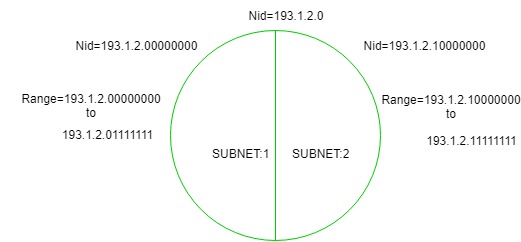
**Subnetting**

When a bigger network is divided into smaller networks, to maintain security, then that is known as Subnetting. So, maintenance is easier for smaller networks. For example, if we consider a class A address, the possible number of hosts is 224 for each network, it is obvious that it is difficult to maintain such a huge number of hosts, but it would be quite easier to maintain if we divide the network into small parts. **Now, let’s talk about dividing a network into two parts:** To divide a network into two parts, you need to choose one bit for each Subnet from the host ID part.



In the above diagram, there are two Subnets. **Note:** It is a class C IP so, there are 24 bits in the network id part and 8 bits in the host id part.

**Subnetting for a network should be done in such a way that it does not affect the network bits**. In class C the first 3 octets are network bits so it remains as it is.

* **For Subnet-1:** The first bit which is chosen from the host id part is zero and the range will be from (193.1.2.00000000 till you get all 1’s in the host ID part i.e, 193.1.2.01111111) except for the first bit which is chosen zero for subnet id part. Thus, the range of subnet-1:

193.1.2.0 to 193.1.2.127

           Subnet id of Subnet-1 is : 193.1.2.0

           Direct Broadcast id of Subnet-1 is : 193.1.2.127

           Total number of host possible is : 126 (Out of 128, 2 id’s are used for Subnet id &  Direct Broadcast id)

           Subnet mask of Subnet- 1 is : 255.255.255.128

* **For Subnet-2:** The first bit chosen from the host id part is one and the range will be from (193.1.2.100000000 till you get all 1’s in the host ID part i.e, 193.1.2.11111111). Thus, the range of subnet-2:

193.1.2.128 to 193.1.2.255

          Subnet id of Subnet-2 is: 193.1.2.128

          Direct Broadcast id of Subnet-2 is : 193.1.2.255

          Total number of host possible is : 126 (Out of 128, 2 id’s are used for Subnet id &  Direct Broadcast id)

          Subnet mask of Subnet- 2 is : 255.255.255.192

Finally, after using the subnetting the total number of usable hosts are reduced from 254 to 252.

**Note:**

1. To divide a network into four (22) parts you need to choose two bits from the host id part for each subnet i.e, (00, 01, 10, 11).
2. To divide a network into eight (23) parts you need to choose three bits from the host id part for each subnet i.e, (000, 001, 010, 011, 100, 101, 110, 111) and so on.
3. We can say that if the total number of subnets in a network increases the total number of usable hosts decreases.

Along with the advantage there is a small disadvantage for subnetting that is, before subnetting to find the IP address first network id is found then host id followed by process id, but after subnetting first network id is found then subnet id then host id and finally process id by this the computation increases.

**Example1.** An organization is assigned a class C network address of 201.35.2.0. It uses a netmask of 255.255.255.192 to divide this into sub-networks. Which of the following is/are valid host IP addresses?

A. 201.35.2.129

B. 201.35.2.191

C. 201.35.2.255

D. Both (A) and (C)

**Solution:**

Converting the last octet of the netmask into the binary form: 255.255.255.**11**000000

Converting the last octet of option A into the binary form: 201.35.2.**10**000001

Converting the last octet of option B into the binary form: 201.35.2.**10**111111

Converting the last octet of option C into the binary form: 201.35.2.**11**111111

From the above, we see that Option B and C is not a valid host IP address (as they are broadcast address of a subnetwork)

and OPTION A is not a broadcast address and it can be assigned to a host IP.

**Example 2.**An organization has a class C network address of 201.32.64.0. It uses a subnet mask of 255.255.255.248. Which of the following is NOT a valid broadcast address for any subnetworks?

A. 201.32.64.135

B. 201.32.64.240

C. 201.32.64.207

D. 201.32.64.231

**Solution:**

Converting the last octet of the netmask into the binary form: 255.255.255.**11111**000

Converting the last octet of option A into the binary form: 201.32.64.**10000**111

Converting the last octet of option B into the binary form: 201.32.64.**11110**000

Converting the last octet of option C into the binary form: 201.32.64.**11001**111

Converting the last octet of option D into the binary form: 201.32.64.**11100**111