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WEEK-END ASSIGNMENT-05

Computer Networking Workshop (CSE 4541)

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Course Outcome: CO_2 **Program Outcome:** PO_{1-3}, PO_5 **Learning Level:** L_5

VLSM Network Design, Summarization and IP address Troubleshooting

1. In a block of addresses, we know the IP address of one host is 25.34.12.56/16. Determine the first address and the last address of this block. Also Verify whether that is a CIDR block or not.

Solution **Remark**

Network address = 25.34.0.0
Broadcast address = 25.34.255.255
First address = 25.34.0.1
Last address = 25.34.255.254
Since both network and broadcast address fall within IPV4 range we can conclude this is a valid CIDR block.

2. A CIDR block is given as 182.44.82.16/26. Find the first address and the last address in this block.

Solution **Remark**

First address: 182.44.82.0
Last address: 182.44.82.63

3. Asssume a CIDR block is given as 20.30.40.10/25. Divide the block in two subblocks, and find the first address, last address, subnet mask of each block.

Solution **Remark**

Subnet mask = 255.255.255.128

Sub-block 1:
Network address: 20.30.40.0/26
First address: 20.30.40.1
Last address: 20.30.40.63
Subnet mask: 255.255.255.192

Sub-block 2:
Network address: 20.30.40.64/26
First address: 20.30.40.65
Last address: 20.30.40.126
Subnet mask: 255.255.255.192

4. Asssume a CIDR block is given as 20.30.40.10/25. Divide the block in 4 subblocks, and find the first address, last address, subnet mask of each block. Also observe the format of subnet mask getting changes in the subnets.

Solution **Remark**

Subblock 1
First address : 20.30.40.0
Last address : 20.30.40.31
Subnet mask : 255.255.255.224

Subblock 2
First address : 20.30.40.32
Last address : 20.30.40
Subnet mask : 255.255.255.224

Subblock 3
First address : 20.30.40.64
Last address : 20.30.40.95
Subnet mask : 255.255.255.224

subblock 4
First address : 20.30.40.96
Last address : 20.30.40.127
Subnet mask : 255.255.255.224

5. Consider a Class C IP 200.1.2.0. Design 3 subnets each of IPs 128, 64 and 64 respectively. Find the range of addresses, subnetwork address, and subnet mask of each subnet. Also observe the change in the format of subnet masks from the original mask.

Solution **Remark**

Subnet 1
Network address : 200.1.2.0
First address host : 200.1.2.1
Last host address : 200.1.2.126
Broadcast : 200.1.2.127
Subnet mask : 255.255.255.128

Subnet 2
Network address : 200.1.2.128
First address host : 200.1.2.129
Last host address : 200.1.2.190
Broadcast : 200.1.2.191
Subnet mask : 255.255.255.192

Subnet 3
Network address : 200.1.2.192
First host address : 200.1.2.193
Last host address : 200.1.2.254
Broadcast : 200.1.2.255
Subnet mask : 255.255.255.192

6. Suppose an organization is given a block of ip addresses 17.12.40.0/26, which contains 64 addresses. The organization has three offices and needs to divide the addresses into three subblocks of 32, 16, and 16 addresses. Construct the subnetworks with the first address, last address and subnet mask of each block. Also conclude whether subnet masks are fixed length or of variable length.

Solution **Remark**

	Subblock 1	Subblock 2	Subblock 3
First address	17.12.40.1	17.12.40.33	17.12.40.49
Last address	17.12.40.30	17.12.40.46	17.12.40.62
Subnet mask	255.255.255.224	255.255.255.240	255.255.255.240

7. An ISP is granted a block of addresses starting with 190.100.0.0/16 (65,536 addresses). The ISP needs to distribute these addresses to three groups of customers as follows:

   (a) The first group has 64 customers; each needs 256 addresses.
   (b) The second group has 128 customers; each needs 128 addresses.
   (c) The third group has 128 customers; each needs 64 addresses.

   Design the subblocks and find out how many addresses are still available after these allocations.

Solution **Remark**

	Group 1	Group 2	Group 3
Network address	190.100.0.0	190.100.64.0	190.100.128.0
First address	190.100.0.1	190.100.64.1	190.100.128.1
Last address	190.100.63.254	190.100.127.254	190.100.191.254
Number of addresses	16384	16384	8192

Total allocated addresses = 16384 + 16384 + 8192 = 40960.

Remaining addresses = 65536 − 40960 = 24576

8. An ISP is granted a block of addresses starting with 120.60.4.0/22. The ISP wants to distribute these blocks to 100 organizations with each organization receiving just eight addresses. Design the subblocks and give the slash notation for each subblock. Find out how many addresses are still available after these allocations.

Solution **Remark**

120.60.4.0/22 has a total $2^{10} = 1024$ addresses
100 organization will need 800 addresses (100 × 8)
We can divide the block into subblocks of 8 addresses by using a /29 prefix length which gives 128 subblocks
We have allocated 128 × 8 = 1024 addresses therefore there are no addresses available after these allocations.

9. A large number of consecutive IP addresses are available starting at 198.16.0.0. Suppose that four organizations, A, B, C, and D, request 4000, 2000, 4000, and 8000 addresses, respectively, and in that order. For each of these, give the first IP address assigned, the last IP address assigned, and the mask in w.x.y.z/s notation.

Solution **Remark**

Organization A : 198.16.0.0 – 198.16.15.255 (255.255.240.0)
Organization B: 198.16.16.0 – 198.16.23.255 (255.255.248.0)
Organization C: 198.16.24.0 – 198.16.39.255 (255.255.240.0)
Organization D: 198.16.40.0 – 198.16.79.255 (255.255.252.0)

10. A typical Internetwork is shown in the below figure-1. Construct the routing table (forwarding table) at the router with the Interface name A, B, C, D and E respectively. A packet addressed to a destination address **200.150.68.118** arrives at the router **R0**. Determine the network and the interface to which the packet will be forwarded. Verify your routing table using Cisco Packet Tracer for the said Internetwork with the IOS command `Router# show ip route`.

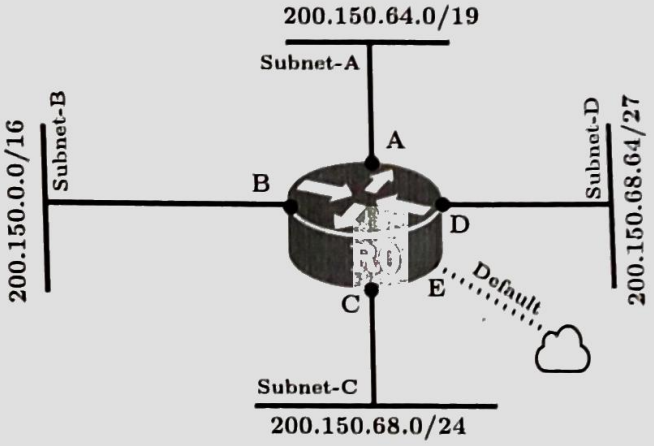

Figure 1: Four subnets directly connected to the Router R0

Solution as well as Paste the CPT based topology design and routing table	Remark

11. Determine the block size and address range for each subnets in the Class C 192.168.10.0 VLSM network given below figure-3.

A: /27
B: /28
C: /28
D: /30
E: /30
F: /30
G: /28
H: /26
I: /28
J: /26
K: /28

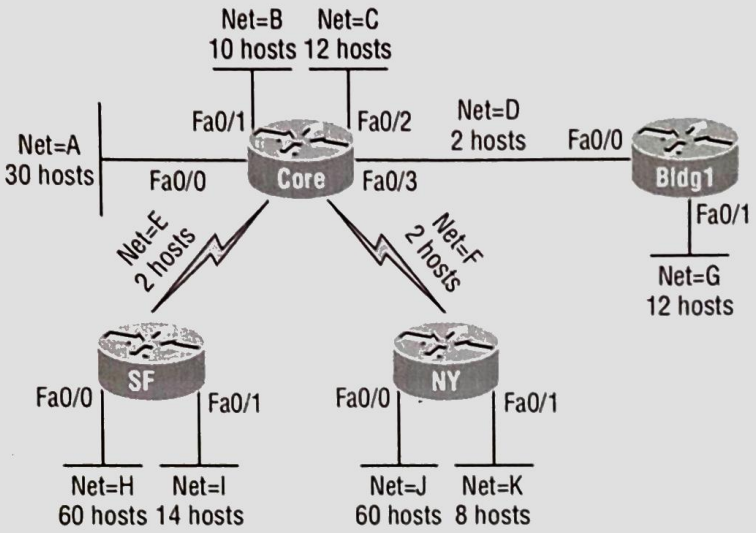

Figure 2: A VLSM network

Solution				Remark
Subnetwork	**Hosts**	**Block Size required**	**Address range**	

12. What summary address would cover all the networks shown and advertise a single, efficient route to Router B that won't advertise more networks than needed?

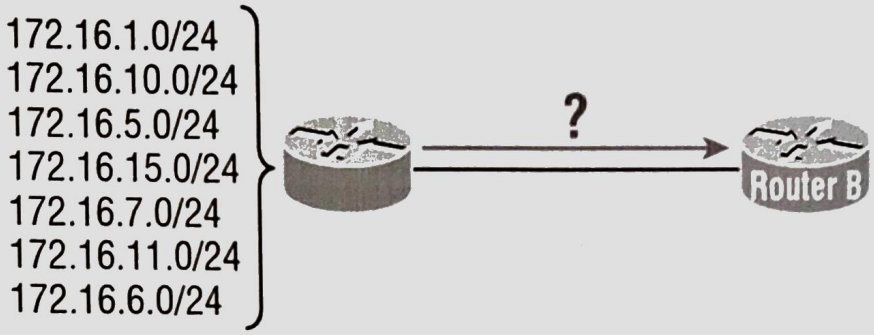

Figure 3: A VLSM network

Solution **Remark**

The first 22 bits are same.
So, the summary address will be 172.16.0.0/21.

13. Determine the best summarization of the given networks: 192.168.128.0 through 192.168.159.0.

Solution **Remark**

The first 22 bits are the same.
So, the summary address will be 192.168.128.0/19

14. On a VLSM network, which mask should you use on point-to-point WAN links in order to reduce the waste of IP addresses?

(A) /31 (D) /30
(B) /27 (E) /29
(C) /28 (F) /24

Answer **Remark**

(D) /30

15. Determine the summary address and the mask to be used that will summarize the subnets.

	Answer	Remark
(A) 192.168.32.0 through 192.168.63.0	(A) 192.168.0.0/16	
(B) 192.168.96.0 through 192.168.111.0	(B) 192.168.0.0/16	
(C) 192.168.128.0 through 192.168.190.0	(C) 192.168.0.0/16	
(D) 172.144.0.0 through 172.159.0.0	(D) 172.144.0.0/12	
(E) 192.168.1.0/24 — 192.168.12.0/24	(E) 192.168.0.0/23	

16. Find the network addresses correctly summarizes the three networks shown below efficiently.
10.0.0.0/16
10.1.0.0/16
10.2.0.0/16

Solution	Remark
The first 8 bits are same. Setting remaining bits to 0, the summary address is 10.0.0.0/8.	

17. Assume the following classful configuration (Figure-4) have been performed using CPT. A user in the sales department informed that it can't get to **Server A** in the marketing department and also it has no rights to log on to **server B**. Now Find out the reason of not getting the access and also troubleshoot the problem to get into **Server A**.

Troubleshooting	Remark

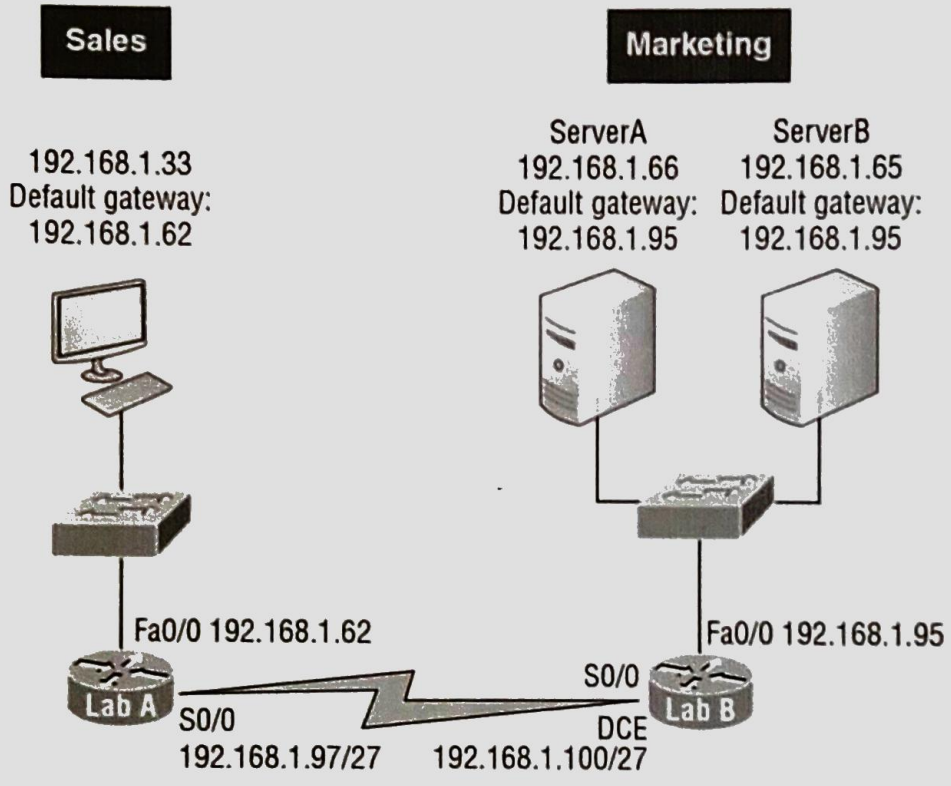

Figure 4: A case of IP address problem

18. A user in the Sales LAN can't get to ServerB. You have the user run through the four basic troubleshooting steps (*(i) ping to loopback, (ii) ping to local host (iii) ping to default gateway (iv) ping to remote network*) and find that the host can communicate to the local network but not to the remote network. Find and define the IP addressing problem. Demonstrate the network shown in Figure-5 in CPT assuming classful addressing

Troubleshooting	Remark

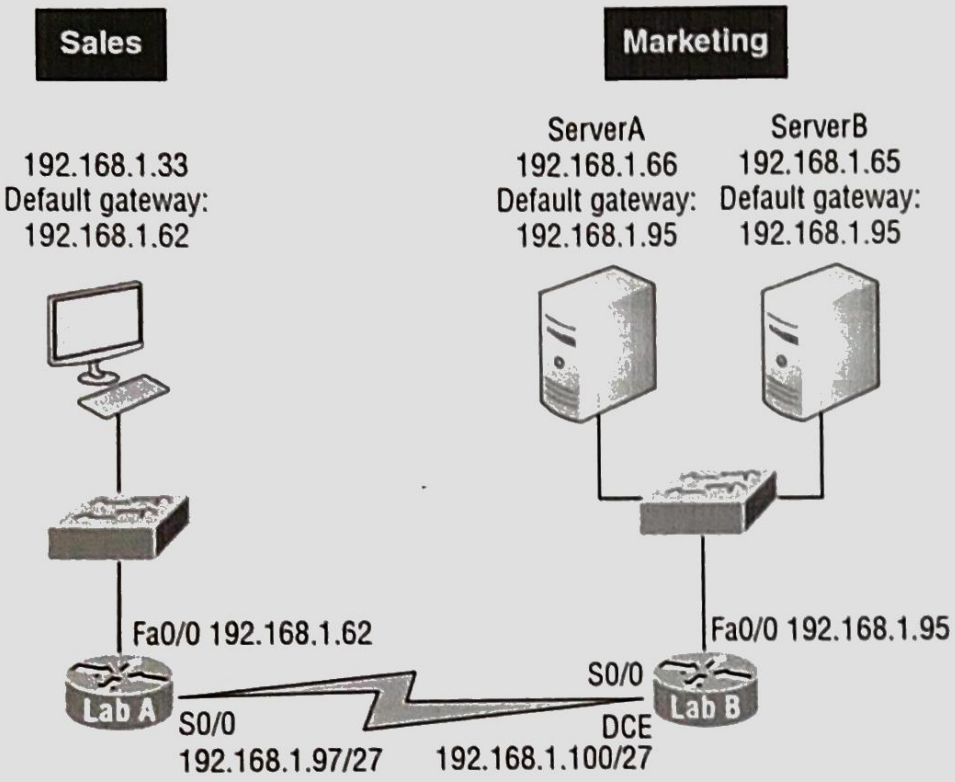

Figure 5: Verifying IP address configuration

19. A classful IP address at the Router on interface *Ethernet0* is 192.168.10.33/27. Determine the IP address, subnet mask, and valid host range could be assigned to the host.

Answer	Remark
Number of hosts = $2^5 - 2 = 30$ Host range = 192.168.10.33 to 192.168.10.62 Subnet mask : 255.255.255.224	

20. Two computers C1 and C2 are configured as follows. C1 has IP address 203.197.2.53 and netmask 255.255.128.0. C2 has IP address 203.197.75.201 and netmask 255.255.192.0. which one of the following statements is true? **[GATE 2006]**

(a) C1 and C2 both assume they are on the same network
(b) C2 assumes C1 is on same network, but C1 assumes C2 is on a different network
(c) C1 assumes C2 is on same network, but C2 assumes C1 is on a different network
(d) C1 and C2 both assume they are on different networks.

Justify your answer **Remark**

C1 network address
203.197.2.53 & 255.255.128.0 = 203.197.0.0

C2 network address
203.197.75.201 & 255.255.192.0 = 203.197.64.0

Since, network addresses are different, C1 & C2 assume they are on different network.
(D) C1 & C2 both assume they are on different networks.

21. Consider three machines M, N and P with IP addresses 100.10.5.2, 100.10.5.5 and 100.10.5.6 respectively. The subnet mask is set to 255.255.255.252 for all the three machines. Which one of the following is true? **[GATE 2019]**

(a) M, N and P all belong to the same subnet
(b) Only N and P belong to the same subnet
(c) M, N, and P belong to three different subnets
(d) Only M and N belong to the same subnet

Justify your answer **Remark**

Network address for M = 100.10.5.2 & 255.255.255.252 = 100.10.5.0
Network address for N = 100.10.5.5 & 255.255.255.252 = 100.10.5.4
Network address for P = 100.10.5.6 & 255.255.255.252 = 100.10.5.4

(B) Machines N & P have belong to the same subnet.