Assignment No:2

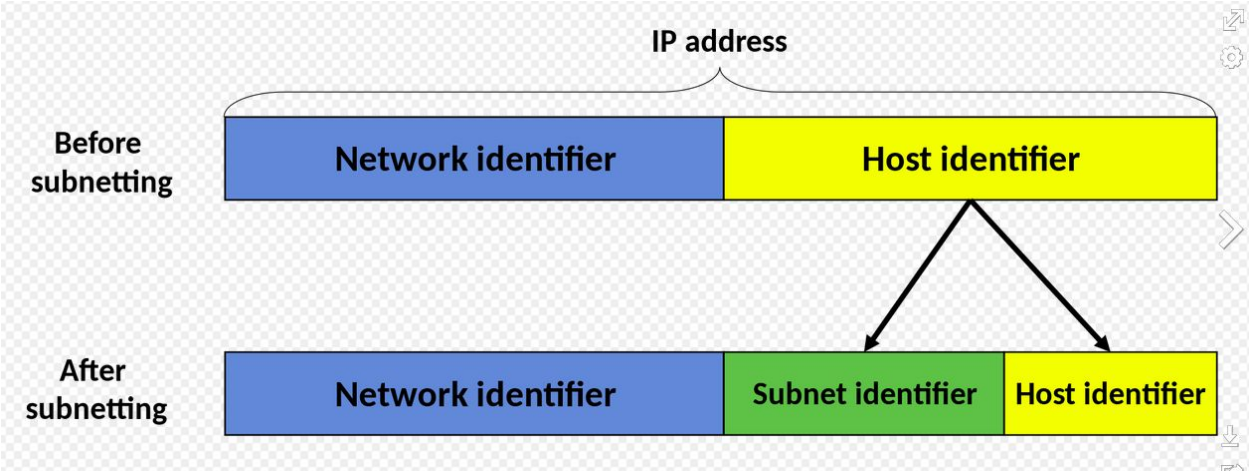
Aim: Using a Network Simulator (e.g. packet tracer) Configure
Sub-netting of a given network
Super-netting of a given networks.

Theory:

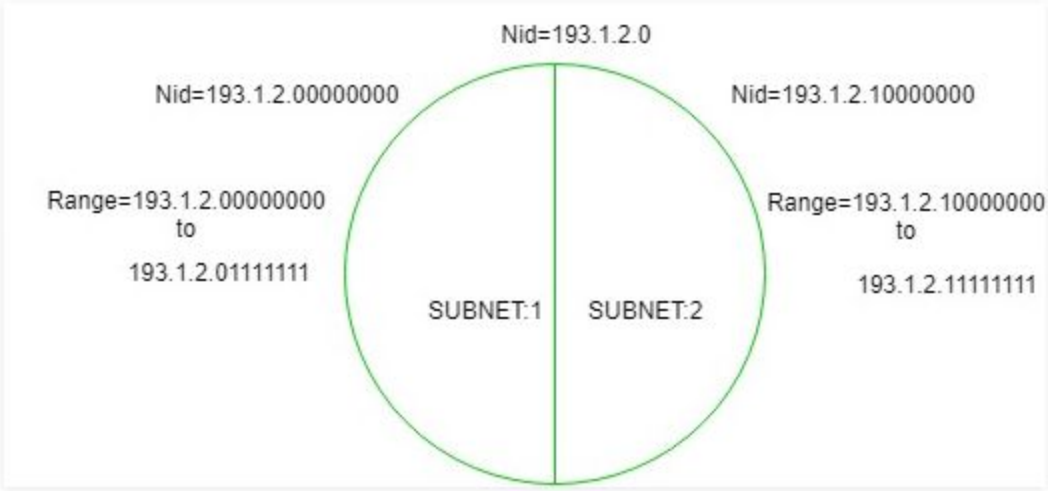
Subnetting

A subnetwork or subnet is a logical subdivision of an IP network. The practice of dividing a network into two or more networks is called subnetting. Computers that belong to a subnet are addressed with an identical most-significant bit-group in their IP addresses. This results in the logical division of an IP address into two fields, the *network number* or *routing prefix* and the *rest field* or *host identifier*. The *rest field* is an identifier for a specific host or network interface.

The benefits of subnetting an existing network vary with each deployment scenario. In the address allocation architecture of the Internet using CIDR and in large organizations, it is necessary to allocate address space efficiently. Subnetting may also enhance routing efficiency, or have advantages in network management when subnetworks are administratively controlled by different entities in a larger organization. Subnets may be arranged logically in a hierarchical architecture, partitioning an organization's network address space into a tree-like routing structure.



so 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.

It is a class C IP so, there are 24 bits in the network id part and 8 bits in the host id part.

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

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

Supernetting:

Supernetting is the opposite of Subnetting. In subnetting, a single big network is divided into multiple smaller subnetworks. In Supernetting, multiple networks are combined into a bigger network termed as a Supernetwork or Supernet. Supernetting is mainly used in Route Summarization, where routes to multiple networks with similar network prefixes are combined into a single routing entry, with the routing entry pointing to a Super network, encompassing all the networks. This in turn significantly reduces the size of routing tables and also the size of routing updates exchanged by routing protocols.

- When multiple networks are combined to form a bigger network, it is termed as super-netting
- Super netting is used in route aggregation to reduce the size of routing tables and routing table updates

There are some points which should be kept in mind while supernetting:

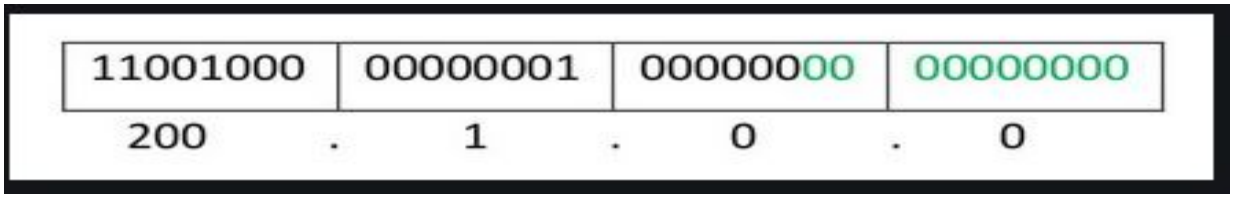
1. All the IP address should be contiguous.
2. Size of all the small networks should be equal and must be in form of 2^n.
3. First IP address should be exactly divisible by whole size of supernet.

Example – Suppose 4 small networks of class C:
200.1.0.0,
200.1.1.0,
200.1.2.0,
200.1.3.0
Build a bigger network which have a single Network Id.

First, lets check whether three condition are satisfied or not:

1. **Contiguous:** You can easily see that all network are contiguous all having size 256 hosts.
   Range of first Network from 200.1.0.0 to 200.1.0.255. If you add 1 in last IP address of first network that is 200.1.0.255 + 0.0.0.1, you will get the next network id that is 200.1.1.0. Similarly, check that all network are contiguous.

2. **Equal size of all network:** As all networks are of class C, so all of the have a size of 256 which in turn equal to 2^8.
3. **First IP address exactly divisible by total size:** When a binary number is divided by 2^n then last n bits are the remainder. Hence in order to prove that first IP address is exactly divisible by while size of Supernet Network. You can check that if last n v=bits are 0 or not.
   In given example first IP is 200.1.0.0 and whole size of supernet is $4*2^8 = 2^{10}$. If last 10 bits of first IP address are zero then IP will be divisible.



Last 10 bits of first IP address are zero (highlighted by green color). So 3rd condition is also satisfied.

Therefore, you can join all these 4 networks and can make a Supernet. New Supernet Id will be 200.1.0.0.

Conclusion:

In this assignment i have simulated supernetting and subnetting using packet tracer.