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Lab Assignment - 4 (CN)

* Aim:
Write a program to implement subnetting to find subnet masks.

* Objectives:
To understand and learn concept of IP address, Subnet mask and subnetting.

* Theory:

i) Internet Protocol: (IP: IPV4 & IPV6)
IPV4 and IPV6 are internal protocol version 4 & 6. IP version 6 is new version of internet protocol, which better than IPV4 in terms of complexity & efficiency.

IPV4:
→ It has 32 bit address length.
→ It supports manual and DHCP address configuration.
→ It can generate 4.29×10^9 address space.

IPV6:
→ IPV6 has 128 bit address length.
→ It supports Auto & renumbering address configuration.
→ In IPV6 end to end, connection integrity is achievable.

ii) IPV4 datagram format:
IPV4 header contains 20 byte fixed mandatory part, followed by optional fields. Hence, minimum size of an IPV4 header is 20 bytes.

iii) IPV4 Addressing Prefixes, CIDR, classful and speical addressing, NAT [Network Address Translation].

→ IPV4 prefix of addressing can be identified by dotted decimal netmask, commonly refereed to as subnet mask
Eg- 255.255.255.0 indicates that network position or prefix length of IPV4 addressing is leftmask 24 most.

→ CIDR - Classless Inter-Domain Routing is IP addressing scheme that improves allocation of IP address.

→ Classful Addressing is an IPV4 addressing architecture that divides address into five groups. Prior to classful first eight bits of IP address defined network agiven host was a part of. This would have had effect of limiting internet to just 254 network.

→ NAT (Network Address Translation)
It is a process in which one or more local IP address translated into one or more Global IP address and vice versa in order to provide internet access to local host.

iv) Default subnet mask and Subnetting:
Default subnet mask is no. of bits which is reserved by

address class using this default mask will accomodate a single network subnet in relative class.

v) Network and hosts per subnet calculation
The subnet mask helps decide no. of network and hosts per subnet.

Eg Host IP address - 192.68.133.68.129
Given Subnet - 255.255.255.248

The last 3 bits of subnet are 0's, hence hosts per subnet.

$= 2^n = 2^3 = 8$

We get network id = 192.68.133.64

FAQ

1) Describe classful and classless IP addressing scheme with example.

- Classful Addressing.
In classful addressing IP addressing are divided into 5 different classes namely A, B, C, D, E. In classful addressing the no. of hosts per address network address is fixed. The subnet mask of each class is also fixed.

Eg Class A IP = 10.1.1.1

- Classless Addressing:
It is IPV4 addressing architecture that uses variable-length subnet masking. It works by allowing IP addressing to be assigned arbitary, network masks without respect to class.

Classless IP - 192.172.64.10/25

ii) What are different special/reserved IPV4 addressing?
The special address in IPV4 are
1) All zero's address and all one's address. Address 0.0.0.0 & 255.255.255.255 are block.
2) Loopback Address - Special block 127.0.0.0/8 has address used for loopback.
3) Multicast - The block 224.0.0.0/4 has multicast
4) Network and Direct Broadcast Address - The first address of block has all suffix bits as '0' and last addressing of blast has all suffix bits as '1' are reserved.

Q3 What is ~~super~~ netting? Explain use of subnetting with example.
→ supernetting is mainly used in Route Summarization where route to multiple network with similar network perform are combined into a single routing entry.

Eg-
- 192.168.0.0/24
↓
11000000.10101000.00000000

- 192.168.1.0./24
11000000.10101000.00000001

- 192.168.2.0/24

↓

11000000.1010 1000.0000 0010

- 192.168.3.0/24

↓

11000000.10101000.00000011

first match the bits from left to right. we convert bits to 0 we get new network Id.

11000000.10101000.00000000.00000000 : 192.168.0.0

The new subnet mask is 255.255.255.0

Q4 Define FLSM, VLSM and CIDR.

- FLSM:

A fixed length subnet mask (FLSM) refers to a type of enterprise or provides networking where a block of IP addresses is divided into multiple subnets of equal length.

- VLSM:

Variable length subnet mask (VLSM) is a subnet - a segmented piece of larger network design strategy where all subnet masks can have varying size.

- CIDR:
Classless - Inter Domain Routing also known as supernetting is a method of assigning internet protocol addresse that improves efficiency of address distribution and replaces previous system based on class A, class B & class C networks.

5. An organization is granted the block 200.50.100.0. The administration wants to create 14 subnets.

a) Find subnet mask.
b) find no. of addresses in each subnet.
c) find the first and last IP addresses in subnet 1.
d) find the first and last IP addresses in subnet 14.

a) We need 4 bits from last octet -
So subnet mask is -

255.255.255.040

b) No. of addresses in each subnet.

$2^n = 2^4 = 16$ addresses

c) The first and last IP address in subnet 1 -
for subnet 1 has range -

200.50.100.0 and 200.50.100.15

d) The first and last IP address in subnet 14 is -

Code

```
import java.util.Scanner;


public class Subnetting {


    public static void main(String[] args) {
        String cl=null;
        int a=0,b=0,c=0,d=0,n=0,sn = 0 ,di=0,cla=0;
        String Subnet=null;
        Scanner sc=new Scanner(System.in);
        System.out.println("Enter Ip Address");
        String ip;
        ip=sc.nextLine();

        a=Integer.parseInt(ip.split("\\.")[0]);
        b=Integer.parseInt(ip.split("\\.")[1]);
        c=Integer.parseInt(ip.split("\\.")[2]);
        d=Integer.parseInt(ip.split("\\.")[3]);

        if(a<128)
        {
            cl="A";
            cla=1;
        }
        else if(a<192)
```

```
        {
            cl="B";
            cla=2;
        }
        else if(a<223)
        {
            cl="c";
            cla=3;
        }
        else if(a<239)
            cl="D";

        System.out.println("Class of IP address is "+cl);

        switch(cla)
        {
        case 1:Subnet="255.0.0.0";
        break;
        case 2:Subnet="255.255.0.0";
        break;
        case 3:Subnet="255.255.255.0";
        break;
        default:Subnet="";
        break;
        }

        System.out.println("Default Subnet Mask:"+Subnet);

        System.out.println("Enter number of Subnets to be created:");
        n=sc.nextInt();

        if(n<3)
            sn=128;
        else if(n<5)
            sn=192;
        else if(n<9)
            sn=224;
        else if(n<17)
            sn=240;
        else if(n<33)
            sn=248;
        else if(n<65)
            sn=252;
        else if(n<129)
            sn=254;
```

```
        else if(n<256)
            sn=255;

        di=256-sn-1;
        if(cl.equals("A"))
        {
            System.out.println("new Subnet mask is 255."+sn+".0.0");
            int dj=b;
            System.out.println("Subnet Ranges:");
            for(int i=0;i<n;i++)
            {
                System.out.println((i+1)+":"+""+a+"."+(dj)+".0.0 to
"+a+"."+(dj+di)+".0.0");
                dj+=di;
            }
        }
        else if(cl.equals("B"))
        {
            System.out.println("new Subnet mask is 255.255."+sn+".0");
            int dj=c;
            System.out.println("Subnet Ranges:");
            for(int i=0;i<n;i++)
            {
                System.out.println((i+1)+":"+""+a+"."+b+"."+(dj)+".0 to
"+a+"."+b+"."+(dj+di)+".0");
                dj+=di;
            }
        }
        else if(cl.equals("c"))
        {
            System.out.println("new Subnet mask is 255.255.255."+sn);
            int dj=d;
            System.out.println("Subnet Ranges:");
            for(int i=0;i<n;i++)
            {
                System.out.println((i+1)+":"+""+a+"."+b+"."+c+"."+dj+" to
"+a+"."+b+"."+c+"."+(dj+di));
                dj+=di+1;

            }
        }
    }
```

Output

```
PS D:\Java> cd "d:\Java\" ; if ($?) { javac Subnetting.java } ; if ($?) { java Subnetting }
Enter Ip Address
192.68.0.1
Class of IP address is c
Default Subnet Mask:255.255.255.0
Enter number of Subnets to be created:
4
new Subnet mask is 255.255.255.192
Subnet Ranges:
1:192.68.0.1 to 192.68.0.64
2:192.68.0.65 to 192.68.0.128
3:192.68.0.129 to 192.68.0.192
4:192.68.0.193 to 192.68.0.256
PS D:\Java>
```