CS3103 Computer Networks Practice
Solutions for the Homework Questions in Lecture Slides of Week- 1

1. **[1 mark]** 207.15.37.35/28 is one of the IP addressees of assigned to a company.
   How many addresses are there in this network block (including all special addresses!)?
   Find the network id and broadcast id of the network?

   Solution:

   There are 16 addresses in this block.

   Network ID: 207.15.37.32/28

   Broadcast ID: 207.15.37.47/28

2. **[2 mark]** An ISP is granted a block of addresses starting with 140.77.0.0/16. The ISP wants to distribute the block to 2816 customers as follows.

   - The first group has 256 medium-size businesses; each needs 128 addresses.
   - The second group has 512 small businesses; each needs 16 addresses.
   - The third group has 2048 households; each needs 4 addresses.

   Design the subnets (sub-blocks) and give the slash notation for each subnet.
   Find out how many addresses are still available after these allocations.

   Solution:

   Grading scheme: Correct First Group: [1 mark]. Correct second and third groups [1 mark]

   First Group:

   140.77.0.0/25 ---- 140.77.0.127/25
   …….
   140.77.127.128/25 ---- 140.77.127.255/25

   Second Group:
   140.77.128.0/28 ---- 140.77.128.15/28
   …….
   140.77.159.240/28 ---- 140.77.159.255/28

Third Group:
140.77.160.0/30 ---- 140.77.160.3/30
…….
140.77.191.252/30 ---- 140.77.191.255/30

16384 are still available.

3. **[7 marks]** Question 3:
   a. **[2 marks]** Suggest a cost effective size of the public IP address block required. . [*Note:- Your solution should consider the potential future expansions given in the description above*].

No of addresses required:

- Backbone: 10 servers + 2 router IPs + 2 unusable addresses : 14 addresses. ~ 16 => **Thus, 16**
- R& D: 60 hosts + 2 unusable + 1 route IP: 63 addresses. ~ 64. (64 x 12 labs) => **Thus, 768.** (assumption, this backbone router has at least 12 + 1 ports)
- On-site: 30 + 2 unusable + 1 router IP: 33 addresses. ~ 64 => **Thus, 64**
- Remote-VPN: 10 + 2 unusable + 1 router IP: 13 addresses. ~ 16 => **Thus, 16**

Total: 864 addresses

Answer: Nearest power of 2 is 1024. It means we require /22 network block to implement this network

Another possible topology and Alternate Solution :

Topology: If each lab has a router…. Then backbone connects to more routers.

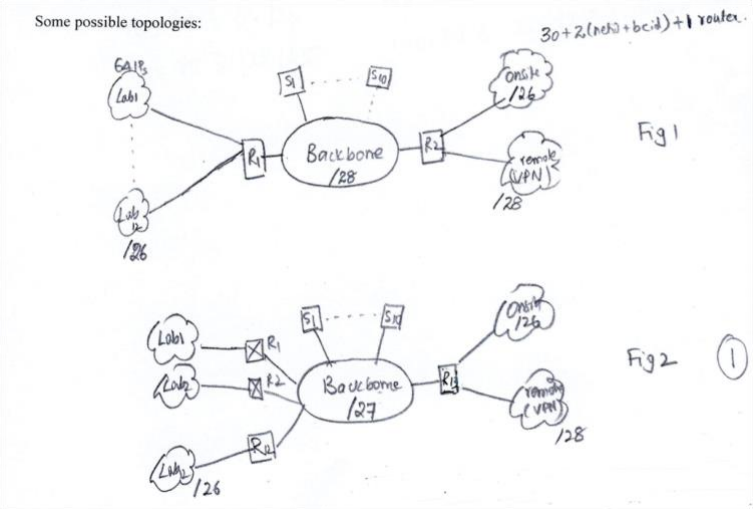
- Backbone: 10 servers + 12 lab router IPs + 1 router IP (other cluster router) + 2 unusable addresses : 25 addresses. ~ 32 => **Thus, 32**
- R& D: 60 hosts + 2 unusable + 1 route IP: 63 addresses. ~ 64. (64 x 12 labs) => **Thus, 768.** (assumption, this backbone router has at least 12 + 1 ports)
- On-site: 30 + 2 unusable + 1 router IP: 33 addresses. ~ 64 => **Thus, 64**
- Remote-VPN: 10 + 2 unusable + 1 router IP: 13 addresses. ~ 16 => **Thus, 16**

Total: 880 addresses

Answer: Nearest power of 2 is 1024. It means we require /22 network block to implement this network

   b. **[2 marks]** Draw a neat diagram of the network.

[Different topologies are possible….]



c. **[3 marks]** For each LAN (or lab), provide the IP subnet details such as net-id, broadcast-id and netmask in the format shown in the table below. Assume the starting block address of the network as 140.78.0.0/n where "n" is the number you have determined from part (a).

Network Name	Net-id (a.b.c.d/n)	Broadcast id
Backbone	140.78.0.0/27	140.78.0.31
Lab-1	140.78.0.64/26	140.78.0.127
Lab-2	140.78.0.128/26	140.78.0.191
Lab-3	140.78.0.192/26	140.78.0.255
Lab-4	140.78.1.0/26	140.78.1.63
Lab-5	140.78.1.64/26	140.78.1.127
Lab-6	140.78.1.128/26	140.78.1.191
Lab-7	140.78.1.192/26	140.78.1.255
On-site sales persons network	140.78.2.0/26	140.78.2.63
Remote sales persons network	140.78.0.32/28	140.78.0.47
Unused block 1	140.78.0.48/28	140.78.0.63
Unused block 2	140.78.2.64/26	140.78.2.127
Unused block 3	140.78.2.128/25	140.78.2.255
Unused block 4	140.78.3.0/24	140.78.3.255