Computer Networks

Lab No.: 5

Subnetting & Supernetting

Objectives:

- ❖ To be familiar with subnetting with FLSM and VLSM
- ❖ To be familiar with supernetting and classless addressing

Requirements:

- ❖ Network simulation tool: Packet Tracer

Subnet mask:

- A subnet mask is used to divide an IP address into two parts ⇒ one part identifies the host computer, the other part identifies the network to which the host belongs
- The format of subnet mask is also similar with IP address
- Subnet mask is used by a host to identify whether the destination is within same subnet or on a different subnet
- The subnet mask has a very important role in subnetting (FLSM as well as VLSM) and supernetting

Activities:

A. Create the network topology as shown in figure 1 below, and note down the output by performing the following activities:

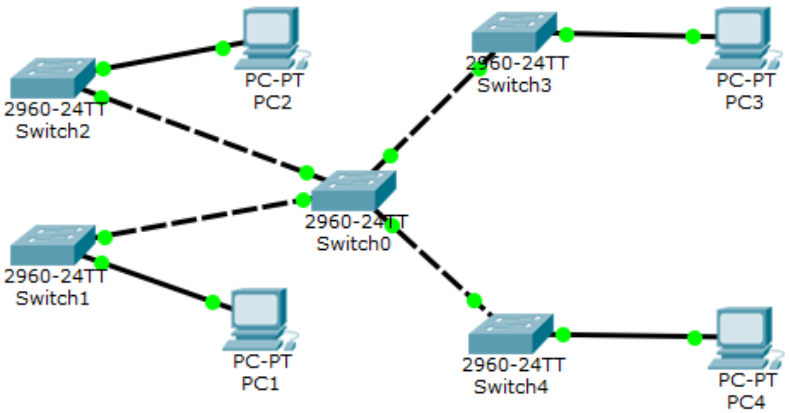

Figure 1: Network Topology 1

1. Assign the IP address of PC1, PC2, PC3 and PC4 as 202.22.22.11, 202.22.22.21, 202.22.22.41, 202.22.22.81 respectively with a subnet mask of 255.255.255.0 to all.
2. Test the connectivity from each of the computers to all other computers using ping. Like from PC1 to other three computers, PC2 to other three computers and so on.

3. Change the subnet mask of all computers to 255.255.255.192 and test the connectivity from each of the computers to all other computers using ping.
4. Change the subnet mask of all computers to 255.255.255.224 and test the connectivity from each of the computers to all other computers using ping.
5. Change the subnet mask of all computers to 255.255.255.240 and test the connectivity from each of the computers to all other computers using ping.

6. For the situation given in 5 above, replace the central switch i.e. Switch0 by a router i.e. Router0 as shown in figure 2 below and configure the hostname of the router as your Firstname. Also configure its interfaces with following IP addresses and subnet mask of 255.255.255.240.
    - Fa 0/0 → 202.22.22.12
    - Fa 1/0 → 202.22.22.22
    - Fa 2/0 → 202.22.22.42
    - Fa 3/0 → 202.22.22.82

7. Configure each computer with a default gateway i.e. IP address of the corresponding interface of the router. Test the connectivity from each of the computers to all other computers using ping.

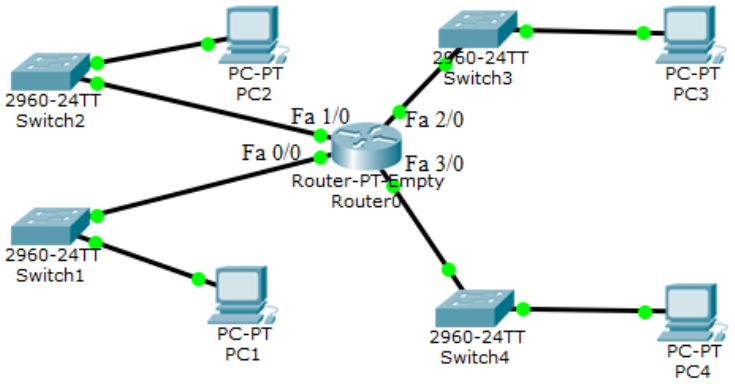

Figure 2: Network Topology 2

B. Create the network topology as shown in figure 1 above and Assign the IP address of PC1, PC2, PC3 and PC4 as 202.44.8.2, 202.44.9.2, 202.44.10.2 and 202.44.12.2 respectively with a subnet mask of 255.255.255.0 to all and note down the result of following operations:
    1. Test the connectivity from each of the computers to another using ping.
    2. Change the subnet mask of all computers to 255.255.254.0 and test the connectivity from each of the computers to another using ping.
    3. Change the subnet mask of all computers to 255.255.252.0 and test the connectivity from each of the computers to another using ping.
    4. Change the subnet mask of all computers to 255.255.248.0 and test the connectivity from each of the computers to another using ping.

C. You have given the IP addresses of 200.70.90.0/24 from your ISP. You are assigned to divide this address range equally for different departments A, B, C, D and two networks E & F for interconnection between routers, which are connected as shown in given figure 3 below. Allocate the IP address range for each of the departments with their network

address, broadcast address and subnet mask. Also list out the unused range of IP addresses (if any). Configure the hostname of each router as your Firstname_1, Firstname_2 and so on. Configure static routing in between each of the department's networks as well as to the Internet via ISP Router, i.e. forward all Internet traffic to ISP's router. While assigning IP address blocks to each network consider the possible route aggregation. Use route aggregation wherever possible while configuring static routing.

1. Test the connectivity from each of the networks to the rest of the given networks using ping.
2. Observe the output of the traceroute from a computer of each of the networks to the rest of the given networks.
3. Observe the output by using traceroute to the destination address of 103.5.150.3.

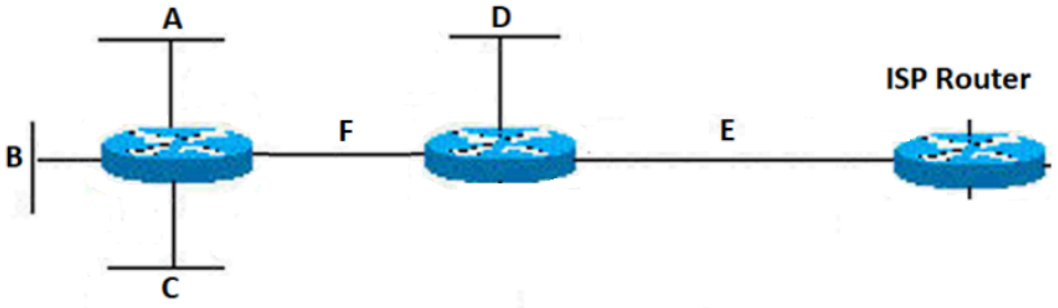

Figure 3: Network Topology 3

D. You have got the IP address of 200.50.40.0/23 from APNIC. You have to divide this address range for different departments A, B, C, D, E and F interconnected as shown in figure 4 below, each department having 100, 40, 50, 60, 12 and 20 numbers of hosts respectively. In addition to this there are three networks G, H and I having only two hosts in each. Allocate the IP address range for each of the sub-networks with their network address, broadcast address and subnet mask. Also list out the unused range of IP addresses (if any). Configure the hostname of each router as your Firstname_1, Firstname_2 and so on. Also configure static routing in between each of the department's networks as well as to the Internet via ISP Router. While assigning IP address blocks to each network consider the possible route aggregation. Use route aggregation wherever possible while configuring static routing.

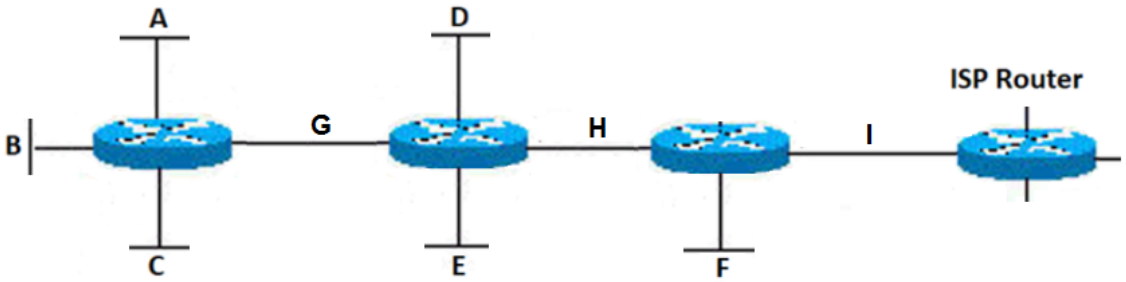

Figure 4: Network Topology 4

1. Test the connectivity from each of the networks to the rest of the given networks using ping.

2. Observe the output of the traceroute from a computer of each of the networks to the rest of the given networks.
3. Observe the output by using traceroute to the destination address of 103.5.150.3.

Exercises:

I. What is a subnet mask? Why is it used? Explain with examples.
II. What is subnetting with FLSM and subnetting with VLSM? Mention their importance in networking with suitable examples.
III. What is classless routing? Why is it important in the Internet system? Explain with suitable examples.
IV. Observe and note down the output of each of the above mentioned tasks and comment on the result by explaining the reason in detail.

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