2. Dynamic Routing and Access Control List

A. OVERVIEW

1. Learning objective

The **learning objective** of this lab is to understand how to dynamically exchange routing information between routers, and how to restrict user or system access to a particular object or system resource. Firstly, students will configure, observe, and troubleshoot the Routing Information Protocol[1] (RIP) and the Open Shortest Path First[2] (OSPF). Then, students build the policy lists that use the Access-Control-List (ACL) to grant or deny access to certain networks or resources.

2. Practice Environment

- Practicing with physical networking devices
- Cisco Packet Tracer

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[1] Distance Vector Routing algorithm
[2] Link State Routing algorithm

B. LAB TASKS

1. Dynamic Routing theory

Before practicing, let's find the answer to the following questions:
   a. What is different between Classful and Classless?
   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?
   c. What is the C, L, and R (shown in Figure 1) stand for?
   d. Propose an ACL that prevents all hosts in network 192.168.10.0/24 access the internet via HTTP/HTTPS protocol.

```
R1# show ip route | begin Gateway
Gateway of last resort is not set

      192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.1.0/24 is directly connected, GigabitEthernet0/0
L        192.168.1.1/32 is directly connected, GigabitEthernet0/0
      192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.2.0/24 is directly connected, Serial0/0/0
L        192.168.2.1/32 is directly connected, Serial0/0/0
R      192.168.3.0/24 [120/1] via 192.168.2.2, 00:00:24, Serial0/0/0
R      192.168.4.0/24 [120/1] via 192.168.2.2, 00:00:24, Serial0/0/0
R      192.168.5.0/24 [120/2] via 192.168.2.2, 00:00:24, Serial0/0/0
R1#
```

Figure 1: Example of the routing table

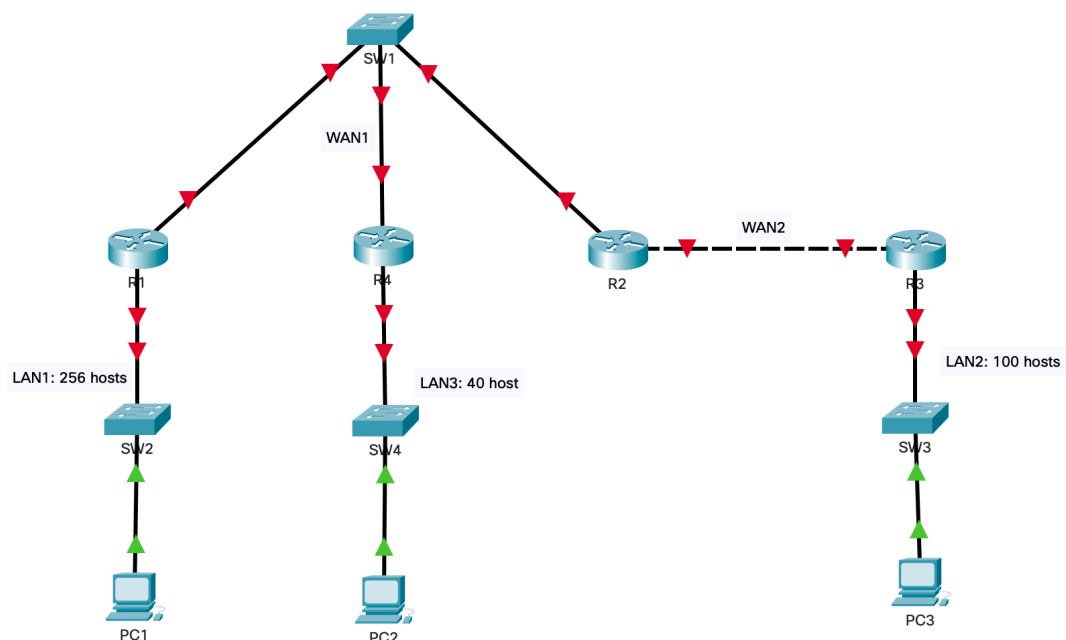## 2. Dynamic routing protocol and Access Control List on physical networking devices

Figure 2: The network topology for Task 2

Giving the network topology as shown in the figure above and network address *172.(16+X%16).0.0/16* (with X standing for your group's ID).

Requirements:
1. Plan suitable subnets for LAN and WAN networks in detail and fill out to *Subnetting table* (refer to Table 1). VLSM method is recommended.
2. Set the hostname for all devices.
3. Set Banner Motd as *"Warning: Authorized Access Only on Router Rx"* (Rx is the name of Routers) for all Routes.
4. 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).
5. Configure RIPv2 routing to all routers so that all hosts among networks can communicate with each other.
6. Enable Tenet Remote Access on all routers.
7. Deny access to PC1 from only LAN3.
8. Allow access to LAN2 by default except for accessing from LAN3.
9. Allow remote access to R2 through telnet protocol from only LAN1.

Please note that you should frequently save the Running-configuration to the Startup-configuration in case of unexpected device rebooting.

Table 1: Example of Subnetting Table

Subnet	Network Address/CIDR	First IP Address	Broadcast Address
LAN1	172.19.0.0	172.19.0.1	172.19.1.255
LAN2	172.19.2.0	172.19.2.1	172.19.2.127
LAN3	172.19.2.128	172.19.2.129	172.19.2.191
WAN1	172.19.2.192	172.19.2.193	172.19.2.199
WAN2	172.19.2.200	172.19.2.201	172.19.2.203

Table 2: Example of IP assignment table

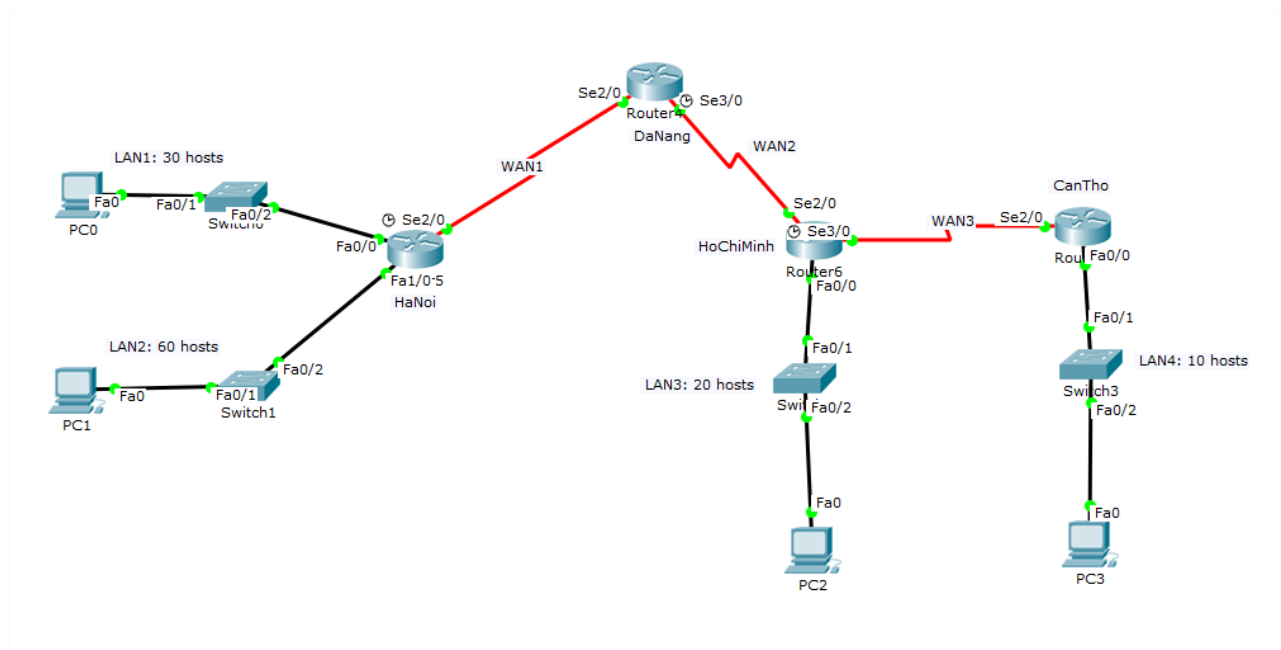| Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0	172.19.2.193		
	Fa0/1	172.19.0.1		
R2	Fa0/0	172.19.2.195		
	Fa0/1	172.19.2.201		
R3	Fa0/0	172.19.2.1		
	Fa0/1	172.19.2.202		
PC1	NIC			
PC2	NIC			
PC3	NIC			

3. RIPv2 and Access Control List

Figure 3: The network topology for Task 3

Requirements: You are given the network topology as shown in the figure above and network address *172.(16+X%16).0.0/16* (with X standing for your group's ID).

1. Plan suitable subnets for LAN and WAN networks in detail and fill out to *Subnetting table* (refer to Table 1). VLSM is recommended.
2. Set the hostname for all devices.
3. Set Banner Motd as *"Warning: Authorized Access Only on Router Rx"* (Rx is the name of Routers) for all Routes.
4. 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).
5. Configure RIPv2 routing to all routers so that all hosts among networks can communicate with each other.
6. Deny accessing LAN4 from PC0 using Standard Access List.
7. All hosts in the LAN2 allow access to the LAN4 via HTTP/HTTPS protocol only.

Please note that you should frequently save the Running-configuration to the Startup-configuration in case of unexpected device rebooting.
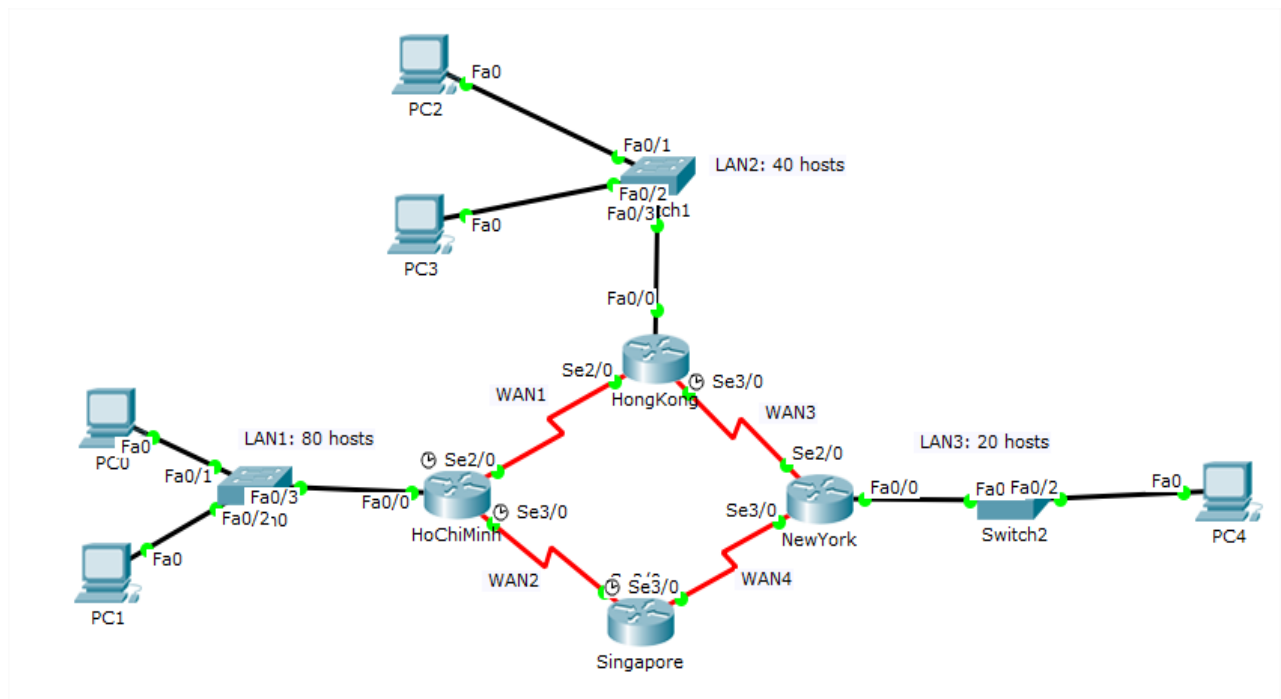
4. OSPF and Access Control List

Figure 4: The network topology for Task 4

Requirements: You are given the network topology as shown in the figure above and network address *172.(16+X%16).0.0/16* (with X standing for your group's ID).

1. Plan suitable subnets for LAN and WAN networks in detail and fill out to *Subnetting table* (refer to Table 1). VLSM is recommended.
2. Set the hostname for all devices.
3. Set Banner Motd as *"Warning: Authorized Access Only on Router Rx"* (Rx is the name of Routers) for all Routes.
4. 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).
5. Configure OSPF routing to all routers so that all hosts among networks can communicate with each other. Using ProcessID = 1 and Area = 0.
6. Prevent access to the LAN3 from VLAN1.
7. The FTP server is accessible from PC0 if and only if using FTP, SSH protocol.

Please note that you should frequently save the Running-configuration to the Startup-configuration in case of unexpected device rebooting.

C. REQUIREMENTS

You are expected to complete all tasks in section B (Lab tasks). Advanced tasks are optional, and you could get bonus points for completing those tasks. We prefer you work in a team of four to get the highest efficiency.

Your submission must meet the following requirements:

▪ You need to submit a **detailed lab report in .docx** *(Word Document)* format, **using the report template** provided on the UIT Courses website.

▪ Either Vietnamese or English report is accepted, that's up to you. The report written in the mixing of multiple languages is not allowed (except for the untranslatable keywords).

▪ When it comes to **programming tasks** *(require you to write an application or script),* please attach all source-code and executable files (if any) in your submission. Please also list the important code snippets followed by explanations and screenshots when running your application in your

report. Simply attaching code without any explanation will not receive points.

▪ Submit work you are proud of – don't be sloppy and lazy!

Your submissions must be your own. You are free to discuss with other classmates to find the solution. However, copying reports is prohibited, even if only a part of your report. Both reports of the owner and the copier will be rejected. Please remember to cite any source of the material (website, book,…) that influences your solution.

Notice: Combine your lab report and all related files into a single **ZIP file (.zip)**, name it as follow:

StudentID1_StudentID2_ReportLabX.zip