CS3543 Lab Assignment for Jan 24th (Deadline: 23:59 on February 9th (SUN), 2020)

Member 1: NAME (STUDENT ID)
Member 2: NAME (STUDENT ID)

General Information

1. This assignment is a pair assignment. The same mark will be offered to the pair of students regardless of individual contributions.
2. The assignment is customized for Ubuntu + KVM environment. It is highly recommended for non-Ubuntu users to enable dual boot on your laptop computer and install Ubuntu. If you would like to work on another operating system and virtualization platform, you need to interpret the Ubuntu/KVM terminology to another environment's terminology.
3. Each pair can create a locally copy of this question file, give the answer to the local copy, and submit in a form of PDF file.
4. Only one submission is good enough as far as the student name and ID are properly mentioned.
5. Do not send any private comment to separately mention the buddy.

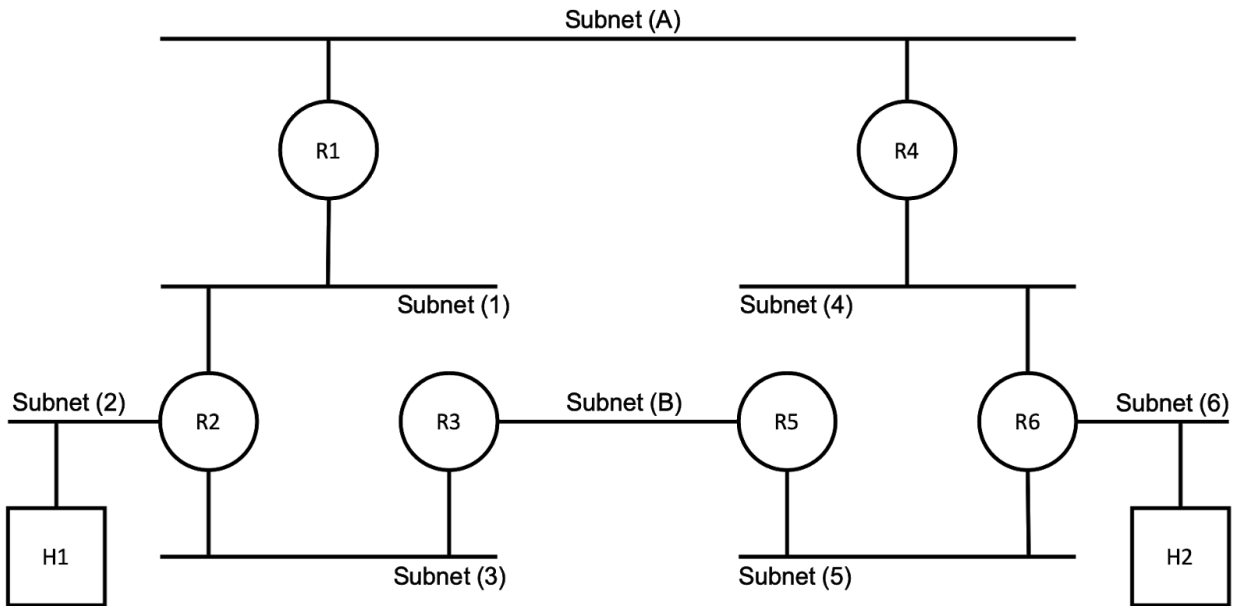

Fig.1. Blank Network Diagram

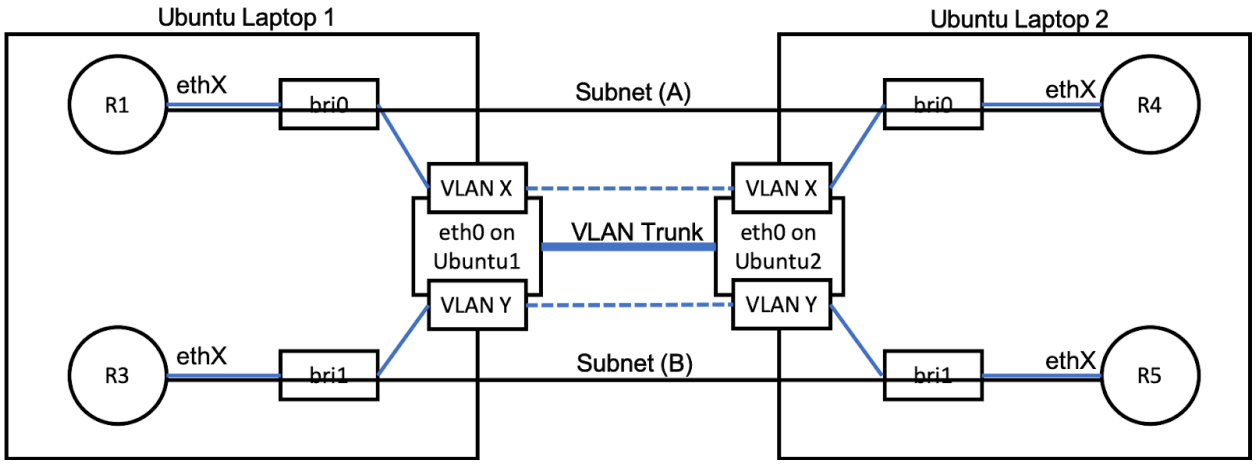

Fig.2. Conceptual Illustration of VLAN Configuration on Ubuntu Laptops 1 and 2

(Instruction)

This assignment requires to directly connect two Ubuntu laptops using a LAN cable to form a slightly bigger network than the previous assignment as shown in Fig. 1. In order to enable inter-router connections via Subnets (A) and (B) between the Ubuntu laptops, VLAN I/F (for VLAN Trunk) needs to be created on the physical LAN port of both Ubuntu laptops, and VLAN I/F needs to be attached to the corresponding bridge I/F as illustrated in Fig.2. Explore the ubuntu configuration 1) to create VLANs on Ubuntu, 2) to configure VLAN I/F (Trunking), and 3) attach VLAN I/F to a bridge I/F, 4) to let the traffic go through a separate VLAN/Bridge between respective pairs of VMs {R1 and R4} and {R3 and R5}.

Question 0.
Complete the following table about the VLAN and Bridge configurations for Subnets (A) and (B). It is strongly recommended to unify the bridge name between Laptops 1 and 2 for each subnet to avoid confusion.

	For Subnet (A)	For Subnet (B)
VLAN ID		
Name of VLAN I/F on Laptop 1		
Name of VLAN I/F on Laptop 2		
Name of Bridge I/F on Laptop 1		
Name of Bridge I/F on Laptop 2		

Question 1.
Assign the necessary configuration (NIC and IPv4/v6 addresses) to implement the network illustrated in Fig. 1, note down the configuration in the network diagram, and insert the update network diagram as an image as the answer to the question.

Supplemental Instructions for Question 1.

1. This assignment does not provide any addressing information. It must be determined and noted down in the network diagram by yourself. Make sure that the following minimum information are clearly visible.
    a. To each subnet: Bridge Name, IPv4 Prefix, IPv6 Prefix
    b. To each NIC: I/F Name, MAC Address, IPv4 Address, IPv6 Address
2. You may use the base network diagram given in the supplemental power-point file or your hand illustration. The example of subnet and NIC information is also available in the same power-point file. If you don't have a better idea, follow the example.

Question 2.
Configure static routes so that the traffic between H1 and H2 goes through Subnet (A) for both directions. Answer by inserting the screen captures of routing table of R2 and R6, and traceroute results between H1 and H2.

Question 3. (For Static Routing)
Execute ping (only IPv4 is OK) from H1 to H2, and disconnect Subnet (A) by unplugging the LAN cable between the laptops, and explain what happens in the network and how a router react when the next hop router becomes unreachable. Insert the screen captures of tcpdump on both NICs of R1, and provide additional explanation of what you observe as part of the answer.

Question 4. (For Static Routing)
Configure static routes on the routers so that 1) ping traffic from H1 to H2 goes through Subnet (A), and 2) that from H2 to H1 goes through Subnet (B) using both IPv4 and IPv6. Answer by inserting the screen captures of the routing table on R2 and R6, and the tcpdump result on R1 and R5 on those you should observe the traffic is one way.

Question 5.
Create a routing loop among R1, R2, … R6, and explain what happens in the network. Insert the screen captures of tcpdump on H1 and IPv4/v6 traceroute performed from H1 to H2. And explain 1) the traceroute results, and 2) what kind of message H1 receives when routing loop happens.

Question 6.1.
Delete the static routes from all the routers, and enable OSPF for IPv4 and OSPFv3 for IPv6 on them so that ping and ping6 are successful between H1 and H2. Insert screen captures of the OSPF/OSPFv3 neighbor tables, IPv4/v6 routing tables on R2 and R6, successful ping/ping6 results on H1 or H2.

Question 6.2.
Select two different types of OSPF-related messages that you observe in the experiment, and explain what kind of information they carry and what their role is respectively.

Question 7.1. (For OSPF)
Execute ping (only IPv4 is OK) from H1 to H2, and disconnect Subnet (A) by unplugging the LAN cable between the laptops. Keep pinging even after you disconnect the LAN cable (up to 1 minute should be enough), and observe what happens to the ping result.

Question 7.2.
Insert the screen captures of the routing table on R2 to compare those before and after unplugging the LAN cable. And explain which change in the routing table is the cause of observation that you gave in the previous answer in 7.1.

Question 8.
Configure OSPF Link Costs on the routers so that 1) ping traffic from H1 to H2 goes through Subnet (A), and 2) that from H2 to H1 goes through Subnet (B) using both IPv4 and IPv6. Answer by inserting the screen captures of the routing table on R2 and R6, and the tcpdump result on R1 and R5 on those you should observe the traffic is one way.

Done!!

Some notes:

1. OSPF ECMP was omitted because it makes less sense in this scenario.
2. If you’re stuck in VLAN configuration, ping TAs or come to the lab session.