Computer Networks

Lab # 01:

IP addressing

Objective:

To familiarize the students with the concepts of IP addressing, address classes, subnet mask and default subnet mask

Scope:

The student should be able to perform the following at the end of this lab:

Set IP addresses and subnet mask and use basic utilities used for IP addressing.

Useful Concept:

Each Network Interface Card (NIC or Network card) present in a PC is assigned one Network address called as IP address [or Network address]. This IP address is assigned by the administrator of the network. No two PCs can have the same IP address.

There is a burned-in address on the NIC called as Physical Address [or MAC address or Hardware address]. The MAC address of a network card indicates the vendor of that card and a unique serial number.

2.1   Rules of IPv4 addressing

1. Format of IP address
2. IPv4 is made up of four parts, in the pattern as w.x.y.z. Each part has 8 binary bits and the values in decimal can range from 0 to 255.
3. IP address classes
4. IP addresses are divided into different classes. These classes determine the maximum number of hosts per network ID. Only three classes are actually used for network connectivity.

The following table lists first 3 classes, which are used for addressing.

IP address class	Value of the leftmost byte
Class A	1-126 [0 and 127 are not allowed]
Class B	128-191
Class C	192-223

5. Grouping of IP addresses into different classes.

   1) Class A, B, C, D, E

   2) Class A: first bit in w is 0 and others can be anything

      i. 0.0.0.0 to 127.255.255.255

      ii. First 8 bits are used for network part and the remaining for host part.

   3) Class B: First bit in w is 1 and second bit is 0.

      i. 128.0.0.0 to 191.255.255.255

      ii. First 16 bits for network part and remaining host part

   4) Class C: first bit in w is 1, second bit in w is 1 and third bit is 0

      i. 192.0.0.0 to 223.255.255.255

      ii. First 24 bits for network part and last 8 bits for host part.

   5) Class D: first 3 bits in are 1 and fourth bit is 0; used for multicast.

      i. 224.0.0.0 to 239.255.255.255

   6) Class E: future use or experimental purposes.

      i. 240.0.0.0 to 255.255.255.255

6. Default Subnet mask

   It is used to identify the network part from the host part. Put binary one for the parts that represent network part and zero for the part that represent host part.

   1) Class A: 255.0.0.0

   2) Class B: 255.255.0.0

   3) Class C: 255.255.255.0

   4) For Network-Host division -- consecutive 1s are followed by consecutive 0s

7. Invalid IP address.

1) If the network part is all 0s, the address belongs to class A. But this is an invalid ip address because for an ip address all the network or host part should not be all 1s or all 0s.

    i. 0.0.0.0 is not valid. Routers use it internally (the default route).

2) If the network part is all 1s, this address belongs to class E. But due to presence of all 1s, it is not valid. This represent broadcast to all networks.

    i. 255.255.255.255 is not valid (broadcast address).

If the host part is all 0s, this represents network address. This is not a valid ip address.

If the host part is all 1s, this represents broadcast address. This is not a valid ip address.

We can't use ip address within private address range as part of public ip address.

Class A: 10.0.0.0 to 10.255.255.255

Class B: 172.16.0.0 to 172.31.255.255

Class C: 192.168.0.0 to 192.168.255.255

127.any.any.any Network address is used for loop-back testing. This will help you to check the network card of your own PC [localhost].

Part A:

1- Write the address class next to each IP address.

Address	Class
131.107.2.89	
3.3.57.0	
200.200.5.2	
191.107.2.10	
127.0.0.1	

2- Identify address classes that will allow more than 1000 hosts per network?

3- Identify address classes that will allow only 254 hosts per network?

Part B: Identify invalid IP address: Circle the portion of the IP address that would be invalid (NOT PUBLIC) if it were assigned to a host, and then explain why it is invalid.

1. 131.107.256.80
2. 222.222.255.222
3. 231.200.1.1
4. 126.1.0.0
5. 0.127.4.100
6. 190.7.2.0
7. 127.1.1.1
8. 198.121.254.255
9. 255.255.255.255
10. 256.0.0.0