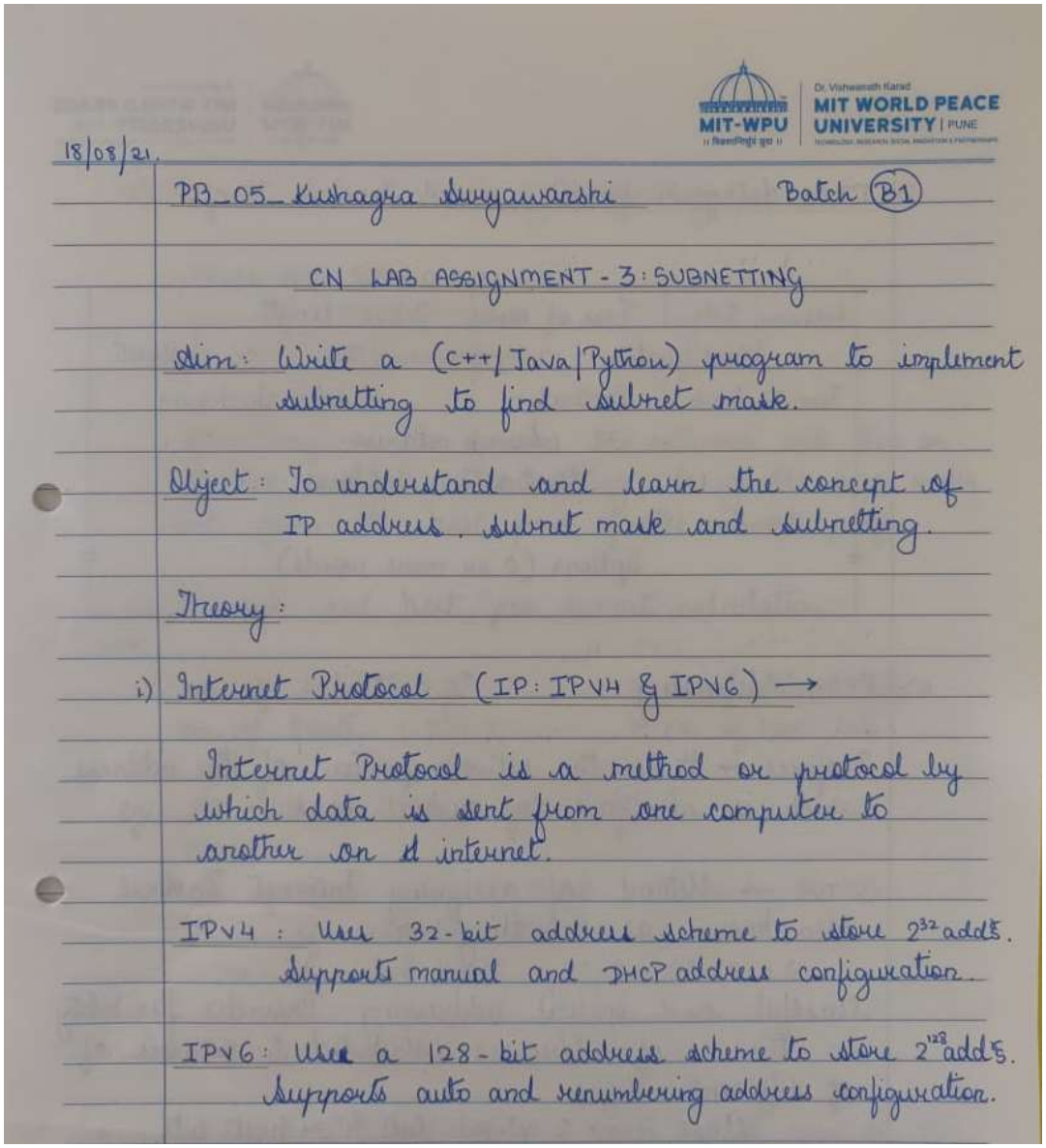
PB_05_Kushagra Suryawanshi

T.Y.B.TECH

Batch B1

CN LAB ASSIGNMENT 3: SUBNETTING



18/08/21.

PB_05_Kushagra Suryawanshi Batch B1

CN LAB ASSIGNMENT - 3 : SUBNETTING

Aim: Write a (C++/Java/Python) program to implement subnetting to find subnet mask.

Object: To understand and learn the concept of IP address, subnet mask and subnetting.

Theory:

i) Internet Protocol (IP: IPV4 & IPV6) →

Internet Protocol is a method or protocol by which data is sent from one computer to another on d internet.

IPV4: Uses 32-bit address scheme to store 2^{32} addrs. Supports manual and DHCP address configuration.

IPV6: Uses a 128-bit address scheme to store 2^{128} addrs. Supports auto and renumbering address configuration.

ii) IPV4 datagram format :-

Version	IHL	Type of service	Total length			
Identification			NULL	DF	MF	offset
Time to leave		Protocol	Header checksum			
Source address						
Destination address						
Options (0 or more words)						

iii) IPV4 Addressing :-

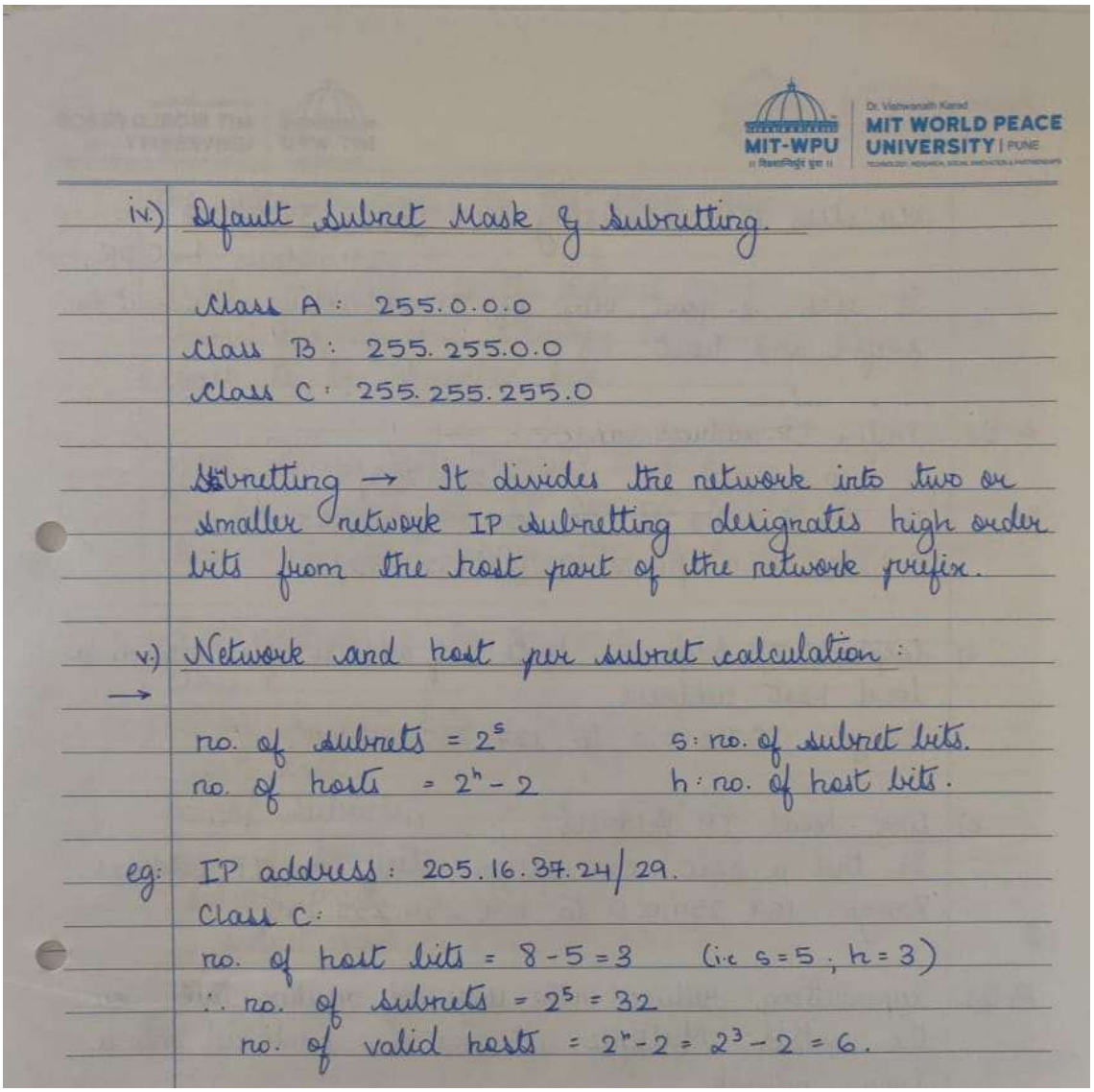
Prefixes → It is the network portion of the address which is identified by subnet mask.

CIDR → Method of assigning Internet Protocol also known as subnetting

Classful and special addressing : Provides flexibility in the no of addresses distributed to network of different sizes.

Class A → 8 network bits & 24 host bits.
Class B → 16 network bits & 16 host bits.
Class C → 24 network bits & 8 host bits.

NAT → It is used to map multiple local private addresses to a public one before transferring the information.



iv.) Default Subnet Mask & Subnetting.

Class A : 255.0.0.0
Class B : 255.255.0.0
Class C : 255.255.255.0

Subnetting → It divides the network into two or smaller network IP subnetting designates high order bits from the host part of the network prefix.

v.) Network and host per subnet calculation :

→

no. of subnets = 2^s — s : no. of subnet bits.
no. of hosts = $2^h - 2$ — h : no. of host bits.

eg: IP address : 205.16.37.24/29.
Class C :
no. of host bits = 8 - 5 = 3 (i.e s = 5 ; h = 3)
∴ no. of subnets = $2^5 = 32$
no. of valid hosts = $2^h - 2 = 2^3 - 2 = 6$.

Algorithm:

- Import the ipaddress library.
- Take IP address and CIDR value as input
- Determine class of the IP address by checking the octets of IP address.
- Count subnet bits. Number of subnets is 2^s .
- Count host bits. Number of valid hosts is $2^h – 2$.
- Use broadcast_address to determine the broadcast address.
- The first and last IP addresses are the first and last elements in the host list.

CODE:

```
import ipaddress
a=input("Enter IP network: ")
a=ipaddress.IPv4Network(a)
cidr=int(input('CIDR='))
print(a)
print(f"Subnet Mask: {a.netmask}")
b=a


strnum = str(b)
class1 = strnum.split('/')
ipadd = class1[0].split('.')
cidr =  int(class1[1])
for i in range(0,len(ipadd)):
   ipadd[i] = int(ipadd[i])
ip1= ipadd[0]
if (ip1 >=1 and ip1 <= 126):
   print("Class A")
   print(f'Net ID = {ipadd[0]}')
   print(f'Host ID = {ipadd[1]}.{ipadd[2]}.{ipadd[3]}')
   subnetbits=cidr - 8
elif (ip1  >= 128 and ip1  <= 191):
   print(f'Net ID = {ipadd[0]}.{ipadd[1]}')
   print(f'Host ID = {ipadd[2]}.{ipadd[3]}')
   subnetbits=cidr - 16
   print("Class B")
```

```
elif (ip1  >= 192 and ip1  <= 223):
    print(f'Net ID = {ipadd[0]}.{ipadd[1]}.{ipadd[2]}')
    print(f'Host ID = {ipadd[3]}')
    subnetbits=cidr - 24
    print("Class C")
elif (ip1  >= 224 and ip1  <= 239):
    print("Class D")
    subnetbits=cidr
elif (ip1  >= 240 and ip1  <=255):
    print("Class E")

print(f'No. of subnet id bits = {subnetbits}')
print(f'No. of subnet masks= {2**subnetbits}')

def Dec_to_Bin(integer):
    binary = '.'.join([bin(int(x)+256)[3:] for x in integer.split('.')])
    return binary

subnet_bin = Dec_to_Bin(str(a.netmask))
subnet_bin.split(".")
n=subnet_bin.count('0')
num_host = pow(2,n) - 2
print("Number of hosts is = ",num_host)

print("Broadcast address:", a.broadcast_address)
```

```
print('First IP : ' , list(a.hosts())[0])
print('Last IP : ' , list(a.hosts())[-1])
```

Output:

```
1.Class A

Enter IP network: 10.0.0.0/14
CIDR=14
10.0.0.0/14
Subnet Mask: 255.252.0.0
Class A
Net ID = 10
Host ID = 0.0.0
No. of subnet id bits = 6
No. of subnet masks= 64
Number of hosts is =  262142
Broadcast address: 10.3.255.255
First IP :  10.0.0.1
Last IP :  10.3.255.254
```

```
2. Class B:

Enter IP network: 140.70.0.0/19
CIDR=19
140.70.0.0/19
Subnet Mask: 255.255.224.0
Net ID = 140.70
Host ID = 0.0
Class B
No. of subnet id bits = 3
No. of subnet masks= 8
Number of hosts is =  8190
Broadcast address: 140.70.31.255
First IP :  140.70.0.1
Last IP :  140.70.31.254
```

3. Class C:

```
Enter IP network: 192.168.1.0/27
CIDR=27
192.168.1.0/27
Subnet Mask: 255.255.255.224
Net ID = 192.168.1
Host ID = 0
Class C
No. of subnet id bits = 3
No. of subnet masks= 8
Number of hosts is =  30
Broadcast address: 192.168.1.31
First IP :  192.168.1.1
Last IP :  192.168.1.30
```

4. Class D:

```
Enter IP network: 230.255.10.0/25
CIDR=25
230.255.10.0/25
Subnet Mask: 255.255.255.128
Class D
No. of subnet id bits = 25
No. of subnet masks= 33554432
Number of hosts is =  126
Broadcast address: 230.255.10.127
First IP :  230.255.10.1
Last IP :  230.255.10.126
```

5. Class E:

```
Enter IP network: 245.200.10.0/27
CIDR=27
245.200.10.0/27
Subnet Mask: 255.255.255.224
Class E
No. of subnet id bits = 6
No. of subnet masks= 64
Number of hosts is =  30
Broadcast address: 245.200.10.31
First IP :  245.200.10.1
Last IP :  245.200.10.30
```

My Observations:

- Each Class differs in number of Network bits and Host bits.
- Python contains ‘ipaddress’ as an inbuilt library. This library also provides functions like deducing subnet masks, broadcast address, hosts etc.

FAQS:

FAQS:

A. 1> classful IP addressing :- uses 3-part view of IP addressing i.e network, subnet and host.
eg: class A : 8 network bits & 24 host bits.

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classless IP addressing :- 130.16.37.16/27
IP address ↳ CIDR.
It uses 2-part view of IP addressing i.e subnet or prefix and host.

A: Q2. a) Prefix IP address-range :
A : 10.0.0.0/8 to 10.255.255.255/8
B : 172.16.0.0/12 to 172.255.255.255/12
C : 192.168.0.0/16 to 192.168.255.255/16.

b) loopback IP Address : host's self address also known as local host address.
Range : 127.0.0.0 to 127.255.255.255.

c) link-local IP Address :
In this a host can assign itself an IP address.
Range : 169.254.0.0 to 169.254.255.255

A. Q3. Supernetting reduces the size of routing table on the routers. Multiple networks are combined into a bigger network.

eg: Instead of routes having 8 individual routes it can have an aggregated route of these 8 individual routes.

A. Q4. FLSM : Fixed length Subnet Mask.
Strategy where every one of your networks within

the infrastructure is the same size.

VLSM: Variable length subnet mask.
Subnet deployment strategy that allows all subnet mask to be variable size.

CIDR: Class Inter Domain Routing.
The assignments of IP are not limited to 3 classes.
The whole cast range can be in any size block.

Q5. (a) IP address = 200.50.100.0
Class C
no. of subnet bits = 4 (s)
host bits = 4 (h)
no. of subnets = $2^8 - 2^4 = 16$.
no. of host = $2^4 - 2 = 14$.
subnet mask = 11110000 = 240.
∴ subnet mask = 255.255.255.240.

(b) CIDR = 28
Bits remaining will be used to address in each subnet.
⇒ 32 - 28 = 4 ∴ $2^4 = 16$ and $16 - 2 = 14$.
Ans: 14.

(c) Subnet address → 200.50.100.0 (Subnet 1)
First I.P: 200.50.100.1 ; Last I.P: 200.50.100.14

(d) Subnet address → 200.50.100.0 (Subnet 14)
First I.P: 200.50.100.1 ; Last I.P: 200.50.100.222