



## BÁO CÁO THỰC HÀNH

### Bài thực hành số 02: Dynamic Routing and Access Control List

**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. Dynamic routing theory

#### a. What is different between Classful and Classless?

In a classful routing, the IP address is divided into five classes: A, B, C, D, and E. The class of the IP address determines the number of bits used for the network and host portion of the address.

Classless routing allows the use of variable-length subnet masks (VLSMs) and does not assume that the network and host portions of an IP address are contiguous. This allows for more efficient use of IP address space, as different subnets within a network can use different subnet masks to allocate IP addresses as needed.

#### b. We usually use the command **no auto-summary** when configuring RIP. Please explain why we need to use this command. What will happen if we configure RIPv2 without that command?

The command "no auto-summary" is used when configuring RIPv1 or RIPv2 to prevent automatic summarization of network prefixes at the classful network boundary.

When RIPv2 is configured without the "no auto-summary" command, automatic summarization is enabled, and network prefixes are summarized to the classful network boundary. This can cause issues when there are subnets within a network that have different routing requirements or when there are discontinuous networks. In these cases, automatic summarization can cause suboptimal routing, where traffic takes longer paths or is blackholed.

#### c. What is the C, L, and R (shown in Figure 1) stand for?

C stands for Connected. A route with a code of C indicates that the network is directly connected to the router.

L stands for Local. A route with a code of L indicates that the network is a local route, also known as a host route.

R stands for RIP, RIP routing

#### d. Propose an ACL that prevents all hosts in network 192.168.10.0/24 access the internet via HTTP/HTTPS protocol

ACL:

```
access-list 100 deny tcp 192.168.10.0 0.0.0.255 any eq 80 //HTTP
```

```
access-list 100 deny tcp 192.168.10.0 0.0.0.255 any eq 443 //HTTPS
```

```
access-list 100 permit ip any any
```

```
interface [interface name]
```

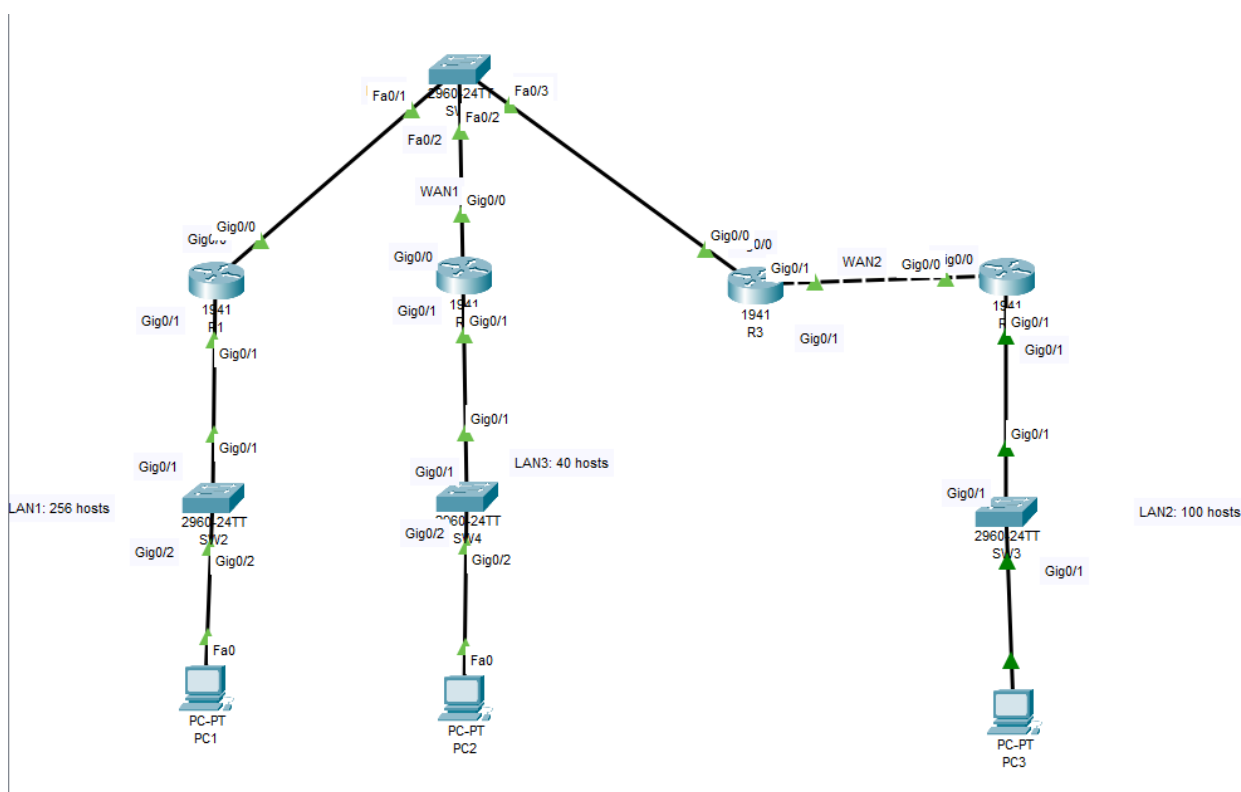
```
ip access-group 100 out
```

## 2. Dynamic routing protocol and Access Control List on physical networking devices

- a. You need to divide the allocated network into suitable subnets for LAN and WAN networks. Then, fill out the result in Subnetting table (refer to Table 1). The VLSM method is recommended.

Subnet	Network Address/CIDR	First IP Address	Broadcast IP Address
LAN1	172.18.0.0	172.18.0.1	172.168.1.255
LAN2	172.18.2.0	172.18.2.1	172.18.2.63
LAN3	172.18.2.128	172.18.2.129	192.18.2.255
WAN1	172.18.1.0	172.18.1.1	172.18.1.3
WAN2	172.18.3.0	172.18.3.1	172.18.3.3

- b. Set the hostname on all devices to match the topology diagram.



I changed a little bit

- c. Set Banner Motd as “Warning: Authorized Access Only on Router Rx” (Rx is the name of Routers) on all routes.

R1:

```
Warning: Authorized Access Only on Router R1
R1>
```

R2:

```
Warning: Authorized Access Only on Router R1

R2>en

R3:

Warning: Authorized Access Only on Router R3

R3>|

R4:

Warning: Authorized Access Only on Router R4

R4>
```

d. Configure IP addresses and masks on all devices. You need to fill out this information in the IP Assignment table (refer to Table 2)

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Gig0/0	172.18.1.1	255.255.255.0	
	Gig0/1	172.18.0.1	255.255.254.0	
R2	Gig0/0	172.18.1.2	255.255.255.252	
	Gig0/1	172.18.2.1	255.255.255.192	
R3	Gig0/0	172.18.1.3	255.255.255.0	
	Gig0/1	172.18.2.129	255.255.255.252	
R4	Gig0/0	172.18.3.2	255.255.255.252	
	Gig0/1	172.18.2.65	255.255.255.128	
PC1	NIC	172.18.0.10	255.255.255.0	172.18.0.1
PC2	NIC	172.18.2.2	255.255.255.192	172.18.2.1
PC3	NIC	172.18.2.130	255.255.255.128	172.18.2.129

```
R1:

R1>en
R1#show ip int brief
Interface      IP-Address      OK? Method Status      Protocol
GigabitEthernet0/0  172.18.1.1      YES manual up          up
GigabitEthernet0/1  172.18.0.1      YES manual up          up
Vlan1          unassigned      YES unset  administratively down down
R1#

R2:

R2>en
R2#show ip int brief
Interface      IP-Address      OK? Method Status      Protocol
GigabitEthernet0/0  172.18.1.2      YES manual up          up
GigabitEthernet0/1  172.18.2.1      YES manual up          up
Vlan1          unassigned      YES unset  administratively down down

R3:
```

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R3#show ip int brief

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0	172.18.1.3	YES	manual	up	up
GigabitEthernet0/1	172.18.3.1	YES	manual	up	up
Vlan1	unassigned	YES	unset	administratively down	down

R4:

R4#

%SYS-5-CONFIG\_I: Configured from console by console

show ip int brief

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0	172.18.3.2	YES	manual	up	up
GigabitEthernet0/1	172.18.2.129	YES	manual	up	up
Vlan1	unassigned	YES	unset	administratively down	down

PC1:

IPv4 Address	172.18.0.10
Subnet Mask	255.255.255.0
Default Gateway	172.18.0.1
DNS Server	0.0.0.0

PC2:

IP Configuration

☐ DHCP
 ☒ Static

IPv4 Address

172.18.2.2

Subnet Mask

255.255.255.192

Default Gateway

172.18.2.1

DNS Server

0.0.0.0

PC3:

☐ DHCP
 ☒ Static

IPv4 Address

172.18.2.130

Subnet Mask

255.255.255.128

Default Gateway

172.18.2.129

DNS Server

0.0.0.0

### e. Configure the routers to run RIPv2

R1 and routing table

R1#conf t

Enter configuration commands, one per line. End with CNTL/Z.

R1(config)#router rip

R1(config-router)#version 2

R1(config-router)#network 172.18.0.0

R1(config-router)#network 172.18.1.0

R1(config-router)#no atu

R1(config-router)#no au

R1(config-router)#no auto-summary

R1(config-router)#end

R1#

```

172.18.0.0/16 is variably subnetted, 7 subnets, 6 masks
C    172.18.0.0/23 is directly connected, GigabitEthernet0/1
L    172.18.0.1/32 is directly connected, GigabitEthernet0/1
C    172.18.1.0/24 is directly connected, GigabitEthernet0/0
L    172.18.1.1/32 is directly connected, GigabitEthernet0/0
R    172.18.2.0/26 [120/1] via 172.18.1.2, 00:00:23, GigabitEthernet0/0
R    172.18.2.128/25 [120/2] via 172.18.1.3, 00:00:12, GigabitEthernet0/0
R    172.18.3.0/30 [120/1] via 172.18.1.3, 00:00:12, GigabitEthernet0/0

```

R2:

```

R2#
%SYS-5-CONFIG_I: Configured from console by console
conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router rip
R2(config-router)#version 2
R2(config-router)#network 172.18.2.0
R2(config-router)#network 172.18.1.0
R2(config-router)#no au
R2(config-router)#no auto-summary
R2(config-router)#end
R2#

172.18.0.0/16 is variably subnetted, 7 subnets, 5 masks
R    172.18.0.0/23 [120/1] via 172.18.1.1, 00:00:28, GigabitEthernet0/0
C    172.18.1.0/30 is directly connected, GigabitEthernet0/0
L    172.18.1.2/32 is directly connected, GigabitEthernet0/0
C    172.18.2.0/26 is directly connected, GigabitEthernet0/1
L    172.18.2.1/32 is directly connected, GigabitEthernet0/1
R    172.18.2.128/25 [120/2] via 172.18.1.3, 00:00:20, GigabitEthernet0/0
R    172.18.3.0/30 [120/1] via 172.18.1.3, 00:00:20, GigabitEthernet0/0

```

R3:

```

R3(config)#router rip
R3(config-router)#version 2
R3(config-router)#network 172.18.0.0
R3(config-router)#network 172.18.1.0
R3(config-router)#network 172.18.3.0
R3(config-router)#no au
R3(config-router)#no auto-summary
R3(config-router)#end
R3#

172.18.0.0/16 is variably subnetted, 9 subnets, 6 masks
R    172.18.0.0/23 [120/1] via 172.18.1.1, 00:00:29, GigabitEthernet0/0
C    172.18.1.0/24 is directly connected, GigabitEthernet0/0
L    172.18.1.3/32 is directly connected, GigabitEthernet0/0
R    172.18.2.0/25 [120/1] via 172.18.3.2, 00:00:22, GigabitEthernet0/1
R    172.18.2.0/26 [120/1] via 172.18.1.2, 00:00:02, GigabitEthernet0/0
R    172.18.2.64/30 [120/1] via 172.18.3.2, 00:02:56, GigabitEthernet0/1
R    172.18.2.128/30 is possibly down, routing via 172.18.3.2, GigabitEthernet0/1
C    172.18.3.0/30 is directly connected, GigabitEthernet0/1
L    172.18.3.1/32 is directly connected, GigabitEthernet0/1

```

R4:



```
R4(config)#router rip
R4(config-router)#version 2
R4(config-router)#network 172.18.2.128
R4(config-router)#network 172.18.3.0
R4(config-router)#no au
R4(config-router)#no auto-summary
R4(config-router)#end
R4#
```

```
172.18.0.0/16 is variably subnetted, 7 subnets, 6 masks
R    172.18.0.0/23 [120/2] via 172.18.3.1, 00:00:07, GigabitEthernet0/0
R    172.18.1.0/24 [120/1] via 172.18.3.1, 00:00:07, GigabitEthernet0/0
R    172.18.2.0/26 [120/2] via 172.18.3.1, 00:00:07, GigabitEthernet0/0
C    172.18.2.128/25 is directly connected, GigabitEthernet0/1
L    172.18.2.129/32 is directly connected, GigabitEthernet0/1
C    172.18.3.0/30 is directly connected, GigabitEthernet0/0
L    172.18.3.2/32 is directly connected, GigabitEthernet0/0
```

Ping:

	Successful	PC1	PC3	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC1	PC2	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC1	R3	ICMP		0.000	N	2	(edit)	(delete)
	Successful	PC3	PC2	ICMP		0.000	N	3	(edit)	(delete)
	Successful	PC3	R1	ICMP		0.000	N	4	(edit)	(delete)

## f. Enable Telnet Remote Access on all routers.

R1:

```
R1(config)#line vty 0 15
R1(config-line)#password uitcisco
^
% Invalid input detected at '^' marker.

R1(config-line)#password uitcisco
R1(config-line)#login
R1(config-line)#trans
R1(config-line)#transport input telnet
R1(config-line)#end
R1#
```

R2:

```
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#line vty 0 15
R2(config-line)#password uitcisco
R2(config-line)#login
R2(config-line)#trans
R2(config-line)#transport input telnet
R2(config-line)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console
```

R3:



```
R3>en
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#line vty 0 15
R3(config-line)#password uitcisco
R3(config-line)#login
R3(config-line)#tra
R3(config-line)#transport input telnet
R3(config-line)#end
R3#
%SYS-5-CONFIG_I: Configured from console by console
```



R4:

```
R4>en
R4#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R4(config)#line vty 0 15
R4(config-line)#password uit cisco
R4(config-line)#login
R4(config-line)#tran
R4(config-line)#transport input
R4(config-line)#transport input telnet
R4(config-line)#
```

## g. Configure the Standard ACL(s) to allow access to LAN2 from PC1.



```
R1(config)#acc
R1(config)#access-list 10 permit 172.18.2.0 0.0.0.63
R1(config)#int gig0/0
R1(config-if)#ip access
R1(config-if)#ip access-group 10 in
R1(config-if)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
copy
R1#copy running
R1#copy running-config st
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

It mean permit all traffic from lan 2 to lan 1

 Successful PC2 PC1 ICMP  0.000 N 5 (edit) (delete)

## h. Block all traffic from LAN1 to LAN2

```
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#acc
R1(config)#access-list 11 deny 172.18.2.0 0.0.0.63
R1(config)#access-list 11 permit any
R1(config)#int gig 0/0
R1(config-if)#ip ac
R1(config-if)#ip access-group 11 out
R1(config-if)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
copy run
R1#copy running-config st
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

 Failed PC1 PC2 ICMP  0.000 N 6 (edit) (delete)

Since it's blocked, for sure we receive a fail notification

Code mean deny any traffic to LAN2 and permit to all other traffic.

- i. On the router R2, we can remotely configure via Telnet protocol. To enhance the security, you should configure that only accept remote from LAN3.

```
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#access
R2(config)#access-list 12 permit 172.18.2.128 0.0.0.127
R2(config)#line vty 0 4
R2(config-line)#access-class 12 in
R2(config-line)#write memory
^
% Invalid input detected at '^' marker.

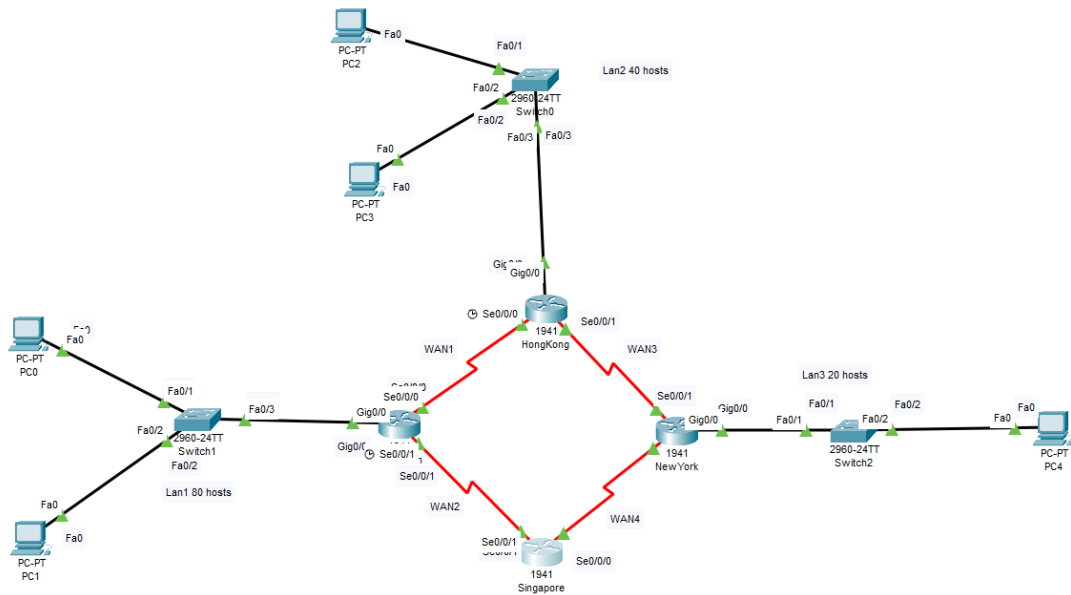
R2(config-line)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console
write memory
Building configuration...
[OK]
R2#
```

### 3. OSPF and Access Control List

- a. You need to divide the allocated network into suitable subnets for LAN and WAN networks. Then, fill out the result in Subnetting table (refer to Table 1). The VLSM method is recommended.

Subnet	Network Address/CIDR	First IP Address	Broadcast IP Address
LAN1	172.18.0.0	172.18.0.1	172.168.0.127
LAN2	172.18.0.128	172.18.0.129	172.18.0.191
LAN3	172.18.0.192	172.18.0.193	192.18.2.223
WAN1	172.18.0.224	172.18.0.225	172.18.0.231
WAN2	172.18.0.232	172.18.0.233	172.18.0.239
WAN3	172.18.0.240	172.18.0.241	172.18.0.247
WAN4	172.18.0.248	172.18.0.249	172.18.0.255

**b. Set the hostname on all devices.**



HoChiMinh: R1

```
Router(config)#hostname Router1
Router1(config)#
```

Singapore: R2

```
Router(config)#hostname Router2
Router2(config)#
```

NewYork: R3

```
Router(config)#hostname Router3
Router3(config)#
```

HongKong: R4

```
Router(config)#hostname Router4
Router4(config)#
```

**c. Set Banner Motd as “Warning: Authorized Access Only on Router Rx” (Rx is the name of Routers) on all Routes.**

```
Warning: Authorized Access Only on Router R1

Router1>
Warning: Authorized Access Only on Router R2

Router2>
Warning: Authorized Access Only on Router R3

Router3>
Warning: Authorized Access Only on Router R4

Router4>
```

**d. Assign the IP address for all necessary interfaces of devices. You need to fill out this information in the IP Assignment table (refer to Table 2).**

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1 (HoChiMinh)	Gig0/0	172.18.0.1	255.255.255.128	
	Se0/0/0	172.18.0.225	255.255.255.248	
	Se0/0/1	172.18.0.233	255.255.255.248	
R2 (Singapore)				
	Se0/0/0	172.18.0.249	255.255.255.248	
	Se0/0/1	172.18.0.238	255.255.255.248	
R3 (NewYork)	Gig0/0	172.18.0.193	255.255.255.224	
	Se0/0/0	172.18.0.254	255.255.255.248	
	Se0/0/1	172.18.0.241	255.255.255.248	
R4 (HongKong)	Gig0/0	172.18.0.129	255.255.255.192	
	Se0/0/0	172.18.0.230	255.255.255.248	
	Se0/0/1	172.18.0.246	255.255.255.248	
PC0	NIC	172.18.0.2	255.255.255.128	172.18.0.1
PC1	NIC	172.18.0.3	255.255.255.128	172.18.0.1
PC2	NIC	172.18.0.130	255.255.255.192	172.18.0.129
PC3	NIC	172.18.0.131	255.255.255.192	172.18.0.129
PC4	NIC	172.18.0.194	255.255.255.224	172.18.0.193

😞 too many device, so I prefer not to capture, you can check in my packet tracer file.

**e. Configure OSPF routing to all routers so that all hosts among networks can communicate with each other. Using ProcessID = 1 and Area = 0.**

Router1(HoChiMinh):

```
Router1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router1(config)#router ospf 1
Router1(config-router)#network 172.18.0.0 0.0.0.127 area 0
Router1(config-router)#network 172.18.0.224 0.0.0.7 area 0
Router1(config-router)#network 172.18.0.232 0.0.0.7 area 0
Router1(config-router)#e
02:14:25: %OSPF-5-ADJCHG: Process 1, Nbr 172.18.0.246 on Serial0/0/0 from LOADING to
FULL, Loading Done
end
^
% Invalid input detected at '^' marker.

Router1(config-router)#end
```

```

172.18.0.0/16 is variably subnetted, 10 subnets, 5 masks
C    172.18.0.0/25 is directly connected, GigabitEthernet0/0
L    172.18.0.1/32 is directly connected, GigabitEthernet0/0
O    172.18.0.128/26 [110/65] via 172.18.0.230, 00:00:10, Serial0/0/0
O    172.18.0.192/27 [110/129] via 172.18.0.230, 00:00:10, Serial0/0/0
C    172.18.0.224/29 is directly connected, Serial0/0/0
L    172.18.0.225/32 is directly connected, Serial0/0/0
C    172.18.0.232/29 is directly connected, Serial0/0/1
L    172.18.0.233/32 is directly connected, Serial0/0/1
O    172.18.0.240/29 [110/128] via 172.18.0.230, 00:00:10, Serial0/0/0
O    172.18.0.248/29 [110/192] via 172.18.0.230, 00:00:10, Serial0/0/0

```

### Router2(Singapore):

```

conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router2(config)#router ospf 1
Router2(config-router)#network 172.18.0.248 0.0.0.7 area 0
Router2(config-router)#
02:09:29: %OSPF-5-ADJCHG: Process 1, Nbr 172.18.0.254 on Serial0/0/0 from LOADING to
FULL, Loading Done
network 172.18.0.232 0.0.0.7 area 0
Router2(config-router)#end

172.18.0.0/16 is variably subnetted, 9 subnets, 5 masks
O    172.18.0.0/25 [110/65] via 172.18.0.233, 00:03:09, Serial0/0/1
O    172.18.0.128/26 [110/129] via 172.18.0.254, 00:03:09, Serial0/0/0
    [110/129] via 172.18.0.233, 00:03:09, Serial0/0/1
O    172.18.0.192/27 [110/65] via 172.18.0.254, 00:07:13, Serial0/0/0
O    172.18.0.224/29 [110/128] via 172.18.0.233, 00:03:09, Serial0/0/1
C    172.18.0.232/29 is directly connected, Serial0/0/1
L    172.18.0.238/32 is directly connected, Serial0/0/1
O    172.18.0.240/29 [110/128] via 172.18.0.254, 00:07:13, Serial0/0/0
C    172.18.0.248/29 is directly connected, Serial0/0/0
L    172.18.0.249/32 is directly connected, Serial0/0/0

```

### Router3(NewYork):

```

Router3>en
Router3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router3(config)#router ospf 1
Router3(config-router)#network 172.18.0.192 0.0.0.31 area 0
Router3(config-router)#network 172.18.0.248 0.0.0.31 area 0
Router3(config-router)#network 172.18.0.248 0.0.0.7 area 0
Router3(config-router)#network 172.18.0.240 0.0.0.7 area 0
Router3(config-router)#end
Router3#
%SYS-5-CONFIG I: Configured from console by console

172.18.0.0/16 is variably subnetted, 10 subnets, 5 masks
O    172.18.0.0/25 [110/129] via 172.18.0.249, 00:03:58, Serial0/0/0
    [110/129] via 172.18.0.246, 00:03:58, Serial0/0/1
O    172.18.0.128/26 [110/65] via 172.18.0.246, 00:06:24, Serial0/0/1
C    172.18.0.192/27 is directly connected, GigabitEthernet0/0
L    172.18.0.193/32 is directly connected, GigabitEthernet0/0
O    172.18.0.224/29 [110/128] via 172.18.0.246, 00:06:24, Serial0/0/1
O    172.18.0.232/29 [110/128] via 172.18.0.249, 00:07:38, Serial0/0/0
C    172.18.0.240/29 is directly connected, Serial0/0/1
L    172.18.0.241/32 is directly connected, Serial0/0/1
C    172.18.0.248/29 is directly connected, Serial0/0/0
L    172.18.0.254/32 is directly connected, Serial0/0/0





```

### Router4(HongKong):

```
Router4>en
Router4#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router4(config)#router ospf 1
Router4(config-router)#network 172.18.0.128 0.0.0.63 area 0
Router4(config-router)#network 172.18.0.224 0.0.0.7 area 0
Router4(config-router)#network 172.18.0.240 0.0.0.7 area 0
Router4(config-router)#end
Router4#
%SYS-5-CONFIG_I: Configured from console by console

172.18.0.0/16 is variably subnetted, 10 subnets, 5 masks
O    172.18.0.0/25 [110/65] via 172.18.0.225, 00:04:58, Serial0/0/0
C    172.18.0.128/26 is directly connected, GigabitEthernet0/0
L    172.18.0.129/32 is directly connected, GigabitEthernet0/0
O    172.18.0.192/27 [110/65] via 172.18.0.241, 00:07:15, Serial0/0/1
C    172.18.0.224/29 is directly connected, Serial0/0/0
L    172.18.0.230/32 is directly connected, Serial0/0/0
O    172.18.0.232/29 [110/128] via 172.18.0.225, 00:04:58, Serial0/0/0
C    172.18.0.240/29 is directly connected, Serial0/0/1
L    172.18.0.246/32 is directly connected, Serial0/0/1
O    172.18.0.248/29 [110/128] via 172.18.0.241, 00:07:15, Serial0/0/1
```

Ping:

Successful	Singa...	PC4	ICMP		0.000	N	3	(edit)	(delete)
Successful	PC3	PC4	ICMP		0.000	N	4	(edit)	(delete)
Successful	PC2	PC4	ICMP		0.000	N	5	(edit)	(delete)
Successful	PC1	PC4	ICMP		0.000	N	6	(edit)	(delete)

#### f. Prevent access to the LAN3 from VLAN1.

Wdym by Vlan1, I don't see it in LAB02 file

#### g. The FTP server is accessible from PC0 if and only if using FTP, SSH protocol

I don't see the access server you mentioned in the LAB02 file you provided, but I think we can do something like this:

```
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#acc
Switch(config)#access-list 100 permit tcp host 172.18.0.2 host 192.168.10.10 eq ftp
Switch(config)#access-list 100 permit tcp host 172.18.0.2 host 192.168.10.10 eq ssh

Switch(config)#access-list 100 deny ip any host 192.168.10.10

Switch(config)#access-list 100 permit ip any any
Switch(config)#int fa0/1

Switch(config-if)#ip access-group 100 in
```

Yeah. Some thing like that.

## B. TÀI LIỆU THAM KHẢO