CN Tutorials – 2
IPv4 Subnetting & IPv6 Compression Rules

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Q1. Given an IP address of a subnet find the following,
a. Network address
b. First Host address (Usable)
c. Last Host address (Usable)
d. Broadcast address

1.1) 110.93.251.240/27
a. 110.93.251.224
b. 110.93.251.225
c. 110.93.251.254
d. 110.93.251.255

1.2) 202.63.172.154/25
a. 202.63.172.128
b. 202.63.172.129
c. 202.63.172.254
d. 202.63.172.255

1.3) 25.27.46.165/14
a. 25.24.0.0
b. 25.24.0.1
c. 25.24.255.254
d. 25.24.255.255

1.4) 9.134.48.148/18
a. 9.134.0.0
b. 9.134.0.1
c. 9.134.63.254
d. 9.134.63.255

Q2. Given the block 192.168.1.0/24 create 4 subnets with 28, 52, 15 and 5 hosts each. Give the Network address for each of the subnets.

Ans:
For first subnet, our Subnet Mask will be /27 (27 network bits and 5 host bits. 5+27=32)
For second subnet, our Subnet Mask will be /26 (26 network bits and 6 host bits. 6+26=32)
For third subnet, our Subnet Mask will be /27 (27 network bits and 5 host bits. 5+27=32)
For fourth subnet, our Subnet Mask will be /29 (29 network bits and 3 host bits. 3+29=32)

192.168.1.0/26
192.168.1.64/27
192.168.1.96/27
192.168.1.128/29

Q3. If a class B network on the internet has a subnet mask of 255.255.240.0. What is the maximum number of hosts per subnet and how many subnets are created?
Ans:

- Number of bits reserved for network ID in the given subnet mask = 20.
- So, Number of bits reserved for Host ID = 32 – 20 = 12 bits.
- Thus, Number of hosts per subnet = 212– 2 = 4094.
- In class B, 16 bits are reserved for the network.
- So, Number of bits reserved for subnet ID = 20 – 16 = 4 bits.
- Number of subnets possible = 24= 16.

Q4. You are assigning IP addresses to hosts in the 192.168.4.0 /26 subnet. Which two of the following IP addresses are assignable IP addresses that reside in that subnet?
a. 192.168.4.0
b. 192.168.4.63
c. 192.168.4.62
d. 192.168.4.32
e. 192.168.4.64

Answer: c and d
To determine subnets and usable address ranges created by the 26-bit subnet mask we perform the following steps:

Step #1: Identify the interesting octet (i.e. the octet that contains the first zero in the binary subnet mask). In this question, we have a 26-bit subnet mask, which is written in binary as:
11111111 11111111 11111111 11000000
The interesting octet is the forth octet, because the forth octet (i.e. 11000000) is the first octet to contain a 0 in the binary.

Step #2: Identify the decimal value in the interesting octet of the subnet mask. A 26-bit subnet mask can be written in dotted decimal notation as: 255.255.255.192
Since the forth octet is the interesting octet, the decimal value in the interesting octet is 192.

Step #3: Determine the block size by subtracting the decimal value of the interesting octet from 256. Block Size = 256 – 192 = 64

Step #4: Determine the subnets by counting by the block size in the interesting octet, starting at 0. Placing a zero in the first interesting octet identifies the first subnet as: 192.168.4.0 /26
We then count by the block size (of 64) in the interesting octet (the forth octet in this question) to determine the remaining subnets:

192.168.4.64 /26
192.168.4.128 /26
192.168.4.192 /26

Step #5: This question is asking about the 192.168.4.0 /26 subnet. From the above list of subnets, we can determine that the assignable range of IP addresses for this subnet is
192.168.4.1 – 192.168.4.62.

We can also determine that 192.168.4.0 is the network address, and 192.168.4.63 is the directed broadcast address.
From the assignable range of IP addresses we have calculated, we can determine that the two assignable IP addresses given as options in this question are: **192.168.4.62 and 192.168.4.32.**

Q5. How do you correctly compress the following IPv6 address:

5.1) 2001:0db8:0000:0000:0000:0000:0000:0c50
Ans:
2001:0db8:0:0:0:0:0:0c50 or
2001:0db8::0c50

5.2) 2001:0db8:0000:0000:b450:0000:0000:00b4
Ans:
2001:db8:0:0:b450::b4

5.3) 2001:0db8:00f0:0000:0000:03d0:0000:00ff
Ans:
2001:0db8:00f0::3d0:0:00ff or
2001:db8:f0:0:0:3d0:0:ff or
2001:0db8:0f0:0:0:3d0:0:0ff

5.4) 2001:0db8:0f3c:00d7:7dab:03d0:0000:00ff
Ans:
2001:db8:f3c:d7:7dab:3d0::ff

Q6. How do you correctly expand the following IPv6 address:

6.1) fd00:84::2800:3082:0
Ans:
fd00:0084:0000:0000:0000:2800:3082:0000

6.2) fd65:a000:31::20c4:8
Ans:
fd65:a000:0031:0000:0000:0000:20c4:0008

6.3) fd00:0:200::88
Ans:
fd00:0000:0200:0000:0000:0000:0000:0088

6.4) fd00:1:30:0:c00:8100:0:40a
Ans:
fd00:0001:0030:0000:0c00:8100:0000:040a