
PC21	172.28.125.254	255.255.254.0	172.28.124.1	0.0.0.0

PC22

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 172.28.123.254

Subnet Mask 255.255.252.0

Default Gateway 172.28.120.1

DNS Server 0.0.0.0

PC31

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 172.28.63.254

Subnet Mask 255.255.192.0

Default Gateway 172.28.0.1

DNS Server 0.0.0.0

PC32

Physical Config **Desktop** Programming Attributes

IP Configuration X

Interface FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 172.28.95.254

Subnet Mask 255.255.224.0

Default Gateway 172.28.64.1

DNS Server 0.0.0.0

Server

Physical Config **Services** Desktop Programming Attributes

IP Configuration X

IP Configuration

☐ DHCP ☒ Static

IPv4 Address 172.28.63.253

Subnet Mask 255.255.192.0

Default Gateway 172.28.0.1

DNS Server 0.0.0.0

2. Gán địa chỉ IP cho Router:

2.1. Gán địa chỉ IP cho HQ:

```
HQ(config)#int g0/0
HQ(config-if)#ip address 172.28.0.1 255.255.192.0
HQ(config-if)#no shut

ex
HQ(config)#int g0/1
HQ(config-if)#ip address 172.28.64.1 255.255.224.0
HQ(config-if)#no shut

HQ(config)#int se0/0/0
HQ(config-if)#ip address 172.28.126.129 255.255.255.128
HQ(config-if)#no shut

HQ(config)#int se0/0/1
HQ(config-if)#ip address 172.28.127.1 255.255.255.128
HQ(config-if)#no shut
```

- Kiểm tra lại địa chỉ IP của các Interface của router HQ:

```
Device Name: HQ
Device Model: 2901
Hostname: HQ

Port          Link    VLAN  IP Address      IPv6 Address      MAC Address
GigabitEthernet0/0  Up     --    172.28.0.1/18   <not set>         000A.F361.3101
GigabitEthernet0/1  Up     --    172.28.64.1/19   <not set>         000A.F361.3102
Serial0/0/0        Up     --    172.28.126.129/25 <not set>         <not set>
Serial0/0/1        Up     --    172.28.127.1/25  <not set>         <not set>
Vlan1             Down    1     <not set>       <not set>         00D0.5843.C690
```

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > HQ

2.2. Gán địa chỉ IP cho BR1:

```
BR1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
BR1(config)#int se0/0/0
BR1(config-if)#
BR1(config-if)#ip address 172.28.126.130 255.255.255.128
BR1(config-if)#no shut

BR1(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
ex
BR1(config)#int se0/0/1
BR1(config-if)#ip address 172.28.126.1 255.255.255.128
BR1(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/0/1, changed state to down
BR1(config-if)#no shut
BR1(config-if)#ex
BR1(config)#int g0/0
BR1(config-if)#ip address 172.28.112.1 255.255.248.0
BR1(config-if)#no shutdown

BR1(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
ex
BR1(config)#int g0/1
BR1(config-if)#ip address 255.255.248.0 255.255.240.0
Not a valid host address - 255.255.248.0
BR1(config-if)#ip address 172.28.96.1 255.255.240.0
BR1(config-if)#no shut

BR1(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
```

- Kiểm tra lại địa chỉ IP của các Interface của router BR1:

Device Name: BR1
Device Model: 2901
Hostname: BR1

Port	Link	VLAN	IP Address	IPv6 Address	MAC Address
GigabitEthernet0/0	Up	--	172.28.112.1/21	<not set>	0090.210C.E701
GigabitEthernet0/1	Up	--	172.28.96.1/20	<not set>	0090.210C.E702
Serial0/0/0	Up	--	172.28.126.130/25	<not set>	<not set>
Serial0/0/1	Up	--	172.28.126.1/25	<not set>	<not set>
Vlan1	Down	1	<not set>	<not set>	0090.21BC.0918

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > BR1

2.3. Gán địa chỉ IP cho BR2:

```

BR2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
BR2(config)#int se0/0/0
BR2(config-if)#ip address 172.28.126.2 255.255.255.128
BR2(config-if)#no shut

BR2(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up
ex
BR2(config)#int se0/0/1
BR2(config-if)#ip address 172.28.127.2 255.255.255.128
BR2(config-if)#no shut

BR2(config-if)#
BR2(config)#int g0/0
BR2(config-if)#ip address 172.28.124.1 255.255.254.0
BR2(config-if)#no shut

BR2(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

BR2(config)#int g0/1
BR2(config-if)#ip address 172.28.120.1 255.255.252.0
BR2(config-if)#no shut

BR2(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

```

- Kiểm tra lại địa chỉ IP của các Interface của router BR2:

Device Name: BR2
Device Model: 2901
Hostname: BR2

Port	Link	VLAN	IP Address	IPv6 Address	MAC Address
GigabitEthernet0/0	Up	--	172.28.124.1/23	<not set>	000C.85EE.6101
GigabitEthernet0/1	Up	--	172.28.120.1/22	<not set>	000C.85EE.6102
Serial0/0/0	Up	--	172.28.126.2/25	<not set>	<not set>
Serial0/0/1	Up	--	172.28.127.2/25	<not set>	<not set>
Vlan1	Down	1	<not set>	<not set>	0001.4387.1D0E

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > BR2

Bước 4: Định tuyến tĩnh cho các Router trong mô hình sao cho các thiết bị có thể thấy nhau.

1. Định tuyến cho router HQ:

```
HQ#conf t
Enter configuration commands, one per line. End with CNTL/Z.
HQ(config)#ip route 172.28.112.0 255.255.248.0 172.28.126.130
HQ(config)#ip route 172.28.96.0 255.255.240.0 172.28.126.130
HQ(config)#ip route 172.28.120.0 255.255.252.0 172.28.127.2
HQ(config)#ip route 172.28.124.0 255.255.254.0 172.28.127.2
```

- Dùng lệnh **show ip route** để kiểm tra lại bảng định tuyến:

```
HQ#sh 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 not set

172.28.0.0/16 is variably subnetted, 12 subnets, 8 masks
C       172.28.0.0/18 is directly connected, GigabitEthernet0/0
L       172.28.0.1/32 is directly connected, GigabitEthernet0/0
C       172.28.64.0/19 is directly connected, GigabitEthernet0/1
L       172.28.64.1/32 is directly connected, GigabitEthernet0/1
S       172.28.96.0/20 [1/0] via 172.28.126.130
S       172.28.112.0/21 [1/0] via 172.28.126.130
S       172.28.120.0/22 [1/0] via 172.28.127.2
S       172.28.124.0/23 [1/0] via 172.28.127.2
C       172.28.126.128/25 is directly connected, Serial0/0/0
L       172.28.126.129/32 is directly connected, Serial0/0/0
C       172.28.127.0/25 is directly connected, Serial0/0/1
L       172.28.127.1/32 is directly connected, Serial0/0/1
```

2. Định tuyến cho router BR1:

```
BR1(config)#ip route 172.28.120.0 255.255.252.0 172.28.126.2
BR1(config)#
BR1(config)#ip route 172.28.124.0 255.255.254.0 172.28.126.2
BR1(config)#ip route 172.28.64.0 255.255.224.0 172.28.126.129
BR1(config)#ip route 172.28.0.0 255.255.192.0 172.28.126.129
```

- Dùng lệnh **show ip route** để kiểm tra lại bảng định tuyến:

```
sh ip rout
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 not set

172.28.0.0/16 is variably subnetted, 12 subnets, 8 masks
S       172.28.0.0/18 [1/0] via 172.28.126.129
S       172.28.64.0/19 [1/0] via 172.28.126.129
C       172.28.96.0/20 is directly connected, GigabitEthernet0/1
L       172.28.96.1/32 is directly connected, GigabitEthernet0/1
C       172.28.112.0/21 is directly connected, GigabitEthernet0/0
L       172.28.112.1/32 is directly connected, GigabitEthernet0/0
S       172.28.120.0/22 [1/0] via 172.28.126.2
S       172.28.124.0/23 [1/0] via 172.28.126.2
C       172.28.126.0/25 is directly connected, Serial0/0/1
L       172.28.126.1/32 is directly connected, Serial0/0/1
C       172.28.126.128/25 is directly connected, Serial0/0/0
L       172.28.126.130/32 is directly connected, Serial0/0/0
```


3. Định tuyến cho router BR2:

```
BR2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
BR2(config)#ip route 172.28.112.0 255.255.248.0 172.28.126.1
BR2(config)#ip route 172.28.96.0 255.255.240.0 172.28.126.1
BR2(config)#ip route 172.28.0.0 255.255.192.0 172.28.127.1
BR2(config)#ip route 172.28.64.0 255.255.224.0 172.28.127.1
```

- Dùng lệnh **show ip route** để kiểm tra lại bảng định tuyến:

```
BR2#sh ip rout
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 not set

172.28.0.0/16 is variably subnetted, 12 subnets, 8 masks
S       172.28.0.0/18 [1/0] via 172.28.127.1
S       172.28.64.0/19 [1/0] via 172.28.127.1
S       172.28.96.0/20 [1/0] via 172.28.126.1
S       172.28.112.0/21 [1/0] via 172.28.126.1
C       172.28.120.0/22 is directly connected, GigabitEthernet0/1
L       172.28.120.1/32 is directly connected, GigabitEthernet0/1
C       172.28.124.0/23 is directly connected, GigabitEthernet0/0
L       172.28.124.1/32 is directly connected, GigabitEthernet0/0
C       172.28.126.0/25 is directly connected, Serial0/0/0
L       172.28.126.2/32 is directly connected, Serial0/0/0
C       172.28.127.0/25 is directly connected, Serial0/0/1
L       172.28.127.2/32 is directly connected, Serial0/0/1

BR2#
```

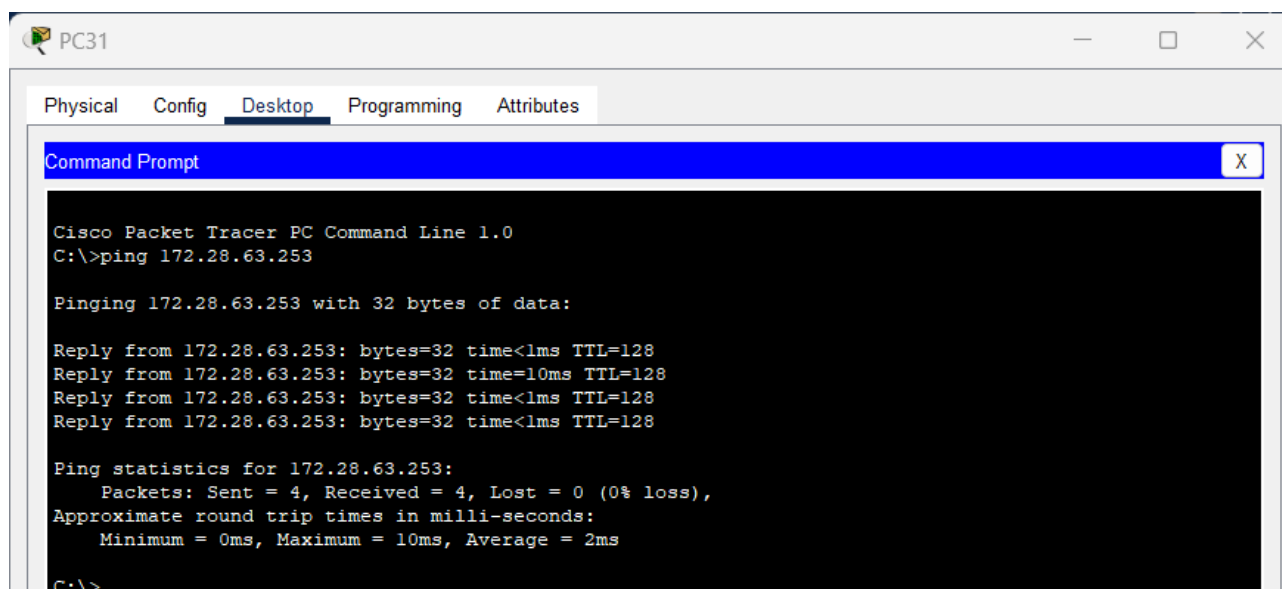
Bước 5: Kiểm tra sự thông suốt giữa các thiết bị trong mô hình mạng.

- Đảm bảo kết nối thông suốt, kiểm tra qua **ping** giữa tất cả các thiết bị trong mạng (PC/Server – PC/Server, Router – Router, Router – PC/Server)
- Có thể truy cập website tại Server từ các PC khác.

1. Kiểm tra qua ping giữa các thiết bị:

• PC/Server – PC/Server

- ping từ PC31 sang server:



```
PC31
Physical Config Desktop Programming Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.28.63.253

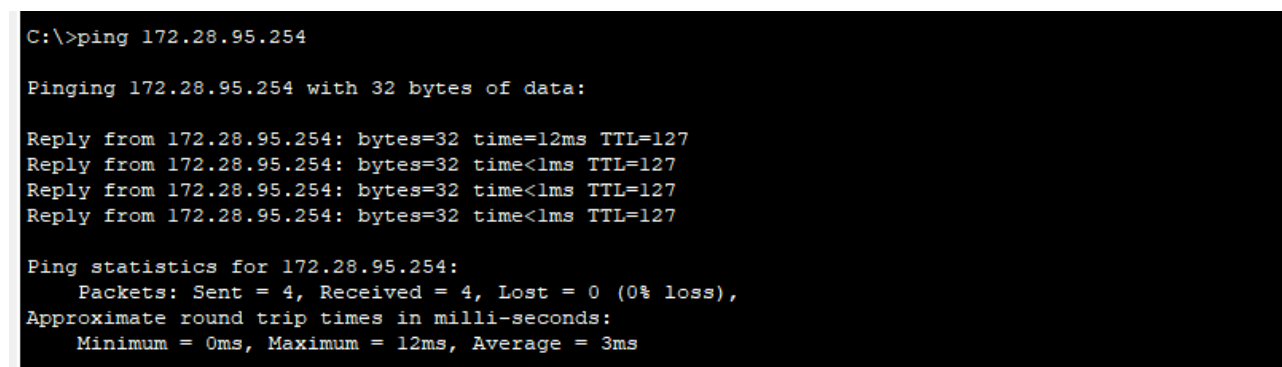
Pinging 172.28.63.253 with 32 bytes of data:

Reply from 172.28.63.253: bytes=32 time<1ms TTL=128
Reply from 172.28.63.253: bytes=32 time=10ms TTL=128
Reply from 172.28.63.253: bytes=32 time<1ms TTL=128
Reply from 172.28.63.253: bytes=32 time<1ms TTL=128

Ping statistics for 172.28.63.253:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 10ms, Average = 2ms

C:\>
```

- ping từ PC31 sang PC 32:



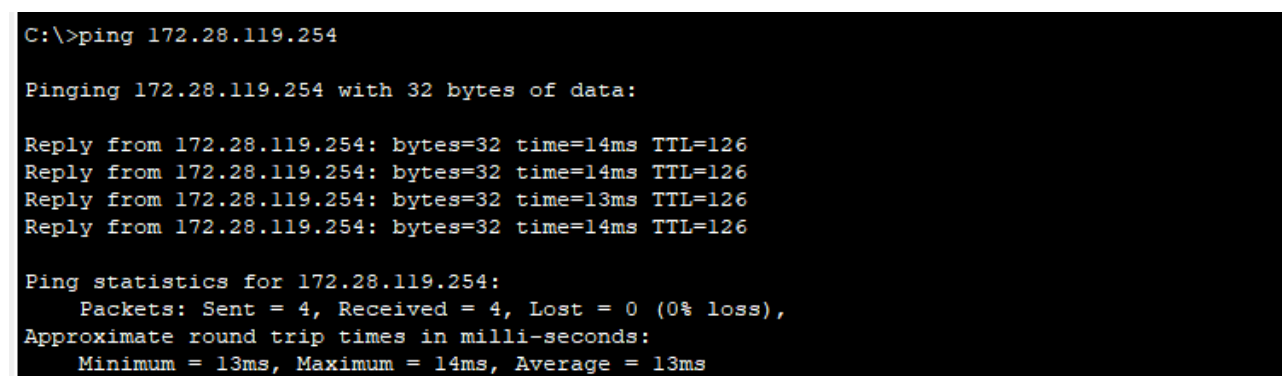
```
C:\>ping 172.28.95.254

Pinging 172.28.95.254 with 32 bytes of data:

Reply from 172.28.95.254: bytes=32 time=12ms TTL=127
Reply from 172.28.95.254: bytes=32 time<1ms TTL=127
Reply from 172.28.95.254: bytes=32 time<1ms TTL=127
Reply from 172.28.95.254: bytes=32 time<1ms TTL=127

Ping statistics for 172.28.95.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 12ms, Average = 3ms
```

- ping từ PC31 sang PC11:



```
C:\>ping 172.28.119.254

Pinging 172.28.119.254 with 32 bytes of data:

Reply from 172.28.119.254: bytes=32 time=14ms TTL=126
Reply from 172.28.119.254: bytes=32 time=14ms TTL=126
Reply from 172.28.119.254: bytes=32 time=13ms TTL=126
Reply from 172.28.119.254: bytes=32 time=14ms TTL=126

Ping statistics for 172.28.119.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 13ms, Maximum = 14ms, Average = 13ms
```

- ping từ PC31 sang PC12:

```
C:\>ping 172.28.111.254

Pinging 172.28.111.254 with 32 bytes of data:

Reply from 172.28.111.254: bytes=32 time=19ms TTL=126
Reply from 172.28.111.254: bytes=32 time=12ms TTL=126
Reply from 172.28.111.254: bytes=32 time=12ms TTL=126
Reply from 172.28.111.254: bytes=32 time=2ms TTL=126

Ping statistics for 172.28.111.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 19ms, Average = 11ms
```

- ping từ PC31 sang PC21:

```
C:\>ping 172.28.125.254

Pinging 172.28.125.254 with 32 bytes of data:

Reply from 172.28.125.254: bytes=32 time=14ms TTL=126
Reply from 172.28.125.254: bytes=32 time=2ms TTL=126
Reply from 172.28.125.254: bytes=32 time=12ms TTL=126
Reply from 172.28.125.254: bytes=32 time=11ms TTL=126

Ping statistics for 172.28.125.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 14ms, Average = 9ms
```

- ping từ PC31 sang PC22:

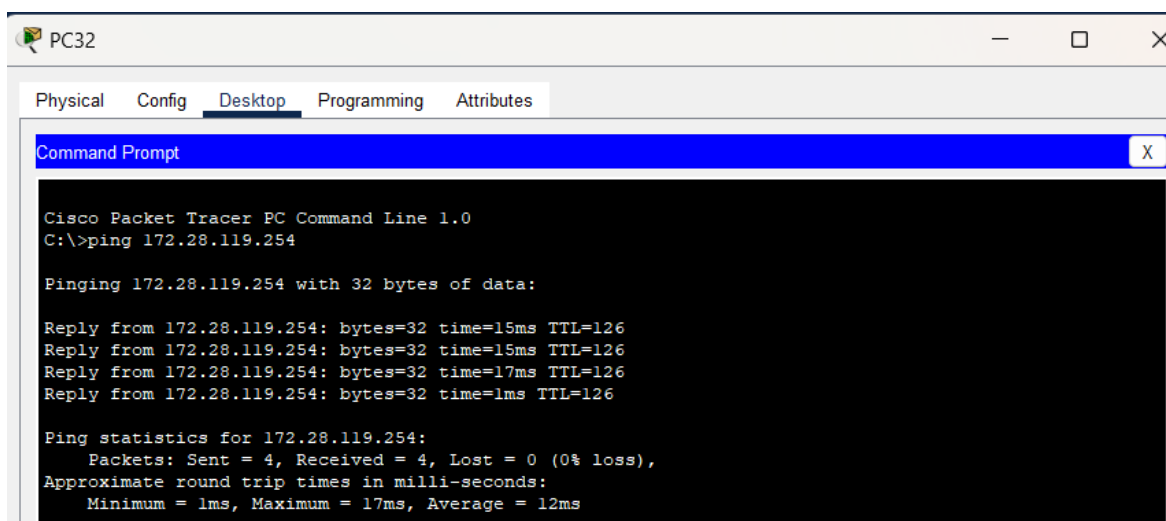
```
C:\>ping 172.28.123.254

Pinging 172.28.123.254 with 32 bytes of data:

Reply from 172.28.123.254: bytes=32 time=15ms TTL=126
Reply from 172.28.123.254: bytes=32 time=10ms TTL=126
Reply from 172.28.123.254: bytes=32 time=1ms TTL=126
Reply from 172.28.123.254: bytes=32 time=10ms TTL=126

Ping statistics for 172.28.123.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 15ms, Average = 9ms
```

- ping từ PC32 sang PC11:



- ping từ PC32 sang PC12:

```
C:\>ping 172.28.111.254

Pinging 172.28.111.254 with 32 bytes of data:

Reply from 172.28.111.254: bytes=32 time=12ms TTL=126
Reply from 172.28.111.254: bytes=32 time=13ms TTL=126
Reply from 172.28.111.254: bytes=32 time=14ms TTL=126
Reply from 172.28.111.254: bytes=32 time=1ms TTL=126

Ping statistics for 172.28.111.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 14ms, Average = 10ms
```

- ping từ PC32 sang PC21:

```
C:\>ping 172.28.125.254

Pinging 172.28.125.254 with 32 bytes of data:

Reply from 172.28.125.254: bytes=32 time=13ms TTL=126
Reply from 172.28.125.254: bytes=32 time=14ms TTL=126
Reply from 172.28.125.254: bytes=32 time=14ms TTL=126
Reply from 172.28.125.254: bytes=32 time=14ms TTL=126

Ping statistics for 172.28.125.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 13ms, Maximum = 14ms, Average = 13ms
```

- ping từ PC32 sang PC22:

```
C:\>ping 172.28.123.254

Pinging 172.28.123.254 with 32 bytes of data:

Reply from 172.28.123.254: bytes=32 time=16ms TTL=126
Reply from 172.28.123.254: bytes=32 time=4ms TTL=126
Reply from 172.28.123.254: bytes=32 time=1ms TTL=126
Reply from 172.28.123.254: bytes=32 time=13ms TTL=126

Ping statistics for 172.28.123.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 16ms, Average = 8ms
```

- ping từ PC32 sang PC31:

```
C:\>ping 172.28.63.254

Pinging 172.28.63.254 with 32 bytes of data:

Reply from 172.28.63.254: bytes=32 time<1ms TTL=127
Reply from 172.28.63.254: bytes=32 time<1ms TTL=127
Reply from 172.28.63.254: bytes=32 time<1ms TTL=127
Reply from 172.28.63.254: bytes=32 time=10ms TTL=127

Ping statistics for 172.28.63.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 10ms, Average = 2ms
```

- ping từ PC32 sang Server:

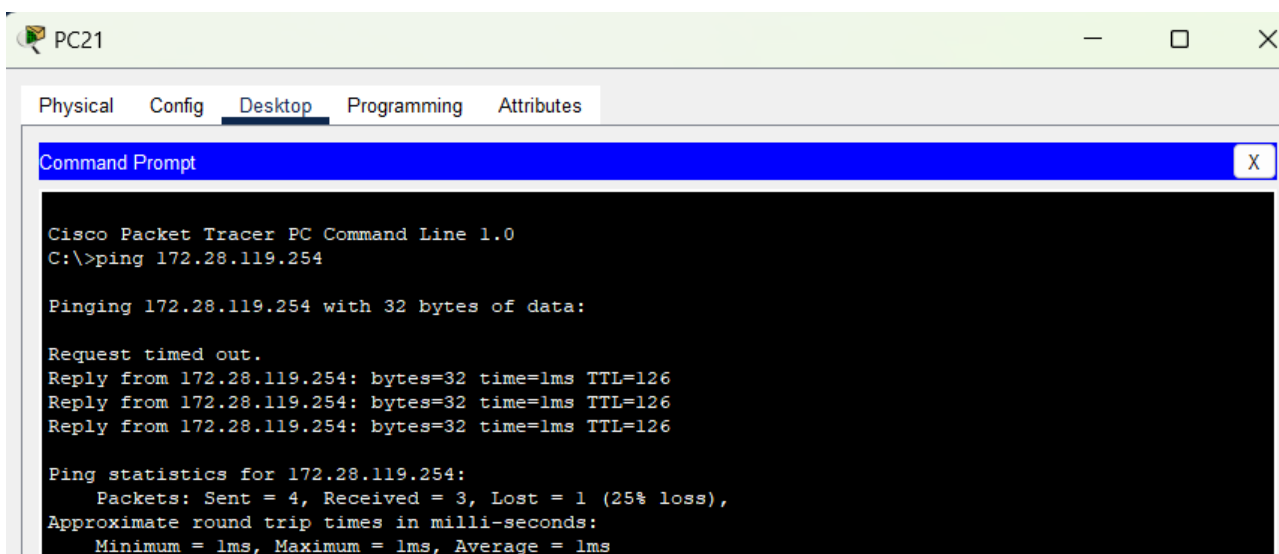
```
C:\>ping 172.28.63.253

Pinging 172.28.63.253 with 32 bytes of data:

Reply from 172.28.63.253: bytes=32 time=13ms TTL=127
Reply from 172.28.63.253: bytes=32 time<1ms TTL=127
Reply from 172.28.63.253: bytes=32 time<1ms TTL=127
Reply from 172.28.63.253: bytes=32 time=6ms TTL=127

Ping statistics for 172.28.63.253:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 13ms, Average = 4ms
```

- ping từ PC21 sang PC11:



- ping từ PC21 sang PC12:

```
C:\>ping 172.28.111.254

Pinging 172.28.111.254 with 32 bytes of data:

Request timed out.
Reply from 172.28.111.254: bytes=32 time=14ms TTL=126
Reply from 172.28.111.254: bytes=32 time=14ms TTL=126
Reply from 172.28.111.254: bytes=32 time=17ms TTL=126

Ping statistics for 172.28.111.254:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 14ms, Maximum = 17ms, Average = 15ms
```

- ping từ PC21 sang Server:

```
C:\>ping 172.28.63.253

Pinging 172.28.63.253 with 32 bytes of data:

Request timed out.
Reply from 172.28.63.253: bytes=32 time=26ms TTL=126
Reply from 172.28.63.253: bytes=32 time=14ms TTL=126
Reply from 172.28.63.253: bytes=32 time=7ms TTL=126

Ping statistics for 172.28.63.253:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 7ms, Maximum = 26ms, Average = 15ms
```

- ping từ PC21 sang PC31:

```
C:\>ping 172.28.63.254

Pinging 172.28.63.254 with 32 bytes of data:

Request timed out.
Reply from 172.28.63.254: bytes=32 time=22ms TTL=126
Reply from 172.28.63.254: bytes=32 time=1ms TTL=126
Reply from 172.28.63.254: bytes=32 time=14ms TTL=126

Ping statistics for 172.28.63.254:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 22ms, Average = 12ms
```

- ping từ PC21 sang PC22:

```
C:\>ping 172.28.123.254

Pinging 172.28.123.254 with 32 bytes of data:

Request timed out.
Reply from 172.28.123.254: bytes=32 time<1ms TTL=127
Reply from 172.28.123.254: bytes=32 time<1ms TTL=127
Reply from 172.28.123.254: bytes=32 time=14ms TTL=127

Ping statistics for 172.28.123.254:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 14ms, Average = 4ms
```

- ping từ PC21 sang PC32:

```
C:\>ping 172.28.95.254

Pinging 172.28.95.254 with 32 bytes of data:

Request timed out.
Reply from 172.28.95.254: bytes=32 time=1ms TTL=126
Reply from 172.28.95.254: bytes=32 time=15ms TTL=126
Reply from 172.28.95.254: bytes=32 time=15ms TTL=126

Ping statistics for 172.28.95.254:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 15ms, Average = 10ms
```

- ping từ PC22 sang PC11:

```
C:\>ping 172.28.119.254

Pinging 172.28.119.254 with 32 bytes of data:

Reply from 172.28.119.254: bytes=32 time=27ms TTL=126
Reply from 172.28.119.254: bytes=32 time=20ms TTL=126
Reply from 172.28.119.254: bytes=32 time=1ms TTL=126
Reply from 172.28.119.254: bytes=32 time=14ms TTL=126

Ping statistics for 172.28.119.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 27ms, Average = 15ms
```


- ping từ PC22 sang PC12:

```
C:\>ping 172.28.111.254

Pinging 172.28.111.254 with 32 bytes of data:

Reply from 172.28.111.254: bytes=32 time=19ms TTL=126
Reply from 172.28.111.254: bytes=32 time=14ms TTL=126
Reply from 172.28.111.254: bytes=32 time=1ms TTL=126
Reply from 172.28.111.254: bytes=32 time=15ms TTL=126

Ping statistics for 172.28.111.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 19ms, Average = 12ms
```

- ping từ PC22 sang PC21:

```
C:\>ping 172.28.125.254

Pinging 172.28.125.254 with 32 bytes of data:

Reply from 172.28.125.254: bytes=32 time<1ms TTL=127
Reply from 172.28.125.254: bytes=32 time=1ms TTL=127
Reply from 172.28.125.254: bytes=32 time<1ms TTL=127
Reply from 172.28.125.254: bytes=32 time<1ms TTL=127

Ping statistics for 172.28.125.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

- ping từ PC22 sang PC31:

```
C:\>ping 172.28.63.254

Pinging 172.28.63.254 with 32 bytes of data:

Reply from 172.28.63.254: bytes=32 time=1ms TTL=126
Reply from 172.28.63.254: bytes=32 time=15ms TTL=126
Reply from 172.28.63.254: bytes=32 time=15ms TTL=126
Reply from 172.28.63.254: bytes=32 time=15ms TTL=126

Ping statistics for 172.28.63.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 15ms, Average = 11ms
```

- ping từ PC22 sang PC32:

```
C:\>ping 172.28.95.254

Pinging 172.28.95.254 with 32 bytes of data:

Reply from 172.28.95.254: bytes=32 time=19ms TTL=126
Reply from 172.28.95.254: bytes=32 time=12ms TTL=126
Reply from 172.28.95.254: bytes=32 time=1ms TTL=126
Reply from 172.28.95.254: bytes=32 time=13ms TTL=126

Ping statistics for 172.28.95.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 19ms, Average = 11ms
```

- ping từ PC22 sang Server:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.28.63.253

Pinging 172.28.63.253 with 32 bytes of data:

Reply from 172.28.63.253: bytes=32 time=18ms TTL=126
Reply from 172.28.63.253: bytes=32 time=14ms TTL=126
Reply from 172.28.63.253: bytes=32 time=14ms TTL=126
Reply from 172.28.63.253: bytes=32 time=1ms TTL=126

Ping statistics for 172.28.63.253:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 18ms, Average = 11ms
```

- ping từ PC11 sang PC12:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.28.111.254

Pinging 172.28.111.254 with 32 bytes of data:

Reply from 172.28.111.254: bytes=32 time<1ms TTL=127
Reply from 172.28.111.254: bytes=32 time<1ms TTL=127
Reply from 172.28.111.254: bytes=32 time<1ms TTL=127
Reply from 172.28.111.254: bytes=32 time=14ms TTL=127

Ping statistics for 172.28.111.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 14ms, Average = 3ms
```

- ping từ PC11 sang PC21:

```
C:\>ping 172.28.125.254

Pinging 172.28.125.254 with 32 bytes of data:

Reply from 172.28.125.254: bytes=32 time=18ms TTL=126
Reply from 172.28.125.254: bytes=32 time=1ms TTL=126
Reply from 172.28.125.254: bytes=32 time=14ms TTL=126
Reply from 172.28.125.254: bytes=32 time=15ms TTL=126

Ping statistics for 172.28.125.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 18ms, Average = 12ms
```

- ping từ PC11 sang PC22:

```
C:\>ping 172.28.123.254

Pinging 172.28.123.254 with 32 bytes of data:

Reply from 172.28.123.254: bytes=32 time=19ms TTL=126
Reply from 172.28.123.254: bytes=32 time=19ms TTL=126
Reply from 172.28.123.254: bytes=32 time=15ms TTL=126
Reply from 172.28.123.254: bytes=32 time=14ms TTL=126

Ping statistics for 172.28.123.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 14ms, Maximum = 19ms, Average = 16ms
```


- ping từ PC11 sang PC31:

```
C:\>ping 172.28.63.254

Pinging 172.28.63.254 with 32 bytes of data:

Reply from 172.28.63.254: bytes=32 time=20ms TTL=126
Reply from 172.28.63.254: bytes=32 time=1ms TTL=126
Reply from 172.28.63.254: bytes=32 time=14ms TTL=126
Reply from 172.28.63.254: bytes=32 time=14ms TTL=126

Ping statistics for 172.28.63.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 20ms, Average = 12ms
```

- ping từ PC11 sang PC32:

```
C:\>ping 172.28.95.254

Pinging 172.28.95.254 with 32 bytes of data:

Reply from 172.28.95.254: bytes=32 time=1ms TTL=126
Reply from 172.28.95.254: bytes=32 time=27ms TTL=126
Reply from 172.28.95.254: bytes=32 time=14ms TTL=126
Reply from 172.28.95.254: bytes=32 time=14ms TTL=126

Ping statistics for 172.28.95.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 27ms, Average = 14ms
```

- ping từ PC11 sang Server:

```
C:\>ping 172.28.63.253

Pinging 172.28.63.253 with 32 bytes of data:

Reply from 172.28.63.253: bytes=32 time=21ms TTL=126
Reply from 172.28.63.253: bytes=32 time=13ms TTL=126
Reply from 172.28.63.253: bytes=32 time=1ms TTL=126
Reply from 172.28.63.253: bytes=32 time=12ms TTL=126

Ping statistics for 172.28.63.253:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 21ms, Average = 11ms
```

- ping từ PC 12 sang PC11:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.28.119.254

Pinging 172.28.119.254 with 32 bytes of data:

Reply from 172.28.119.254: bytes=32 time<1ms TTL=127
Reply from 172.28.119.254: bytes=32 time<1ms TTL=127
Reply from 172.28.119.254: bytes=32 time<1ms TTL=127
Reply from 172.28.119.254: bytes=32 time<1ms TTL=127

Ping statistics for 172.28.119.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

- ping từ PC 12 sang PC21:

```
C:\>ping 172.28.125.254

Pinging 172.28.125.254 with 32 bytes of data:

Reply from 172.28.125.254: bytes=32 time=19ms TTL=126
Reply from 172.28.125.254: bytes=32 time=15ms TTL=126
Reply from 172.28.125.254: bytes=32 time=14ms TTL=126
Reply from 172.28.125.254: bytes=32 time=14ms TTL=126

Ping statistics for 172.28.125.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 14ms, Maximum = 19ms, Average = 15ms
```

- ping từ PC 12 sang PC22:

```
C:\>ping 172.28.123.254

Pinging 172.28.123.254 with 32 bytes of data:

Reply from 172.28.123.254: bytes=32 time=18ms TTL=126
Reply from 172.28.123.254: bytes=32 time=1ms TTL=126
Reply from 172.28.123.254: bytes=32 time=1ms TTL=126
Reply from 172.28.123.254: bytes=32 time=1ms TTL=126

Ping statistics for 172.28.123.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 18ms, Average = 5ms
```

- ping từ PC 12 sang PC31:

```
C:\>ping 172.28.63.254

Pinging 172.28.63.254 with 32 bytes of data:

Reply from 172.28.63.254: bytes=32 time=21ms TTL=126
Reply from 172.28.63.254: bytes=32 time=15ms TTL=126
Reply from 172.28.63.254: bytes=32 time=1ms TTL=126
Reply from 172.28.63.254: bytes=32 time=1ms TTL=126

Ping statistics for 172.28.63.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 21ms, Average = 9ms
```

- ping từ PC 12 sang PC32:

```
C:\>ping 172.28.95.254

Pinging 172.28.95.254 with 32 bytes of data:

Reply from 172.28.95.254: bytes=32 time=21ms TTL=126
Reply from 172.28.95.254: bytes=32 time=14ms TTL=126
Reply from 172.28.95.254: bytes=32 time=15ms TTL=126
Reply from 172.28.95.254: bytes=32 time=2ms TTL=126

Ping statistics for 172.28.95.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 21ms, Average = 13ms
```

- ping từ PC 12 sang Server:

```
C:\>ping 172.28.63.253

Pinging 172.28.63.253 with 32 bytes of data:

Reply from 172.28.63.253: bytes=32 time=4ms TTL=126
Reply from 172.28.63.253: bytes=32 time=2ms TTL=126
Reply from 172.28.63.253: bytes=32 time=1ms TTL=126
Reply from 172.28.63.253: bytes=32 time=1ms TTL=126

Ping statistics for 172.28.63.253:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 4ms, Average = 2ms
```

- Router – Router:

- ping từ HQ sang BR1:

```
HQ#ping 172.28.126.130

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.126.130, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 7/9/12 ms
```

- ping từ HQ sang BR2:

```
HQ#ping 172.28.127.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.127.2, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 7/11/13 ms
```

- ping từ BR1 sang HQ:

```
BR1#ping 172.28.126.129

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.126.129, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/11/13 ms
```

- ping từ BR1 sang BR2:

```
BR1#ping 172.28.126.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.126.2, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 7/10/13 ms
```

- ping từ BR2 sang BR1:

```
BR2#ping 172.28.126.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.126.1, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/11/13 ms
```

- ping từ BR2 sang HQ:

```
BR2#ping 172.28.127.1  
  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 172.28.127.1, timeout is 2 seconds:  
!!!!!  
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/11/13 ms
```

- Router – PC/Server:

- ping từ HQ sang PC11:

```
HQ#ping 172.28.119.254  
  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 172.28.119.254, timeout is 2 seconds:  
!!!!!  
Success rate is 80 percent (4/5), round-trip min/avg/max = 9/11/13 ms
```

- ping từ HQ sang PC12:

```
HQ#ping 172.28.111.254  
  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 172.28.111.254, timeout is 2 seconds:  
!!!!!  
Success rate is 80 percent (4/5), round-trip min/avg/max = 1/8/13 ms
```

- ping từ HQ sang PC21:

```
HQ#ping 172.28.125.254  
  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 172.28.125.254, timeout is 2 seconds:  
!!!!!  
Success rate is 80 percent (4/5), round-trip min/avg/max = 9/10/13 ms
```

- ping từ HQ sang PC22:

```
HQ#ping 172.28.123.254  
  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 172.28.123.254, timeout is 2 seconds:  
!!!!!  
Success rate is 80 percent (4/5), round-trip min/avg/max = 2/9/13 ms
```

- ping từ HQ sang PC31:

```
HQ#ping 172.28.63.254  
  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 172.28.63.254, timeout is 2 seconds:  
!!!!!  
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0 ms
```

- ping từ HQ sang PC32:

```
HQ#ping 172.28.95.254  
  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 172.28.95.254, timeout is 2 seconds:  
!!!!!  
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0 ms
```

- ping từ HQ sang Server:

```
HQ#ping 172.28.63.253

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.63.253, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0 ms
```

- ping từ BR1 sang PC11:

```
BR1#ping 172.28.119.254

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.119.254, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms
```

- ping từ BR1 sang PC12:

```
BR1#ping 172.28.111.254

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.111.254, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms
```

- ping từ BR1 sang PC21:

```
BR1#ping 172.28.125.254

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.125.254, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/5 ms
```

- ping từ BR1 sang PC22:

```
BR1#ping 172.28.123.254

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.123.254, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
```

- ping từ BR1 sang PC31:

```
BR1#ping 172.28.63.254

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.63.254, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/6 ms
```

- ping từ BR1 sang PC32:

```
BR1#ping 172.28.95.254

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.95.254, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
```

- ping từ BR1 sang Server:

```
BR1#ping 172.28.63.253
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.63.253, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
```

- ping từ BR2 sang PC11:

```
BR2#ping 172.28.119.254
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.119.254, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

- ping từ BR2 sang PC12:

```
BR2#ping 172.28.111.254
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.111.254, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
```

- ping từ BR2 sang PC21:

```
BR2#ping 172.28.125.254
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.125.254, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms
```

- ping từ BR2 sang PC22:

```
BR2#ping 172.28.123.254
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.123.254, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms
```

- ping từ BR2 sang PC31:

```
BR2#ping 172.28.63.254
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.63.254, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/6 ms
```

- ping từ BR2 sang PC32:

```
BR2#ping 172.28.95.254
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.95.254, timeout is 2 seconds:
!!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
```

- ping từ BR2 sang Server:

```
BR2#ping 172.28.63.253
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.28.63.253, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
```

2. Truy cập website tại Server từ các PC:

- Để truy cập website của Server, ta vào từng PC, chọn Desktop, chọn Web Browser. Tại mục URL nhập vào địa chỉ IP của Server và nhấn Go/Enter:





4. Task 3: Mở rộng (2đ)

Yêu cầu: Sinh viên xây dựng mô hình mạng như trên, đặt IP, hostname cho các thiết bị và sao chép thành 2 file .PKT để thực hiện 2 yêu cầu mở rộng như sau:

Device	Interface	IP Address	Subnet Mask	Default Gateway
R4	S0/0/0	10.0.45.1	255.255.255.252	N/A
	S0/0/1	10.0.46.1	255.255.255.252	N/A
	G0/0	192.168.0.1	255.255.255.0	N/A
	G0/1	192.168.1.1	255.255.255.0	N/A
R5	S0/0/0	10.0.45.2	255.255.255.252	N/A
	S0/0/1	10.0.57.1	255.255.255.252	N/A
R6	S0/0/0	10.0.67.1	255.255.255.252	N/A
	S0/0/1	10.0.46.2	255.255.255.252	N/A
R7	S0/0/0	10.0.67.2	255.255.255.252	N/A
	S0/0/1	10.0.57.2	255.255.255.252	N/A
	G0/0	10.10.10.1	255.255.255.252	N/A
PC-A	Fa0	192.168.0.2	255.255.255.0	192.168.0.1
PC-B	Fa0	192.168.1.2	255.255.255.0	192.168.1.1
Web-server	Fa0	10.10.10.2	255.255.255.252	10.10.10.1

a. Task 3.1:

Định tuyến tĩnh sao cho PC-A, PC-B khi gửi dữ liệu đến Web-Server sẽ đi theo đường phía trên (R4→ R5 → R7) và dữ liệu từ Web-server về PC-A, PC-B sẽ đi đường phía dưới (R7→R6→R4)

- Định tuyến cho Router R4 đến Web-server

```
R4(config)#ip route 10.10.10.0 255.255.255.252 10.0.45.2
R4(config)#
```

- Định tuyến cho Router R5 đến Web-server

```
R5(config)#ip route 10.10.10.0 255.255.255.252 10.0.57.2
R5(config)#
```

- Định tuyến cho Router R6 đến PC-A và PC-B

```
R6(config)#ip route 192.168.0.0 255.255.255.0 10.0.46.1
R6(config)#ip route 192.168.1.0 255.255.255.0 10.0.46.1
R6(config)#
```

- Định tuyến cho Router R7 đến PC-A và PC-B

```
R7(config)#ip route 192.168.0.0 255.255.255.0 10.0.67.1
R7(config)#ip route 192.168.1.0 255.255.255.0 10.0.67.1
R7(config)#
```

- Đường đi của gói tin được gửi từ PC-A đến Web-server và ngược lại

Event List				
Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	PC-A	ICMP
	0.001	PC-A	Switch0	ICMP
	0.002	Switch0	R4	ICMP
	0.003	R4	R5	ICMP
	0.004	R5	R7	ICMP
	0.005	R7	Web-server	ICMP
	0.006	Web-server	R7	ICMP
	0.007	R7	R6	ICMP
	0.008	R6	R4	ICMP
	0.009	R4	Switch0	ICMP
	0.010	Switch0	PC-A	ICMP

b. Task 3.2:

Định tuyến tĩnh sao cho PC-A, PC-B khi gửi dữ liệu sẽ ưu tiên đi theo đường phía trên đến Web-server, nhưng khi có sự cố tại R5 (tắt router) thì sẽ đi theo đường phía dưới đến Web-server (floating static route)

- Định tuyến cho Router R4 đến Web-server qua R5 và R6. Thêm floating static route tới Web-server qua Router R6 với độ ưu tiên thấp hơn (250)

```
R4(config)#ip route 10.10.10.0 255.255.255.252 10.0.45.2
R4(config)#ip route 10.10.10.0 255.255.255.252 10.0.46.2 250
R4(config)#
```

- Định tuyến cho Router R5 đến Web-server, đến PC-A và đến PC-B

```
R5(config)#ip route 10.10.10.0 255.255.255.252 10.0.57.2
R5(config)#ip route 192.168.0.0 255.255.255.0 10.0.45.1
R5(config)#ip route 192.168.1.0 255.255.255.0 10.0.45.1
R5(config)#
```

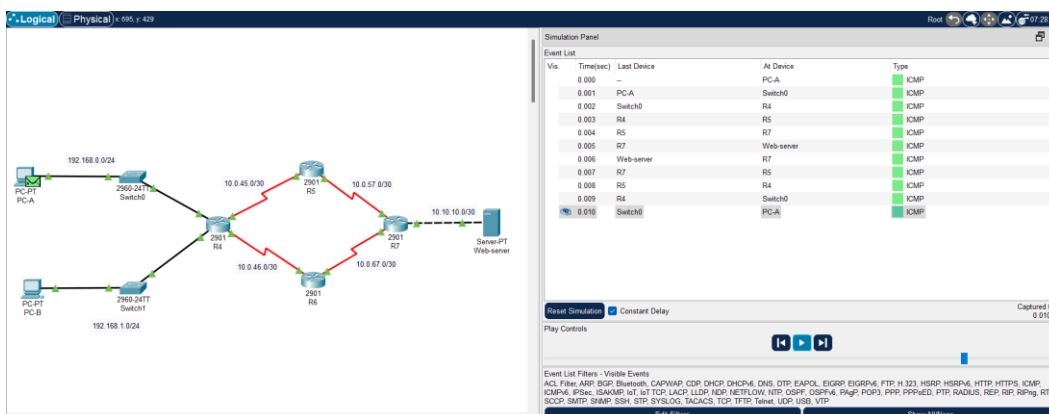
- Định tuyến cho Router R6 đến Web-server, đến PC-A và đến PC-B

```
R6(config)#ip route 10.10.10.0 255.255.255.252 10.0.67.2
R6(config)#ip route 192.168.0.0 255.255.255.0 10.0.46.1
R6(config)#ip route 192.168.1.0 255.255.255.0 10.0.46.1
R6(config)#
```

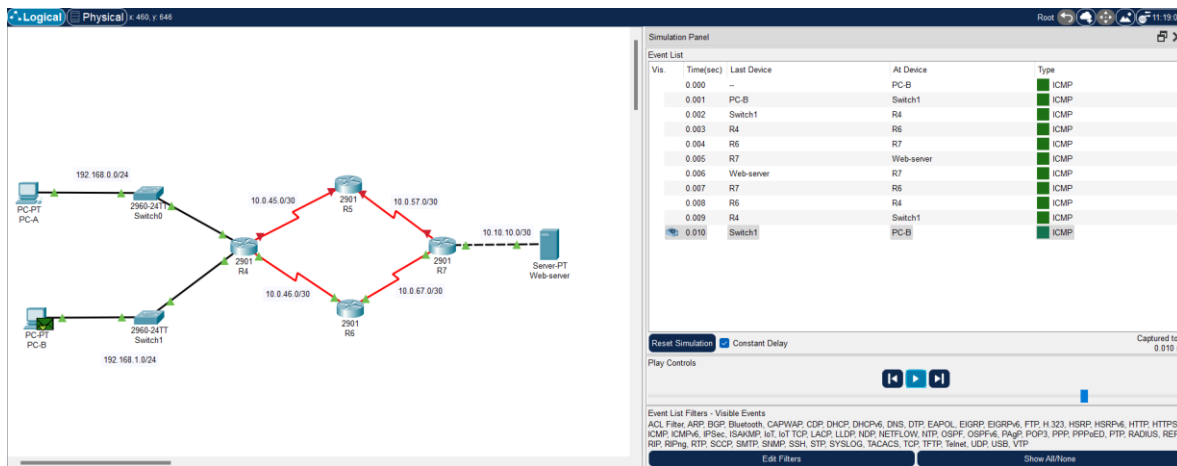
- Định tuyến cho Router R7 đến PC-A và PC-B. Thêm floating static route tới PC-A, PC-B qua Router R6 với độ ưu tiên thấp hơn (250)

```
R7(config)#ip route 192.168.0.0 255.255.255.0 10.0.57.1
R7(config)#ip route 192.168.1.0 255.255.255.0 10.0.57.1
R7(config)#ip route 192.168.0.0 255.255.255.0 10.0.67.1 250
R7(config)#ip route 192.168.1.0 255.255.255.0 10.0.67.1 250
R7(config)#
```

- Đường đi của gói tin được gửi từ PC-A đến Web-server và ngược lại khi Router R5 hoạt động bình thường



- Đường đi của gói tin được gửi từ PC-A đến Web-server và ngược lại khi Router R5 tắt



B. TÀI LIỆU THAM KHẢO

- Lab 1: Routing Concepts and Static Routing (UIT)