

Subnetting

-by Shubham Nitnaware

What is subnetting?

- So, what is subnetting, right? Let's start with the example. Let's say we are about to start a company or an organization where we are going to buy a Public IP for the small network of our company.
- Here, in the start we are just having few people to work for our organization. Let's say in a figure of 50. So, we are going to need 50 hosts IPs for sure.
- So, we went to the IP Provider and we ask for a range of IP to host our network on the internet.
- As, we are having small organization and few people are working, so we are going to get only class C network IP. Because, Class C IPs are generally use for small networks or businesses whereas, Class B for Middle and Class A for Big level networks and businesses.
- IP provider provides us the Network of let's say 192.168.10.0. where the Network IP will be 192.168.10.0 and the Broadcast IP will be 192.168.10.255 and from 192.168.10.1 to 192.168.10.254 we can use for the hosts.
- Here, we are getting 253 hosts IPs that we can use for host. But the requirements are of only $50 + 2 = 52$ (where 2 IPs are Network and broadcast addresses) hosts IPs. Rest 201 IPs are getting wasted unnecessarily.
- So, the technique called subnetting has come into the chapter of networking.
- Do remember, Subnet Networks are classless networks.
- From further we are going to study subnetting in detail.
- There are two ways to subnet the network:
 - Subnetting via Hosts.
 - Subnetting via Networks.

Subnetting via Hosts:

- Subnetting via host is a technique where we will divide the network according to the hosts requirement of the client.
- Let's take the same example of 50 hosts.
- So, in total we will be needing $50 + 2 = 52$ IPs.
- And the network is 192.168.10.0/24.
- As we know that the IPv4 is of 32 bits, where 8 bits in each 4 octets.
- So here,

IP : 192.168.10.0 Subnet : 255.255.255.0
Required IP's are: 52

Here, 24 Network bits are already reserved so will be having only last octet to subnet.

formulae: 2^n

Where, n = host bits

$$2^6 = 64 \text{ IPs}$$

In this network we are getting 64 IP which is fulfilling our requirement and only 12 more addresses which will be used by the organisation for some other work like for printers, etc.

So, what we have is: NNNNNNNN.NNNNNNNN.NNNNNNNN.NNHHHHHH

Binary representation will be: 11111111.11111111.11111111.11000000

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H = are the host bits

N = Network bits

So, here the subnet Mask will be N = 27

i.e. 255.255.255.192

and for Broadcast address just make the host bit 1 and network bit 0 then calculate the binary number into decimal or add 64 in the IPs last octet and subtract 1 from it.

Last octet .00111111 = 63

Or last octet of IP (0 + 64) - 1 = 63

So,

Network address 192.168.10.0

Hosts addresses 192.168.10.1 → 192.168.10.62

Broadcast address 192.168.10.63

Subnet via Network:

Subnetting via network is use when client wants to have a multiple network in the organization or want to part the network. Here we can use this technique.

- Here the approach will be right to left.
- We will carry the network bits. and them to the subnet

For example: We have a network address of **10.10.0.0/16**. We are told to create 8 networks within the given network.

Here, $2^3 = 8$; so here we will carry 3 network bits.

And also we are going need 2 more networks for Network address and Broadcast address for each networks.

Here after adding 3 network bits our subnet mask will become $16 + 3 = 19$.

NNNNNNNN.NNNNNNNN.NNNHHHHH.HHHHHHHH

So, N = 19 ; H = 13

But we only check that octet who has network bit as well as host bits.

So here we will consider 3rd octet,

Therefore, $2^5 = 32$, will be the network range for each network.

10.10.0.0 ----- N.A	}	1 st Network
10.10.0.1 ----- 1 st .A		
..		
..		
10.10.0.31 ----- B.A		

This process will continue till the last network.