LAB 4

Overview of IP Addressing and Sub-Netting.

Objective:

- To understand theoretical knowledge of IPv4 addressing and sub-netting

Subnetting:

Subnetting is the practice of dividing a network into two or smaller networks. It increases routing efficiency, which helps to enhance the security of the network and reduces the size of the broadcast domain.

IP Subnetting designates high-order bits from the host as part of the network prefix. This method divides a network into smaller subnets.

IPv4 Classes:

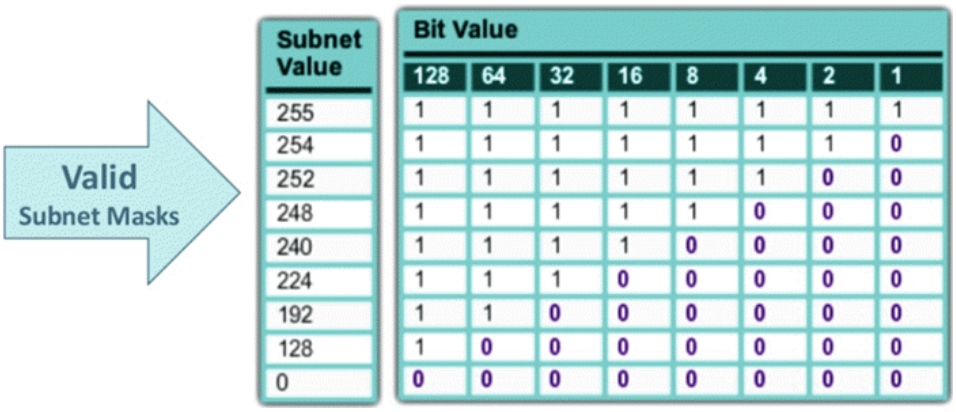
Internet Protocol hierarchy contains several classes of IP Addresses to be used efficiently in various situations as per the requirement of hosts per network. Broadly, the IPv4 Addressing system is divided into five classes of IP Addresses. All the five classes are identified by the first octet of IP Address.

Five Different Classes of IPv4 Addresses

Class	First Octet decimal (range)	First Octet binary (range)	IP range	Subnet Mask	Hosts per Network ID	# of networks
Class A	0 – 127	0XXXXXXX	0.0.0.0-127.255.255.255	255.0.0.0	$2^{24}-2$	2^{7}
Class B	128 – 191	10XXXXXX	128.0.0.0-191.255.255.255	255.255.0.0	$2^{16}-2$	2^{14}
Class C	192 – 223	110XXXXX	192.0.0.0-223.255.255.255	255.255.255.0	$2^{8}-2$	2^{21}
Class D (Multicast)	224 – 239	1110XXXX	224.0.0.0-239.255.255.255			
Class E (Experimental)	240 – 255	1111XXXX	240.0.0.0-255.255.255.255			

Subnet Mask:

A subnet mask is a 32 bits address used to distinguish between a network address and a host address in IP address. A subnet mask identifies which part of an IP address is the network address and the host address. They are not shown inside the data packets traversing the Internet. They carry the destination IP address, which a router will match with a subnet.



Subnet Value	Bit Value							
	128	64	32	16	8	4	2	1
255	1	1	1	1	1	1	1	1
254	1	1	1	1	1	1	1	0
252	1	1	1	1	1	1	0	0
248	1	1	1	1	1	0	0	0
240	1	1	1	1	0	0	0	0
224	1	1	1	0	0	0	0	0
192	1	1	0	0	0	0	0	0
128	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0

Two types of subnet masks are:

- The default Subnet Mask is the number of bits which is reserved by the address class. Using this default mask will accommodate a single network subnet in the relative class.
- A Custom Subnet Mask can be defined by an administrator to accommodate many Network

Class	Default subnet mask	No. of networks	No. of host per network
A	255.0.0.0	256	16,777,214
B	255.255.0.0	65,536	65,534
C	255.255.255.0	16,77,216	126

Example:

IP address: 192.100.10.66 / 25

Subnet Mask: 11111111.11111111.11111111.10000000

Total Subnets = $2^1 = 2$

Total Hosts = $2^7 = 128$

Usable Hosts = $2^7 - 2 = 128-2 = 126$

Valid Subnets = 256 – 128 = 128

Subnet (Network IP)	Usable IP Pool		Broadcast IP
	First Host	Last Host	
192.100.10.0	192.100.10.1	192.100.10.126	192.100.10.127
192.100.10.128	192.100.10.129	192.100.10.254	192.100.10.255