Ip Address:- Internet protocol address

ip address in Network layer. The Network layer is a 3rd layer present in OSI reference model

Network layer:- A Network layer create a packet this packet will definitely have the source ip address and destination ipaddress

So, Any Node in the network is identified with the help of mac address and ip addresses. ip addresses are logical addresses that are dealt in the network layer so packet will definetly contain source & destination ip addresses

ip v4 Addresses:- An ipv4 address is a 32 bit address that uniquely and universally defines the connection of a device to the internet.

The size of ipv4 address is 32 bit long

Note:- 2 devices on the internet can never have the same address at the same time.

For ex:- i want to give ip address for my system 10.10.10.1

But in this world many people used this ip address

This problem is solved by the "N.A.T." Networking Address technologies

⇒ The address space of ipv4 is 2^{32} (or) more than 4 billon

Notations of IPV4 address: (4 octets)

	8 bits	8 bits	8 bits	8 bits
1. Binary notation :	01110101	10010101	00011101	00000010

2. dotted decimal notation : 117.149.29.2

Dotted decimal: The each octet are range between 0 to 255

⇒ The representation of ipv4address in only 4 octets

0.0.0.0 to 255.255.255.255

⇒ if ipv4 address have more than 4 octects it is invalid. ip address

⇒ if ipv4 address not in the range between 0 to 255 it is also invalid.

Conversion ip address from dotted-decimal to binary and vice versa:-

We have to first Remeber the this table to conversion

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1

8 digits

Ex:- convert the ipv4 address from binary to dotted-decimal notation

10000001 00001011 0.1001011 11101111

start with first octect from left side

⇒ 10000001 first octet

for easy understanding we can draw a above table

	1st octet	2nd octet	3rd octet	4th octet
⇒	10000001	00001011	01001011	10111111

Now place the first octet from left side

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
1	0	0	0	0	0	0	1

→ Now we can only add binary digits of '1's value

$128 + 1 = 129$

The first octect = 129

2nd octect

128	64	32	16	8	4	2	1
0	0	0	0	1	0	1	1

$8 + 2 + 1 = 11$

128	64	32	16	8	4	2	1
0	1	0	0	1	0	1	1

$64 + 8 + 2 + 1$

$= 75$

2nd octect = 11

4th octect

128	64	32	16	8	4	2	1
1	1	1	0	1	1	1	1

128+64+32+8+4+2+1.

= 239

128
64
192
32
224

The ipv4address of Binary to dotted adress

129.11.75.239

☆ ex2:- ipv4 address from dotted-decimal to binary notation 145.14.6.8.

128	64	32	16	8	4	2	1
1	0	0	1	0	0		1

The first octect for 145 is We have the above table 8 bits. for to get a 145 the 128 is nedded so, write a '1' inthe place of 128

Now, for 145. how much value is needed for 128

145-128 = 17

so, 17 means 16+1 in this both places we place a Binary digit '1'

→ 2nd octect

→ 14

14 is write in the form of 8 + 4 + 2

So, place Binary digit '1' in the places of 8, 4, 2 and other fill with 0

128	64	32	16	8	4	2	1
0	0	0	0	1	1	1	0

→ 3rd 6 is write in the form of 4+2

So, place Binary '1's in the place of 4, 2.

128	64	32	16	8	4	2	1
0	0	0	0	0	1	1	0

→ 4th octect 8. replace '1' with in that place, and other with '0's

128	64	32	16	8	4	2	1
5	0	0	0	1	0	0	0

Now the final Binary value for ipv4 address is 145.14.6.8

solution:- 10010001 00001110 00000110 00001000

CLASSES OF IPV4 ADRESSES:-

The classes ipv4 address are divided ~~between~~ range of 0 to 255

ipv4 classes are divided into 5 types :-

	First Byte	2nd Byte	3rd byte	4th byte
1. class A	0 (0-127)			
2. class B	10 (128-191)			
3. class C	110 (192-223)			
4. class D	1110 (224-239)			
5. class E	1111 (240-255)			

The Range of class A address is (0-127) The ip address is given is a class A (or) not we can find with the help of first octect

Every Ipv4 addresses have 4 octects

if first octect is range of 0-127 then it is called a class A address

⇒ AND also When the ip address given in Binary form the first octect contain '0' at starting position also a class A address

⇒ class B starts with '10' in Binary form and the range 128 to 191 in the dotted form it is called a class B

⇒ class C starts with '110'

Between 192-223 in the first octect it is called class C Address.

⇒ class D starts with '1110'

Between 224-239 in the first octect it is called a class 'D' Address.

⇒ class E starts with '1111' in Binary form Between 240-255 in the first octet in IP address called a class 'E' Addres.

The Ranges of dotted form inclusive

⇒ ip Addresses are just identity of the devices. we donot know the network But with subnet mask with the ip address is idetify the who are all in the Network.

class A, B, and C are generall purpose ip address. it means we can use this ip addresses for our computers

⇒ class D is multicast Address

⇒ class E is experimental Address & Research purpose.

ip addresses are in the form of

Network	Host addresses

class A :- | N | H | H | H | Default mask 255.0.0.0

class B :- | N | N | H | H |

The first Two are Network addresses and Next two are Host addresses

The Default mask 255.255.0.0

class C :- 255.255.255.0
N N N H

This two are must same.

Subnet masks are represented by slab

⇒ 255.0.0.0 11111111.00000000.00000000.00000000

here we have 8 ones so represent class A address with /8. Subnet masking

class B : 255.255.0.0

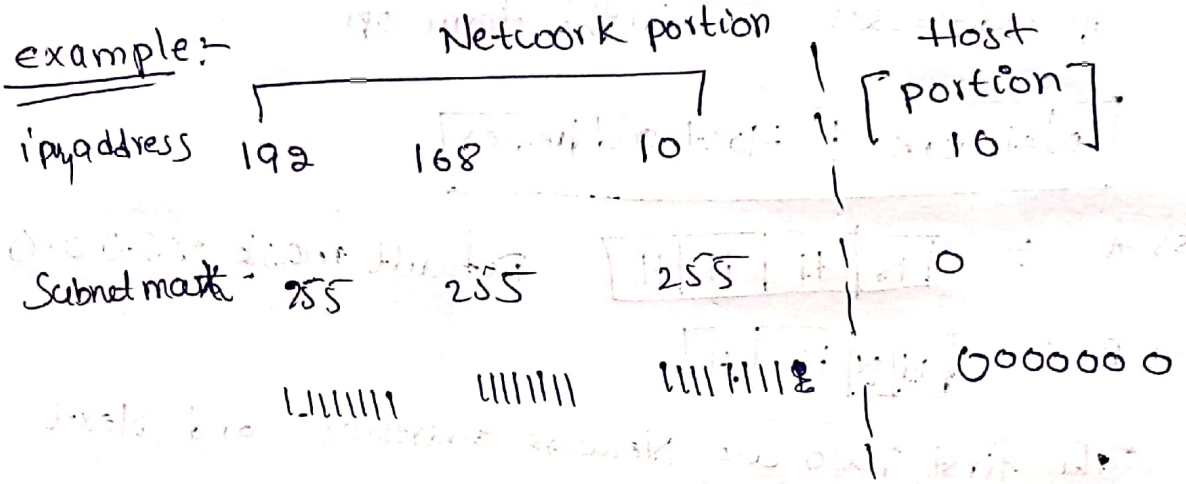
11111111.11111111.00000000.00000

16 ones. Subnet :- /16.

represent along with ip address /16

class C : 255.255.255.0.0 /24.

example :-



The ip address 192.168.10 is in same network. with host address is 10

⇒ if the address 192.168.20.0 it is not in a same network so, the communication is not possible. with the switch.

⇒ switch is used for the communication bet same network devices

⇒ By the Router the communcation possible for two different Networks.

SUBNET MASK:-

To define the network and host portions of an address, a devices use a separate 32-bit pattern called a subnet mask

Wether given ip addresses is same network or not

10.10.10.1
10.10.20.16
with subnet 255.0.0.0.

So, the first octect must match

10.10.10.1
10.10.20.16

matched it is in same network

172.16.200.1
172.16.165.2
with subnet 255.255.0.0.

The two octets must match
so the given ip addresses devices in same network and they can communicate

The Different ways of Host can communicate using Ipv4 address.

In 3 ways.

1. Unicast
2. Broadcast
3. multicast

1. Unicast:-transmission:- one host to destination host it sends packets only one destination ip address.

2. Broadcast transmission:- The process of sending a packet from one host to all hosts in the network

limited:- The Router generally sends packets to every devices in network.

But in limited the Router do not forward a packeets in-limited broadcast.

Directed broadcast:- destination: 172.16.4.255

with in the 172.16.4.0/24 network

between this two ip addresses all device are getting the packets

MULTICAST :-

The process of sending a packet from one host a selected group of hosts, possibly in different network.

⇒ Multicast transsimission reduces traffic

class D is a multicast Address range

224.0.0.0 to 239.255.255.25.

1st octect

first octect between 224 to 239 then it is class D

A Host in a class C network has been assigned an Ip address 192.168.17.9. find the number of addresses in the block, the first address, and the last address

Solution:- Ip address : 192.168.17.9

192 - the first octect starts with this range is class C Network.

The default mask of class C N.N.N.H

255.255.255.0 or /24

192.168.17.9

Network address — Host address 8 bits.

This Network starts with 192.168.17.0 to 192.168.17.255

The first three octects are must same 192.168.17.0 / 192.168.17.255

Number of address : $2^8 = 256$

host = 8

$= 2^8 = 256$ addresses are possible

Number of usable addresses : 256 − 2 = 254

⇒ 192.168.170 is Network address so, we donot use

⇒ 192.168.17.255 is Broadcast address so, we donot use.

First Address : 192.168.17.0 (Network address)

Last Address : 192.168.17.255 (Broadcast address)

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An address in a block is given as 185.28.17.9 Find the number of addresses in the block, the first address, and the last address.

⇒ 185.28.17.9

the first octect starts with 185

it is in class B address

The starting address is 185.28.0.0

Every address between 0 to 255

⇒ Default address is 255.255.0.0

N N . H H

16 16

⇒ Number of address = 2^{16}

= 65536 address

⇒ usable addresses is = 65536 − 2

= 65534

⇒ last adress is 185.255.255.255

private Ip address

private ip address is used to communicate within the same network. Using private ip data or information can be sent or received within the same network

public ip address:-

public ip addresses is used to communicate outside the network. public ip address is basically assigned by the internet Service provider (ISP)

classless addressing:-

Formal name is classless inter-Domain Routing (CIDR).

⇒ classless addresses we can create our own set of standards. we can create new Subnet mask

Subnet mask is used for knowing number of devices in a network then the wastage of ip addresses are less than the classful address

In classfull adress we use A, B and C class addresses there is a large number of ip address wastages so,

We are using classless address to knowing number of devices in a network.

By using "subnetmask", we can create our own network with number of required devices.

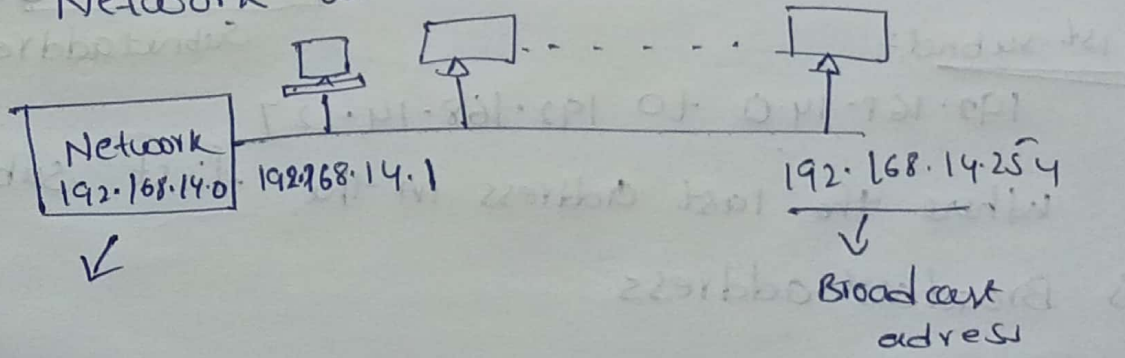
⇒ A subnetwork (or) subnet is a logical subdivision of an Ip network.

⇒ The practice of dividing a network into two (or) more networks is subnetting

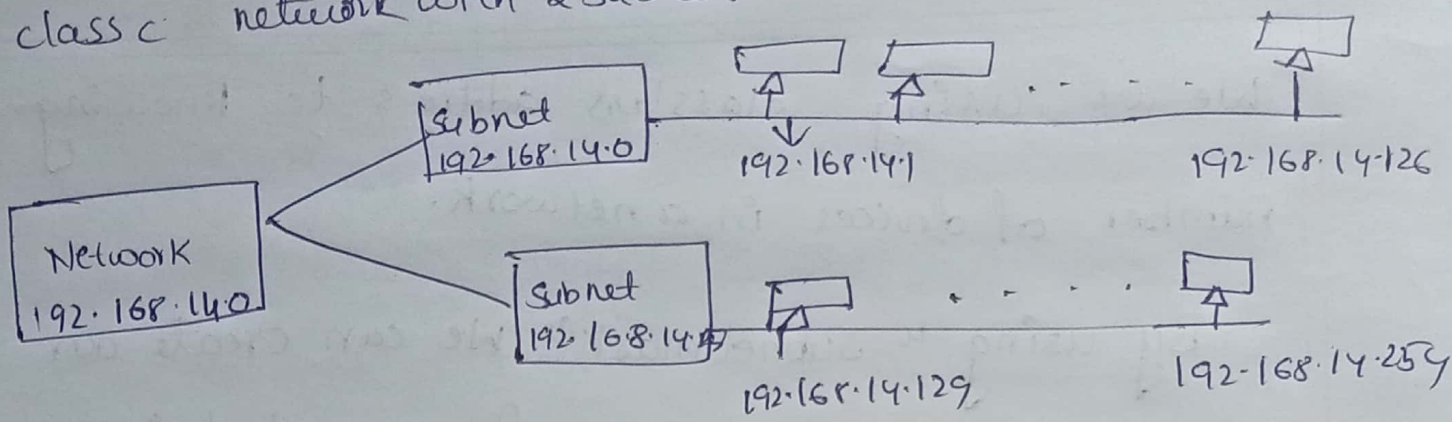
⇒ computers that belong to a subnet are addressed with an identical most-significant-bit-group in their Ip addresses

ex:- first three octects same
192.168.14.1
192.168.14.255

Ex:- Network without subneting



A class c network with 2 subnets



Here, the Network class c

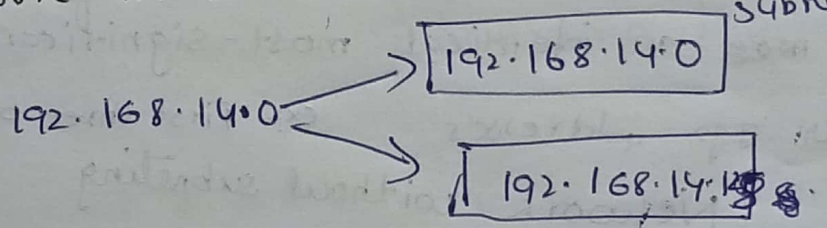
Total possible class addresses ~~for~~ given

address 192.168.14.0 to 192.168.14.255

⇒ The Default gate way address for class c is 255.255.255.0

* 192.168.14.0 is Dividing into two subnetwork.

Total network in to two sub networks



1st subnet:-

192.168.14.0 to 192.168.14.127

Where the last address in the first subnet is 192.168.14.127 is Broadcast address

2nd subnet:-

192.168.14.128 to 192.168.14.255

Where 192.168.14.255 is Broadcast address So we use up to 192.168.14.254.

Subnetting - 5 Steps:-

1. identifying the class of IP address and note the Default subnet mask.
2. convert the Default Subnet Mask into Binary
3. Note the number of hosts required per subnet and find the Subnet Generator and octet position
4. Generator the new subnet mask
5. Use the SG and generate the network ranges in the octet position