



BÁO CÁO THỰC HÀNH

Bài thực hành số 01: Routing Concepts and Static Routing

Môn học: Quản trị mạng và hệ thống

Lớp: NT132.N21.MMCL

Điểm tự đánh giá

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Tổng thời gian thực hiện	
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

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A. BÁO CÁO CHI TIẾT

1. Router and routing concepts

a. What is the role of routers, switches, hubs in a network system?

A router (Layer 3 of OSI) is a device that connects two or more networks together and directs traffic between them based on the destination address of the data packets. Routers are essential for connecting networks and enabling communication between devices in different network segments or locations.

A switch is a device that connects devices within a local area network (LAN) and allows them to communicate with each other. Unlike routers, switches operate at the data link layer (Layer 2) of the OSI model and use MAC addresses to direct traffic between devices. Switches provide a higher level of performance and security than hubs and are essential for creating and managing LANs.

A hub is a device that connects multiple devices together in a LAN and broadcasts data to all devices connected to it. Hubs operate at the physical layer (Layer 1) of the OSI model and do not provide any intelligence to manage or direct network traffic. Hubs are less common today due to their limitations in performance and security, and they have been largely replaced by switches.

b. What is the static routing? Briefly describe the advantages and disadvantages of static routing:

Static routing is a method of configuring network routes by manually entering the paths that network traffic should take from one network to another. In static routing, the network administrator manually configures the routing table on each router or networking device to determine the best path for data to travel between networks.

Advantages:

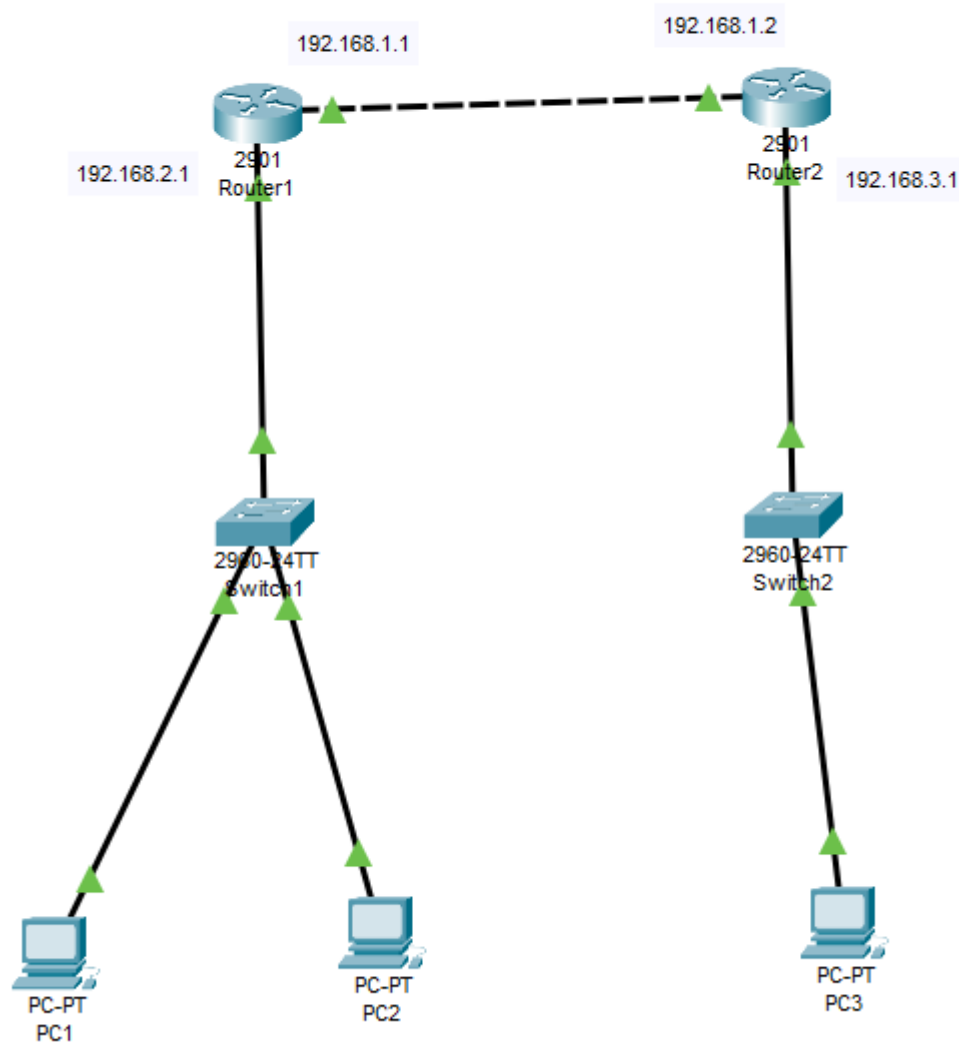
- **Simplicity:** Static routing is simple to configure and requires no complex algorithms or protocols to determine the best path for data to travel.
- **Predictability:** Static routing provides a predictable path for data to travel, which can be beneficial in certain network environments where network traffic patterns are consistent and stable.
- **Lower overhead:** Static routing requires less overhead than dynamic routing protocols, as it does not require any ongoing communication between routers to update network topology information.

Disadvantages:

- **Lack of flexibility:** Static routing is not flexible and cannot adapt to changes in network topology, traffic patterns, or routing metrics
- **Administrative overhead:** In large networks, manually configuring the routing tables on each router can be time-consuming and prone to errors
- **Limited scalability:** Difficult to maintain and troubleshoot the network over time.

2. Basic router configuration and static routing

Topology



Set password on R1

```
Router0(config)#enable password uitscisco
Router0(config)#enable secret uitscisco
The enable secret you have chosen is the same as your enable password.
This is not recommended. Re-enter the enable secret.
Router0#
Router0#
Router0#en
Router0#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router0(config)#line vty 0 15
Router0(config-line)#password uitscisco
Router0(config-line)#end
Router0#
```

Banner MOTD on R1

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```
Router0(config)#banner motd #
Enter TEXT message. End with the character '#'.
Warning: Authorized Access Only on Router R1#

Router0(config)#^Z
Router0#
```

Set password on R2

```
.
enable secret 5 $1$mERr$oBMDBptCrxnnflc3se/4f0
enable password uitcisco
!
!
!
!
!
!
ip cef
no ipv6 cef
!
!
!
username uit password 0 uitcisco
!
```

Banner MOTD

```
banner motd ^C
Warning: Authorized Access Only on Router R2^C
!
```

Assign IP address for R1

```
Router1#show ip int brief
Interface                IP-Address      OK? Method Status      Protocol
GigabitEthernet0/0       192.168.1.1     YES manual up          up
GigabitEthernet0/1       192.168.2.1     YES manual up          up
Vlan1                    unassigned      YES unset  administratively down down
Router1#
```

```
Router1#show ip int gig0/0
GigabitEthernet0/0 is up, line protocol is up (connected)
  Internet address is 192.168.1.1/30
  Broadcast address is 255.255.255.255
  Address determined by setup command
  MTU is 1500 bytes
  Helper address is not set
  Directed broadcast forwarding is disabled
  Outgoing access list is not set
  Inbound access list is not set
```

```
Router1#
Router1#show ip int gig0/1
GigabitEthernet0/1 is up, line protocol is up (connected)
  Internet address is 192.168.2.1/24
  Broadcast address is 255.255.255.255
  Address determined by setup command
  MTU is 1500 bytes
  Helper address is not set
  Directed broadcast forwarding is disabled
```

Assign IP address for R2

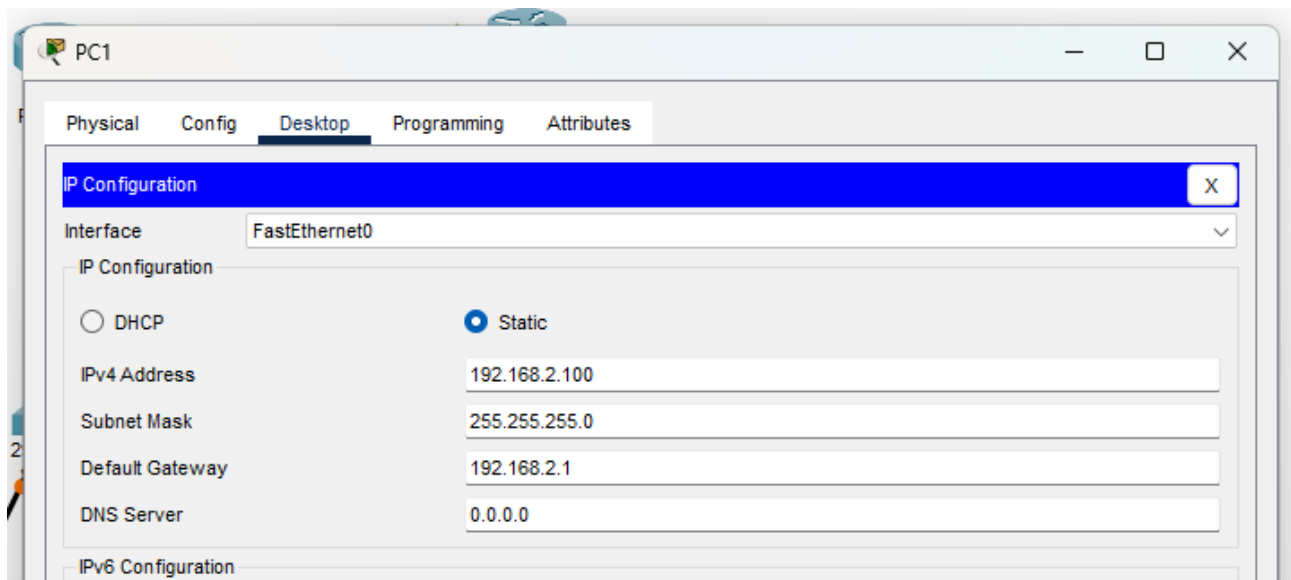
```
Router2#
%SYS-5-CONFIG_I: Configured from console by console
show ip int brief
Interface                IP-Address      OK? Method Status      Protocol
GigabitEthernet0/0       192.168.1.2     YES manual up          up
GigabitEthernet0/1       192.168.3.1     YES manual up          up
Vlan1                    unassigned      YES unset  administratively down down
Router2#
```

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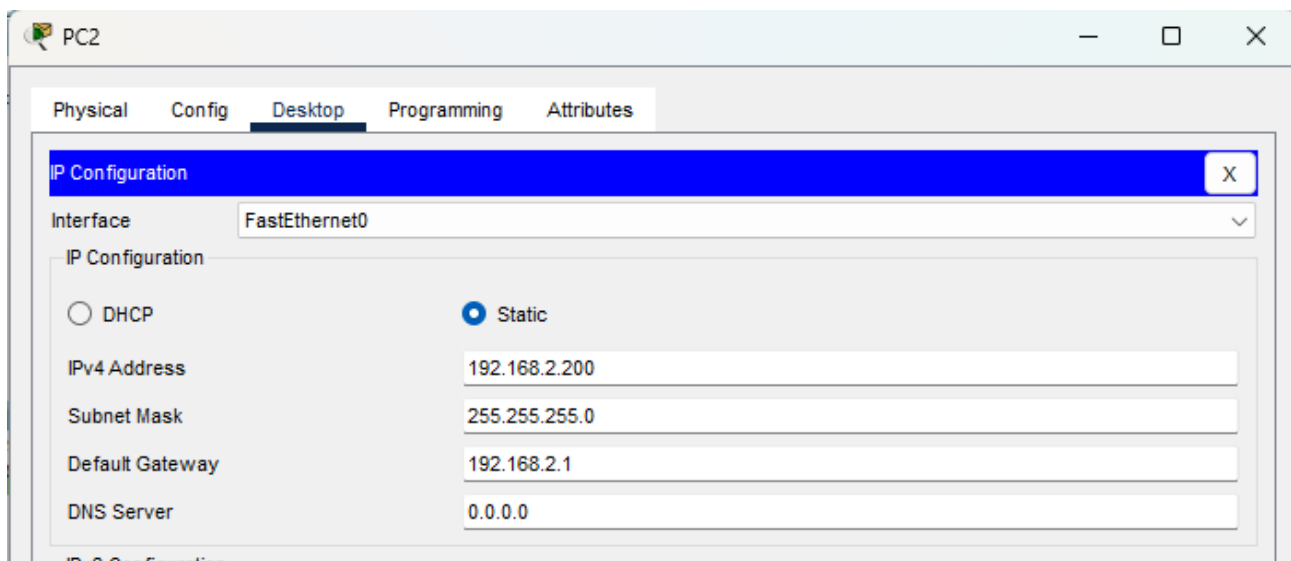
```
Router2#show ip int gig0/0
GigabitEthernet0/0 is up, line protocol is up (connected)
Internet address is 192.168.1.2/30
Broadcast address is 255.255.255.255
Address determined by setup command
MTU is 1500 bytes
Helper address is not set
Directed broadcast forwarding is disabled
Outgoing access list is not set
Inbound access list is not set

Router2#
Router2#show ip int gig0/1
GigabitEthernet0/1 is up, line protocol is up (connected)
Internet address is 192.168.3.1/24
Broadcast address is 255.255.255.255
Address determined by setup command
MTU is 1500 bytes
Helper address is not set
Directed broadcast forwarding is disabled
Outgoing access list is not set
Inbound access list is not set
```

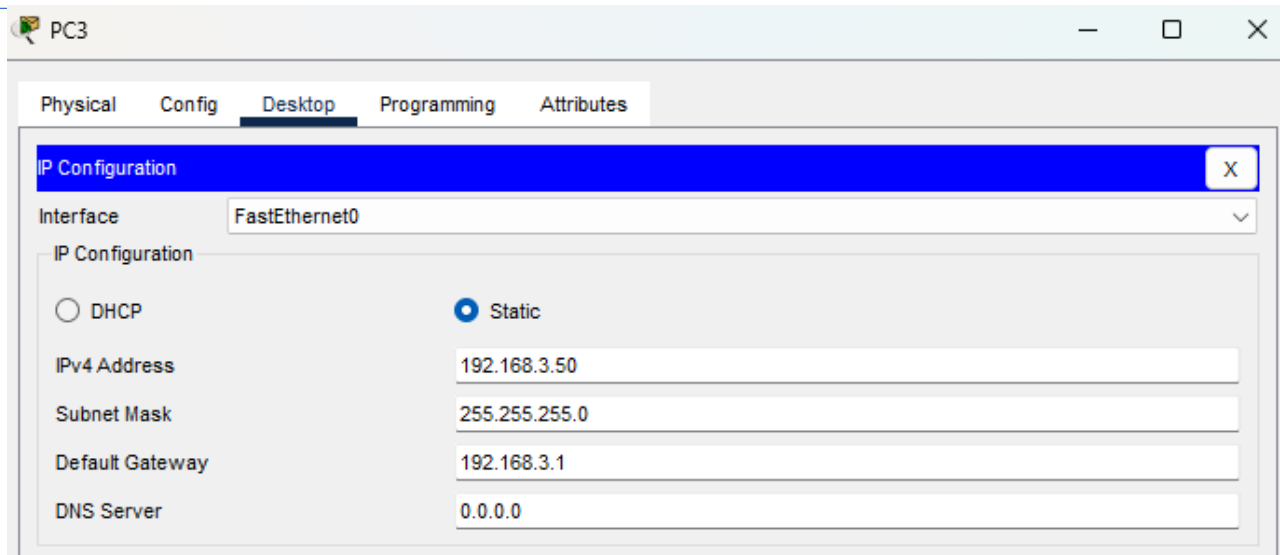
PC1:



PC2:



PC3:



Routing Table R1:

```
Router1#
%SYS-5-CONFIG_I: Configured from console by console
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 not set

    192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/30 is directly connected, GigabitEthernet0/0
L       192.168.1.1/32 is directly connected, GigabitEthernet0/0
    192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.2.0/24 is directly connected, GigabitEthernet0/1
L       192.168.2.1/32 is directly connected, GigabitEthernet0/1
S       192.168.3.0/24 [1/0] via 192.168.1.2
```

Router1#

Routing Table R2:

```
Router2>en
Password:
Router2#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 not set

    192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.1.0/30 is directly connected, GigabitEthernet0/0
L       192.168.1.2/32 is directly connected, GigabitEthernet0/0
S       192.168.2.0/24 [1/0] via 192.168.1.1
    192.168.3.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.3.0/24 is directly connected, GigabitEthernet0/1
L       192.168.3.1/32 is directly connected, GigabitEthernet0/1
```

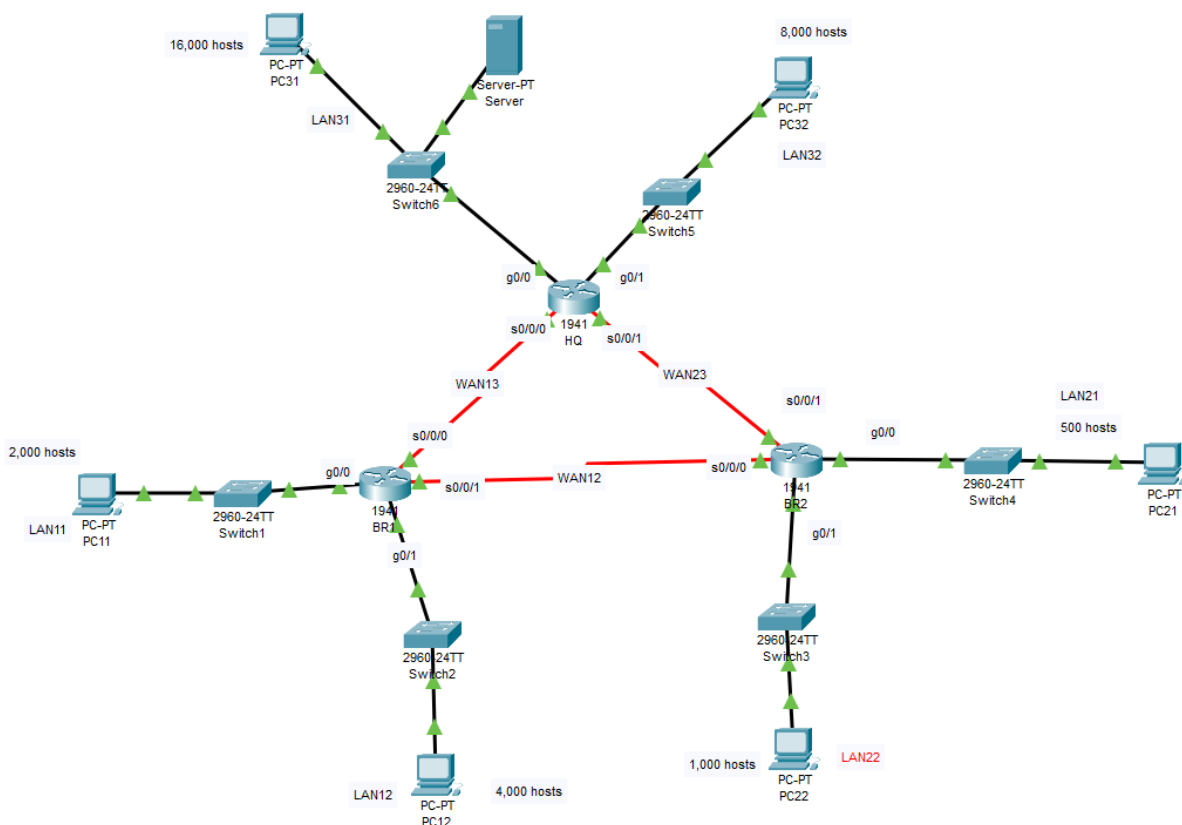
3. Subnetting and static routing

a. Subnetting the given network address and filling out the result to the Table 2. You need to briefly explain how to get these results.

From Figure 2:

- LAN31: 16000 hosts (2^{14}) => /18 subnet mask (255.255.192.0)
- LAN32: 8000 hosts (2^{13}) => /19 subnet mask (255.255.224.0)
- LAN11: 2000 hosts (2^{11}) => /21 subnet mask (255.255.248.0)
- LAN12: 4000 hosts (2^{12}) => /20 subnet mask (255.255.240.0)
- LAN21: 500 hosts (2^9) => /23 subnet mask (255.255.254.0)
- LAN22: 1000 hosts (2^{10}) hosts => /22 subnet mask (255.255.252.0)
- WAN12: 2 host => /30 subnet mask (255.255.255.252)
- WAN13: 2 hosts => /30 subnet mask (255.255.255.252)
- WAN23: 2 hosts => /30 subnet mask (255.255.255.252)

b. Basic configure on router devices:



HQ showrun


```
HQ#
%SYS-5-CONFIG_I: Configured from console by console
show run
Building configuration...

Current configuration : 1261 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname HQ
!
!
!
enable secret 5 $1$mERr$0BMDBptCrxnnflc3se/4f0
!
!
banner motd ^C Warning: Authorized Access Only on HQ ^C
!
!
!
!
line con 0
password 7 0834455A0A1016141D
login
!
line aux 0
!
line vty 0 4
password 7 0834455A0A1016141D
login
!
```

Same for BR1, BR2

- c. Assign the IP address to routers' interfaces. In each LAN zone, the first IP address of its subnet is reserved to router's interface.

SUBNET	NETWORK ADDRESS/CDIR	FIRST IP ADDRESS	BROADCAST ADDRESS
LAN11	172.18.240.0	172.18.240.1	172.18.247.255
LAN12	172.18.224.0	172.18.224.1	172.18.239.255
LAN21	172.18.252.0	172.18.252.1	172.18.253.255
LAN22	172.18.248.0	172.18.248.1	172.18.251.255
LAN31	172.18.128.0	172.18.128.1	172.18.191.255

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LAN32	172.18.192.0	172.18.192.1	172.18.223.255
WAN12	172.18.254.8	172.18.254.9	172.18.254.11
WAN13	172.18.254.0	172.18.254.1	172.18.254.3
WAN32	172.18.254.4	172.18.254.5	172.18.254.7

Device	Interface	IP Address	Subnet Mask	Default Gateway
HQ	S0/0/0	172.18.254.1	255.255.255.252	
	S0/0/1	172.18.254.5	255.255.255.252	
	G0/0	172.18.128.1	255.255.192.0	
	G0/1	172.18.192.1	255.255.224.0	
BR1	S0/0/0	172.18.254.2	255.255.255.252	
	S0/0/1	172.18.254.9	255.255.255.252	
	G0/0	172.18.240.1	255.255.248.0	
	G0/1	172.18.224.1	255.255.240.0	
BR2	S0/0/0	172.18.254.10	255.255.255.252	
	S0/0/1	172.18.254.6	255.255.255.252	
	G0/0	172.18.252.1	255.255.254.0	
	G0/1	172.18.248.1	255.255.252.0	
PC11 (LAN11)		172.18.240.5 172.18.240.X	255.255.0.0	172.18.240.1
PC12 (LAN12)		172.18.224.3 172.18.224.X	255.255.0.0	172.18.224.1
PC21 (LAN21)		172.18.252.2 172.18.252.X	255.255.0.0	172.18.252.1
PC22 (LAN22)		172.18.248.4 172.18.248.X	255.255.0.0	172.18.248.1
PC31 (LAN31)		172.18.128.9 172.18.128.X	255.255.0.0	172.18.128.1
PC32 (LAN32)		172.18.192.4 172.18.192.X	255.255.0.0	172.18.192.1
SERVER (LAN31)		172.18.128.13 172.18.128.X	255.255.0.0	172.18.128.1

- d. All routers need to configure static routing. So that all devices can communicate with each other.
- e. Configure any redundancy routes to ensure the Router BR1 and BR2 can communicate with each other even if the direct link (link WAN12) fails.

HQ ip routing table:

```
HQ#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 not set

    172.18.0.0/16 is variably subnetted, 12 subnets, 5 masks
C       172.18.128.0/18 is directly connected, GigabitEthernet0/0
L       172.18.128.1/32 is directly connected, GigabitEthernet0/0
C       172.18.192.0/19 is directly connected, GigabitEthernet0/1
L       172.18.192.1/32 is directly connected, GigabitEthernet0/1
S       172.18.224.0/24 [1/0] via 172.18.254.2
S       172.18.240.0/24 [1/0] via 172.18.254.2
S       172.18.248.0/24 [1/0] via 172.18.254.6
S       172.18.252.0/24 [1/0] via 172.18.254.6
C       172.18.254.0/30 is directly connected, Serial0/0/0
L       172.18.254.1/32 is directly connected, Serial0/0/0
C       172.18.254.4/30 is directly connected, Serial0/0/1
--More--
```

BR1 ip routing table:

```
BR1>en
Password:
BR1#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 not set

    172.18.0.0/16 is variably subnetted, 12 subnets, 5 masks
S       172.18.128.0/24 [1/0] via 172.18.254.1
S       172.18.192.0/24 [1/0] via 172.18.254.1
C       172.18.224.0/20 is directly connected, GigabitEthernet0/1
L       172.18.224.1/32 is directly connected, GigabitEthernet0/1
C       172.18.240.0/21 is directly connected, GigabitEthernet0/0
L       172.18.240.1/32 is directly connected, GigabitEthernet0/0
S       172.18.248.0/24 [1/0] via 172.18.254.1
           [1/0] via 172.18.254.10
S       172.18.252.0/24 [1/0] via 172.18.254.1
           [1/0] via 172.18.254.10
C       172.18.254.0/30 is directly connected, Serial0/0/0
L       172.18.254.2/32 is directly connected, Serial0/0/0
C       172.18.254.8/30 is directly connected, Serial0/0/1
L       172.18.254.9/32 is directly connected, Serial0/0/1

BR1#
```

BR2 ip routing table:

```
BR2>en
Password:
BR2#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 not set

    172.18.0.0/16 is variably subnetted, 12 subnets, 5 masks
S       172.18.128.0/24 [1/0] via 172.18.254.5
S       172.18.192.0/24 [1/0] via 172.18.254.5
S       172.18.224.0/24 [1/0] via 172.18.254.5
           [1/0] via 172.18.254.9
S       172.18.240.0/24 [1/0] via 172.18.254.5
           [1/0] via 172.18.254.9
C       172.18.248.0/22 is directly connected, GigabitEthernet0/1
L       172.18.248.1/32 is directly connected, GigabitEthernet0/1
C       172.18.252.0/23 is directly connected, GigabitEthernet0/0
L       172.18.252.1/32 is directly connected, GigabitEthernet0/0
C       172.18.254.4/30 is directly connected, Serial0/0/1
L       172.18.254.6/32 is directly connected, Serial0/0/1
C       172.18.254.8/30 is directly connected, Serial0/0/0
L       172.18.254.10/32 is directly connected, Serial0/0/0
```

B. TÀI LIỆU THAM KHẢO