IP addressing

→ ordinal/sequencial numbers

A.B.C.D

Net ID	Host ID

To find the network in which the host resides

a particular node in the network

find network → router → find host

Class	IP address format

1st (1)   Last 3 (3)

A →

Net ID	Host ID

2   2

B →

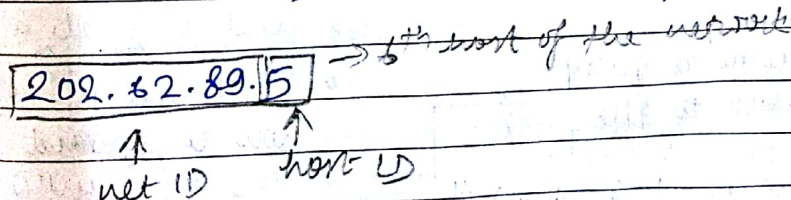| Net ID	Host ID

3   1

C →

Net ID	Host ID

Different network differ in the number of hosts they can accomodate :

Class C n/w (smallest capacity)

1 byte for host ID

$$= 2^8 = 256 \text{ hosts possible}$$

→ 5th host of the network

202.62.89.5

↑ net ID   ↑ host ID

class C network address → 202.62.89.0

Network address format

Net ID	Host ID
Specific	All 0's

Class B n/w

$$130. 120. | 110. 100$$

network address → $130.120. | 0.0$

$130.120. 0. 255$ → 256th to

$130. 120. 1. 0$ → 257th host

or address of the first host

Special addresses
1. Loopback address
2. Directed Broadcast address
3. Limited Broadcast address
4. Network address
5. Masks
6. Private address

Loopback address

$$127. 0.0. 1$$

- Used for network diagnostic purposes.
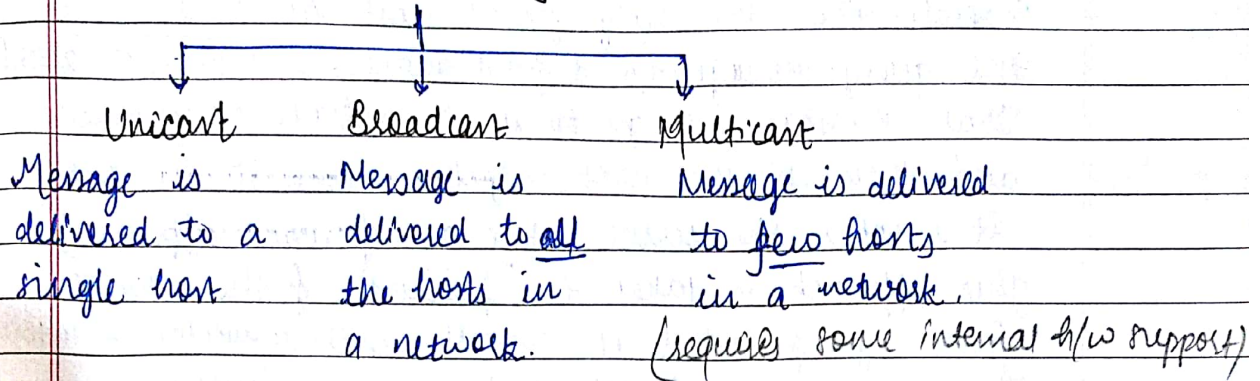- Every OS has NOS (network OS) to handle networks

  ↓
  - Used to assign network gateway
  - used to create a DNS serv.
  - or to specify whom & how to forward messages.
  - most importantly, to diagnose.

we write a query and forward to the address 127.0.0.1...

Manage loopbacks and comes back to the same host.

Message delivery

Unicast	Broadcast	Multicast
Message is delivered to a single host	Message is delivered to all the hosts in a network.	Message is delivered to few hosts in a network. (requires some internal h/w support)

Multicasting

- Msg is sent only to specific hosts.
- Some hosts need to be filtered out who are not supposed to recieve the msg.
- We create a <u>Multicast group</u>.
- Only those who subscribe to this group are the ones who get the <u>internal broadcast</u>.

<u>Directed broadcast</u>

Net ID	Host ID
Specific	All 1's

- Message is delivered to all hosts of the specific network.

Upto A	X XX . 255.255.255	} Reserved for directed broadcast
B	X X X.XXX.255.255	
C	X XX . XXX.XXX.255	

★ MAC address to IP address mapping is required.

<u>Limited broadcast network</u>

If a newly joined host has to interact with other hosts, it needs at least the server address to query for IP addresses of other hosts. It doesn't know gateway address, server address or even its immediate

neighbour's address.

To resolve this, the newly joined host can send the query message to a fixed address 255.255.255.255. That message will go to its immediate neighbour and then to the next neighbour and so on till it reaches the server (store and forward approach). This approach is taken to prevent of the message from going outside the network (if its connected to internet). The server replies directly to the new host (unicast delivery) with reqd. query.

\# Network mask (Default mask)

Net ID	Host ID
All 1's	All 0's

→ To find the required path for forwarding

class A 255.0.0.0   ⎤
class B 255.255.0.0 ⎬ Reserved for network masks
class C 255.255.255.0 ⎦

- When the router recieves a msg, it has to forward the msg to some destination address.
- Router finds the destination address through the network mask.
- e.g., destination address is 205.16.32.10
  - it belongs to class C
  - router uses default mask of C.
  - performs bitwise AND with the address.
  - Thus, host ID becomes 0.

Bitwise AND → &

     205.16.32.10
→   255.255.255.0
     205.16.32.0
    network address

Masks ─── Default
          ─ Subnet mask
          └ Supernet mask

- Masks are used to hide the hosts from the rest of the world

Private ## address

- IP addresses of those networks which can't be accessed from outside of their network in an intranet.

Private address range

Class A → 10.0.0.0 - 10.255.255.255
Class B → 172.16.0.0 - 172.16.31.255
Class C → 192.168.0.0 - 192.168.255.255

- Hosts with private address can't access the public networks either (so, no direct connection to internet).

- However, it is possible with a NAT router.
                                    ↓
   Network address translation

- ISP uses NAT routers to convert our private addresses to connect to the internet (after some internal mapping)

- Routers having NAT feature maintain a NAT table

NAT Table

Private IP address	Corresponding public IP address
192.168.68.79	178.1822.186.190 → destination IP address

source IP address ↙

- After going through NAT router, the source IP address becomes router's IP address (public)

- But what if the message comes to the NAT router from a popular public network address (like Google). How to find the specific private host address as the there can be multiple instances of that public address is the table. Concept of <u>time stamp</u> is used to resolve conflict.

- Also called multi-homed device. —⊤[R]⊤—
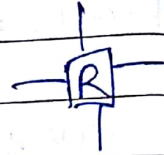
Gateway
Router
bridge

BRouter

Assignment — Day 1
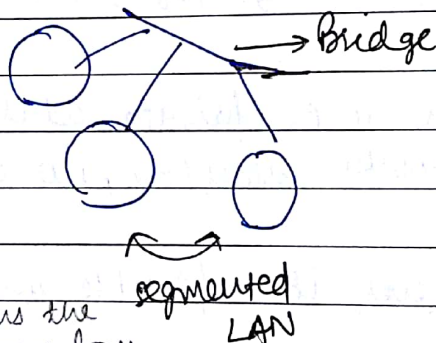Q1 Identify the male and female connectors of RJ-45.
Q2. Familiarize with hub, switches & use them to connect variou computers in a n/w.

Router (continued from Lab1)

→ Bridge

Bridge
- Translational
- Transparent
- Learning
  → Learns the addresses from the packets and makes the table

segmented
LAN

Gateway
- Connects one network from the other
- Translates protocols (like some hosts can follow Novell architecture having different header).
- Provides encryption and security

BRouter
- Has combined functions of router and bridge.

Hub
- Forwards to all ports

Switch
- Has intelligence. Forwards only to specific ports.