Thadomal Shahani Engineering College

Bandra (W.), Mumbai - 400 050.

CERTIFICATE

Certify that Mr./Miss RAGHAV RATHI

of Computer Department, Semester V with

Roll No: 2113208 has completed a course of the necessary

experiments in the subject Computer Network under my

supervision in the **Thadomal Shahani Engineering College**

Laboratory in the year 2023 - 2024

23/10/23

Teacher In- Charge

Head of the Department

Date 23/10/23

Principal

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Experiment 1:-

Aim: Use of crimp tool for RJ45

Theory

Cables can transmit info. along their length to actually get that info. where it needs to go you need to make the right your cable then needs to terminate into a connector & that connector needs a jack to plug into.

Registered Jack 45 (RJ45) is a standard type of physical connector for network cables. RJ45 connectors are commonly seen with Ethernet cables & networks.

Modern Ethernet cables feature a small plastic blue on each end of the cable. The plug is nested into RJ45 jacks of network devices the term plug refers to the cable or "male" end of the connection. while the term "jack refers to the port of "female" end.

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7568 A	7568 B
1. White green	1 White orange.
2 green	2 Orange
3 white orange.	3 White green
4 Blue.	4 Blue.
5 white Blue.	5 White blue.
6 Orange.	6 Green
7 White Brown	7 white Brown
8 Brown	8 Brown.

are two colour coders code used for wiring eight position modular plugs. both are allowed under the ANSI / TIA / EIA wiring standards. The only difference betn the two color codes is that the orange & green pairs are interchanged.

~~There is no transmission diff betn 7568A & 7568 B cabling schemes. NA preference is for both end. Must use the same standard it makes no difference to transmission.~~

Step 1: Use a crimping tool trim the end of the cable you're terminating to ensure proof of end.

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Step 2: Being careful not to damage the inner conducting wires strip off approximately 1 inch of the cables jacket using a modular crimping.

Step 3: Separate the 4 twisted wire pairs from each other & then unwind each pair so that you end up with individual flat the wire out as much as possible.

Step 4: Holding the cable with the wire ends facing away from you from left to right arrange the wire in a flat side-by-side ribbon.

Step 5: Holding the RJ45 connector so that the plug-clip side is facing away from you & the plug-clip side is facing down carefully insert pushing through until the wire end ends.

Step 6: Check to make sure that the wire end coming out of the connectors pin side are in the correct order. If not rearrange into proper formation.

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Step 7: Insert the prepared connector / cable assembly into the slot in crimping tool.

Step 8: If your crimper doesn't trim the wire ends upon termination, carefully cut wire ends to make them as flush with the connector surface as possible

Step 9: After termination repeat the process for the other side of cable.

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-: Experiment No 2 :-

Aim :- Implement of hamming code for error detection & correction.

Theory :-

⇒ Error & Error Correction Code.

When bits are transmitted over the Compter network they are subject to the correpted line in interface & network problem. The corrupted bits last to data being recived by the reciver called error

Error correction code (ECC) are a sequence of numbers generated by specific algo for detecting and removing errors in data that have been transmitted over noisy channels.

⇒ Hamming Code is a block that is capable of detecting upto two simultaneous bit errors and coverting single bit errors.

It is a special code in Computer network which is a set of error correction code It is maily used for deteing & correting errors that occurs all the time of data transmition from sender to reciever.

⇒ Advantage of Hamming Code.

→ It is effective on method networks where data streams off given for the single bit errors.
→ Hamming Code not only provides the detection of a bit error but also helps you to the bit containing error so that it can be corrected.

⇒ Dis- Advantage:

→ If multiple bits are found error, then the outcome may result in another bit which should be corrected to be changed.
→ They can solve only single bit issues.

⇒ Implementation :-

formula to find no of redundant bits.

No of significant bit errors - M+R.
No of states for no error - 1

$$2^R \geq N + R + 1$$

R → Redundants bits.
M → Data bits

Steps to find Hamming Code.

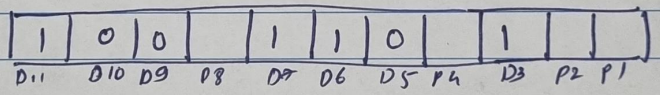
i) First write the bit positions starting from 1 in a binary form (1, 10, 11, 100, etc...)
ii) Mark all bit positions that are power of two as parity (1, 2, 4, 8, ...).
iii) All other bit positions are for the data to be encoded using (3, 5, 6, 7, 9, 10, etc).

Eg.

Write the even parity hamming code for a data byte 1001101

$$2^R \geq M + R + 1$$
$$2^4 \geq 7 + 4 + 1$$

∴ No of redant bits → 4
No of Data bits → 7



P1 : 1, 3, 5, 7, 9, 11
(1), 1, 0, 1, 1, 0, 1

∴ Odd parity.
The P1 bit position → 1.

Similarly,
The P2 bit position → 0
The P4 bit position → 0
The P8 bit position. → 1

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∴ Data to be transmitted to the reciever is

1 0 0 1 1 1 0 0 1 0 1

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Experiment 3 :-

Aim: Implementation of CRC for error detection.

Theory:

The cyclic Redudancy checks (CRC) is the most powerful method for error detection & correction. It is given as a k-bit message & the transmitter creates a (n-k) bit sequence. called frame check sequence. the out coming frame including n bits is precisely divible by some fixed no. Modulo 2 arithmetic is used in this binary addition with no carries just like the XOR operation.

Redudancy means duplicacy the bits used by CRC are dtged by splitting the data unit by a fixed divisor or generator in CRC.

It should have bits equal to the high degree of the generator polynomial The out of data unit that is joined should get a bit sequence that is divisible by the divisor.

CRC can detect all odd even error bit errors & burst errors of less than equal to polynomial degree.

Adv:

1) It is simple to implement in binary N/w.
2) Mathematical analysis of CRC is very simple.
3) It is good at detecting common error caused by noise in transmission.

Disadv of CRC.

1) CRC is not suitable for protection against intentional alteration of data.
2) Prediction of data is possible.

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Example.

Ms to be sent 111001010 1

Devisor : 1101.

```
                ,
1101) 111 00 10 10 1000
      1101
        1101
        1101
        0000 0 1010
               1101
                 1110
                 1101
                  110
```

Msg to be sent.

111001010 1000.

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Experiment 4:-

Aim:- Simulation of go Back N flow control algorithm.

Theory:

Go it is a flow control algo that help in sharing frames from sender to receive. it is based on sliding window protocol which is different from the basic stop & wait protocol.

In sharing window, the multiple frames can be sent at a time. The variations of the sliding window are it & Selective repeat.

In it, N is sender window size support. N is 3 that means that the sender can send 3 frames before getting ~~the~~ ack of acknowledgment for any of these 3 frame. In me the pipelining principle in which the multiple frames can be sent before receiving the acknowledgment of the first frame.

The frame is it are numbered sequentially. If acknowledgment for a frame is not received with in the agreed. Current window are retransmitted.

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Adv

1) It can send multiple frame.
2) Pipelining reduces time requirement.
3) It handle duplex as well as.

Disadv

1) If acknowledgement for a single frame is not received.
2) Retransmission of all the frames on timeout.
3) If the error one frame it ignore take.

Example.

frame to be sent = 6 (0 . . . 5)
N = 3.

i) 5 4 3 2 1 0.
window.

ii) On receiving 0's ack.

5 4 3 2 1 0

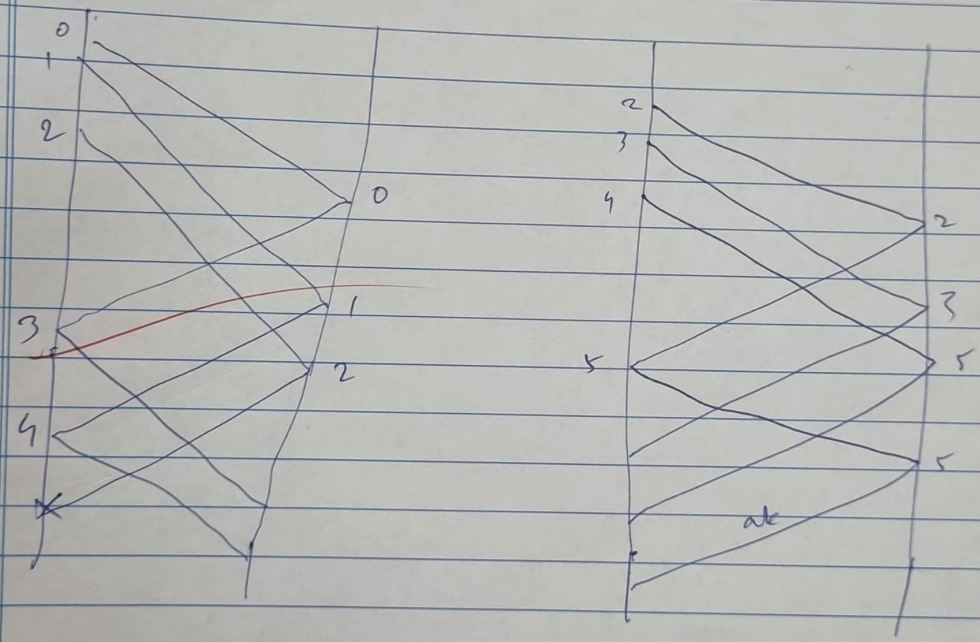
iii) On receiving 1's ack.

5 4 3 2 1 0.

iv) Doesn't receive ack's as
resp the whole
window again
5 4 3 2 1 0

v) on resvg ack for
2

5 4 3 2 1 0



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-: Experiment 5 :-

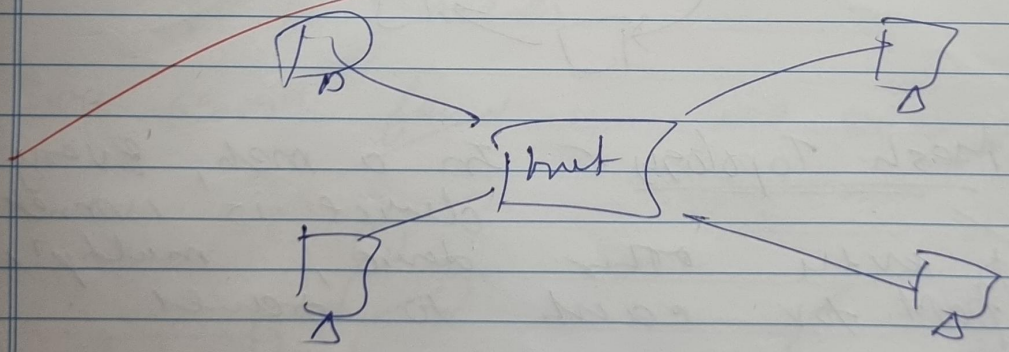
Aim: Build a simple network topology....

Theory:-

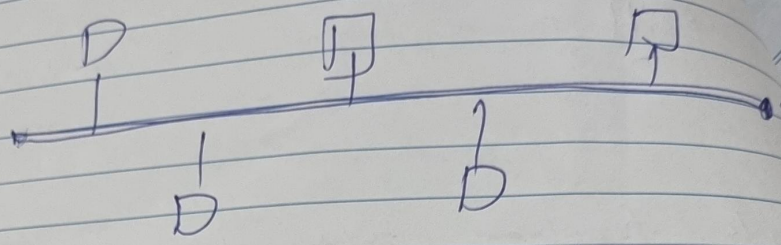
Network topology refers to the physical layout of devices & conn. within a network & diff. netw. topolo. are used for various appli.

① **Star Topology:-** all devices are directly conn. to a central hub as switch. Devices do not connect directly to each other.

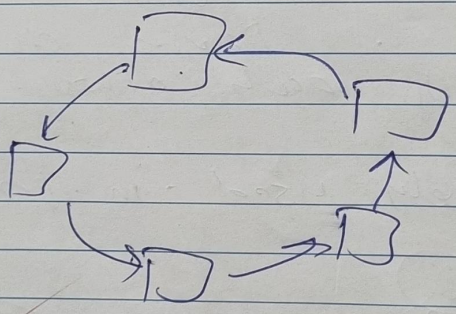
Most commonly used - in home network.



② **Bus Topology:-** All devices are share in single comm. line called as Bus. Data is transmitted down bus & devices can tap in to it.



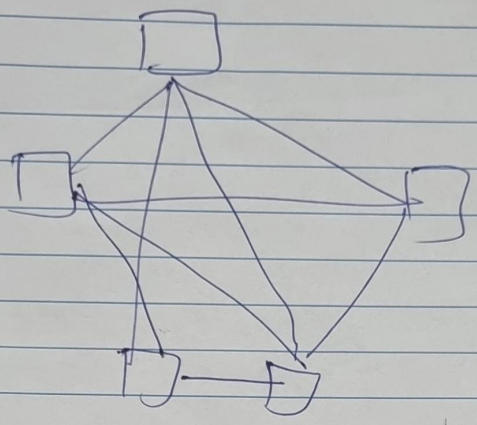
③ Ring Topology :- Each dance to connect to exactly two other devices formed in ~~Boss~~ closed loop. data travels in one direction.



④ Mesh Topology :- In a mesh, every device is connected to every other device, multiple path for each to travel.

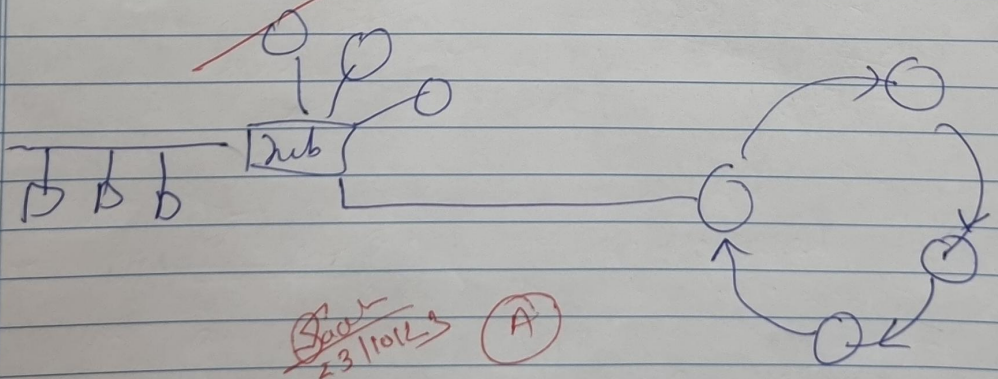
One of the use to critical applications as data centers where redundancy & fault tolerance are critical.

Ensures reliability on any other.



(5) Hybrid Topology :- It combines two or more different topology into a single network. for eg. a network might have a star in one office and ring in another office org. to tailor their network to specific needs.

are found in large enterprice.



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Experiment 6 :-

Aim:- Design VPN & config RIP / OSPF using packet tracer.

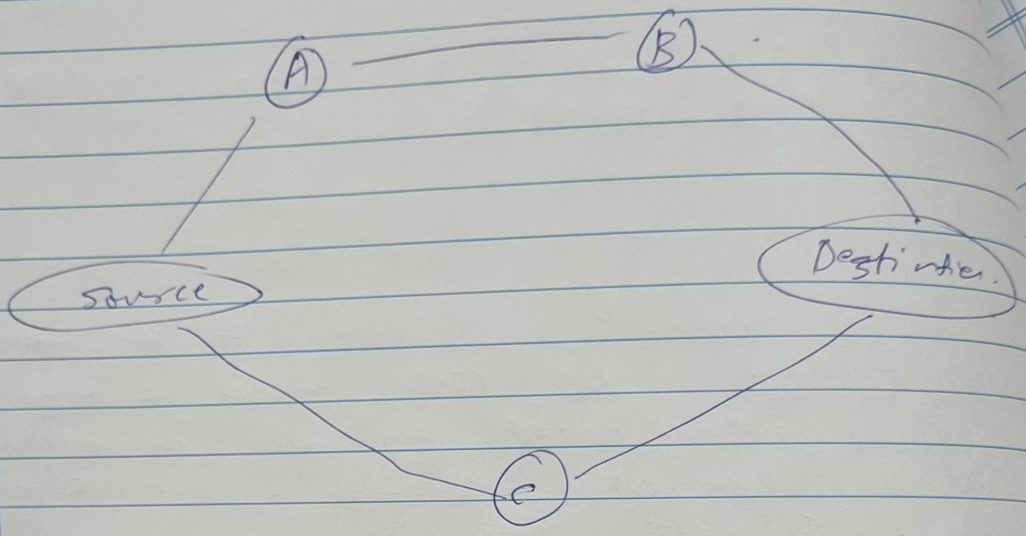
Theory:

it is a network simulation & visualization tool developed by Cisco system a ~~visit~~ tech & learn netw. concept especially in edu cn. env. Such as schools college & train prog. It allow user to conf .

VPN: OR Virtual Private Network is a technology that allow you to create a secure & encry connection.

1) Security
2) Remote access
3) Anonymity

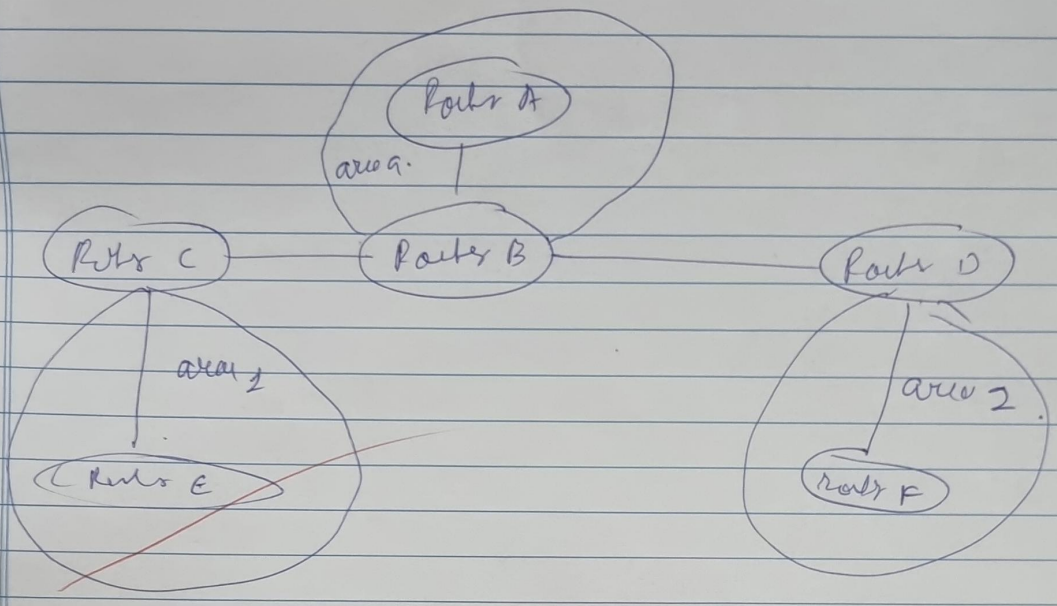
RIP :- Routing Information Protocol, RIP is which distance vector routing protocol use for data /packet transmission. the max no of hop is because it prevent routing loops from source to dest. Meth like the split horizon. treen inccorect or wrong routing info. sally Floyd & van Jacobson (1994).



OSPF :- it stand for Open Shortest Path First which uses a link-state routing algorithm. Using the link state info. which is available in routers. construct the topology in which routers. determine the routing table. for routing decision. It support both variable. length.

Dijkstra algorithm. It computes the shortest path here or each other.
OSPF is that it handles the error.

OSPF is the interior gateway protocol (IGP) which connect networking IP.



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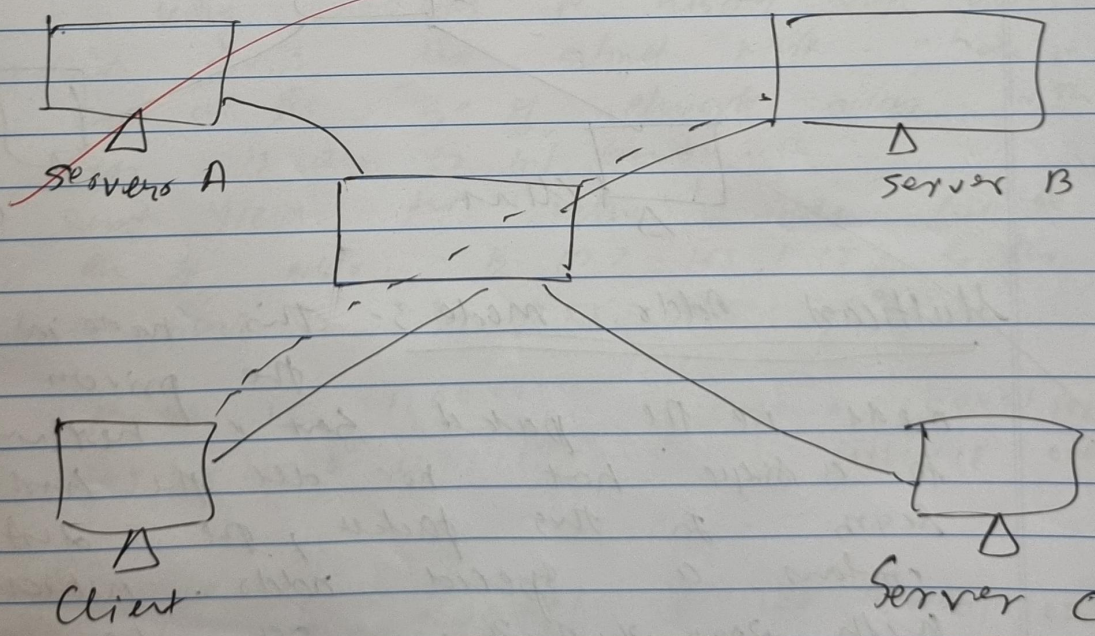
Experiment 7 :-

Aim: WAP to implement of IPv4 addressing concept along with subnet making.

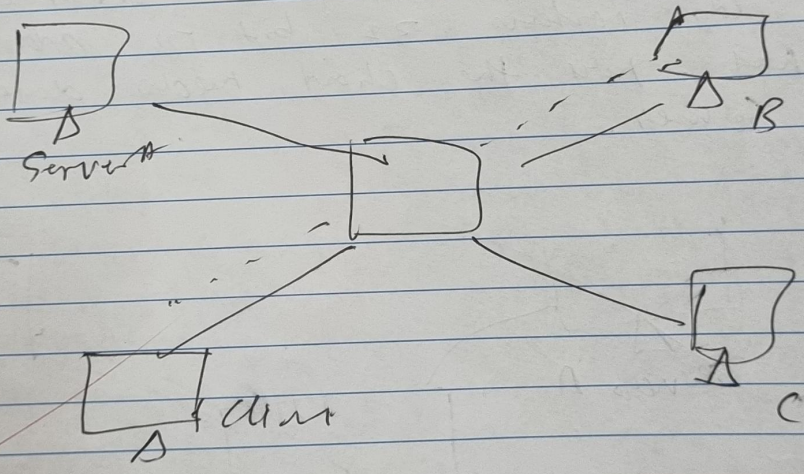
Theory:

IPv4 support 3 diff type of addr modes.

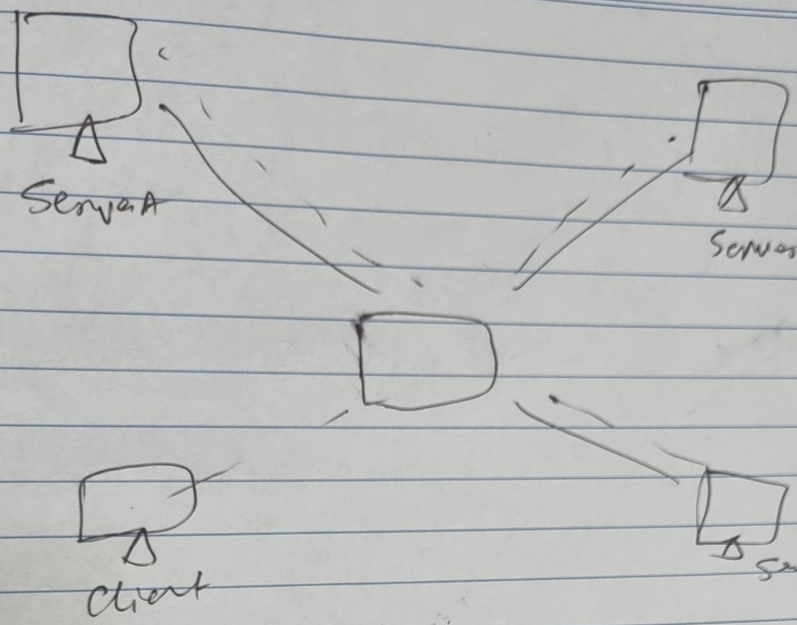
Unicast addr. mode :- In this mode, data is sent only to one destined host the destination addr. fields contains 32-bit IP addr. of dest. host. Here the client needs data to farg. Server.



Broadcast Addr Mode :- In this mode, the dest. addr. field contains a special broadcast addr. i.e. 255.255.255.255 when a host sees this packet on the network, it is bound to process it. host the client sends a packet, which is over heard by all server.



Multicast Addr. Mode :- This mode is a mix of the previous two modes i.e the packet sent is neither dest. to a single host nor all the host on the segm. In this packet, the dest. addr contains a special addr. which starts with 224.x.x.x. can be over by more the one host.



Subnet Mask: The 32 bit IP addr. contains info about the host its network

It is very necessary for this hosts. use subnet mask. which is as long as the size of network addr. in the IP addr. is also 32 bit long.

The first 4 fields the netw. addr. for e.g. say an IP addr. is 192.168.1.152 & its subnet mask is 255.255.255.255.

IP	192.168.1.15	11000000	10101000	00000001	10111000		
mask	255.255.255.0	11111111	11111111	11111111	00000000		

Network

Network ID: 11000000 10101000 00000001 00000000
192.168.1.0 Host IP: 192.168.1.152

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-: Experiment 8 :-

Aim:- Use basic networking commands in Linux ping traceroute nslookup netstat ARP RARP IP ipconfig dig route.

Theory:

i) **ping:-** ping command in Linux is used to test network connectivity between your computer & targeted host. Sends ICMP request & wait for response.

ii) **traceroute:** it is used to trace the route that packets take through the network to each a distant destination host. It displays a list of network hops & their response.

iii) **nslookup:** command in Linux. It is used to query about DNS servers to obtain info. about domain name or IP addr. used to resolve domain name & IP addr. vise versa.

iv) **netstat:** command in Linux display network stat routing table & active network conn. It provides info about network services.

v) **ARP:** The command is used to view and manage ARP cache. It displays info. about the map of IP addr. to MAC addr. on a network.

vi) **RARP:** is used to map a MAC addr to an IP addr. which is the map a MAC addr. to IP

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vii) **ip**: it in linux is used for net config & many. it allows you to perform var. networ. tasks such as conf. netw. interface display. routing tables & manage IP addr.

viii) **ipconfig**: The comat is used to display & config. netw. interfaces on this to display. & system includes. Linux. Therefore it is considered out dated & ip is recommended.

ix) **dig**: the comm. is used for querying DNS server to retrieve info. about domain names. It can provide details like to addr rec query & verbose DNS.

x) **route**: the command is use to display and manipulate the IP route. it shows the route info. the determines how netw. pack are forwarded through system.

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:- Experiment 9 :-

Aim: Use wireshark to understand the operation of TCP / IP layers.

- ethernet layer : Frame header / frame size etc.
- Data link layer : MAC addr. ARP (IP & MAC addr. binding).
- Network layer : IP packet.
- Transport layer : TCP port, TCP handshake segments, etc.

Application layer : DHCP, FTP, HTTP Header formats.

Wireshark is a popular, open-source network protocol analyzer used for capturing and inspecting packets a network. It is a powerful tool for network. It is powerful tool for network administrators security professionals and student.

The objective of the experiment is to use wireshark, a network protocol analyzer to capture and analyze network traffic to understand the operation of various layer of TCP / IP protocol suite.

1) **Ethernet layer :-** This deals with frames which are packet of Data at the

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can observe the size of ethernet frames in wireshark & frames have headers containing info. and like source & destination MAC address.

2.) Data link layer :- Two like layer deals with MAC addr. Wireshark will show you the MAC addr. of the MAC addr. of the devices comm. in the netw. User can capture ARP packet to see how devices map IP addr.

3.) Network layer :- Involves a lot of processes & nodes IP packets. Wireshark displays IP headers with information like IP headers with info. like source & dest IP addr. ICMP packets can be captured to observe network. Some short msg. like ping request and reply.

4.) Transport layer :- Users can see which ports are used by appl. (eg. web browser, email, etc) for comm. By capturing TCP traffic you can see the three way handshake process which is how two devices establish a connect.

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Experiment 10 :-

Aim: Socket prog. using TCP OR UDP

Theory :-

Socket prog. is a crucial aspect of network comm., enabling data exchge between comptr over a network TCP (Transmission Control protocol) and UDP (User Datagram protocol) are 2 commonly used transport layer protocol for socket prog.

1.) **TCP** :- it ensures reliable ordered and error checked delivery of data bet 2 devices. It established a connection before data exchge.

Uses acknowgements and retransmits lost packet if necessary to confirm the receipt of data packets.

Is suitable for application where data integrity and order are critical such as web browser error I and file transfer.

2.) UDP: it dont establish a connection & does not guarantee delivery or order of data packets each UDP packet is treated as an independent unit of data. UDP doesn't use acknowledgment so its faster but can result in lost or out of order packets.

Socket connection on consists of client side connection and server side connection.

client side prog.

To connect to another machine we need a socket conn. A Socket conn. means two machine have information about each one network location. and TCP port.

The java net socket class represents a socket To open a socket.

Socket s = new Socket("127.0.0.1",

The 1st arg. IP addr of 5000) local host where code will run on our single. Host host where code will run on the single stand alone machine.

The communic ove a socket connection. Streams.

used to both i/p and o/p to data.

Conclusion :- Learnt about socket prog. and how to implement it in java using TCP & UDP.

23/10/23 A

Assignment 1 :-

⇒ Write shortnode on

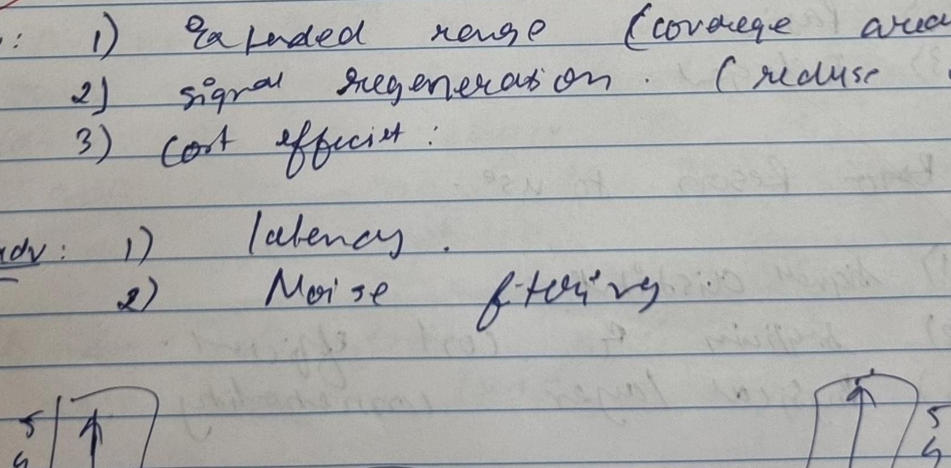
i) Repeater :-

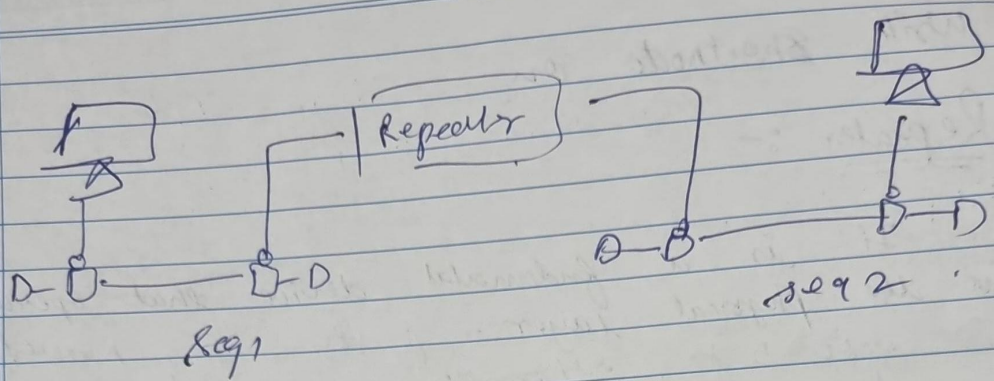
It is a fundamental device that operates in the physical layer of the OSI model. Its role is to retransmit signal by regenerating it before it gets a weak or corrupted. Over long distances power by signal attenuation & degradation noise. ~~...~~ errors increase.

1) Signal extension. (main reason).
2) Maintaining signal integrity.
3) Overcome terrain & obstacles.
4) Versatility in media.

Adv: 1) Extended range (coverage area of netw).
2) Signal regeneration. (reduce error).
3) Cost efficient.

Dis adv: 1) latency.
2) Noise filtering





2) Hub :- its basic multi port repeator a hub uses coming from diff. broad. It can filter data are sent to all connected devices all hub are not intelligent.

3 Types of it.

1) Active
2) Passive
3) Intelligent.

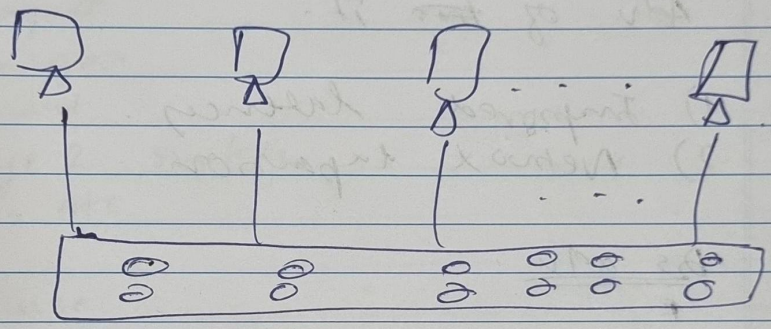
~~Ref~~ Reson to use.

1) signal distant.
2) Simplicity & cost efficient.
3) Physical layer connectivity.

Adv: 1) fast troubleshooting
2) No network addr.
3) Cost

Disadv: 1) limited performance.
2) Collision domain.
3)

Diag.



3) Bridge :- operates at the data link layer, It is repeater, with add on the functionality of filtering content by reading the MAC addr. of the source & dest. It is also inter conn. two lans working on the same protocol.

* is 2 ports device working in data link layer.

Types of bridges.

1) Transparent.

2) Source routing bridge.

Reason to use.

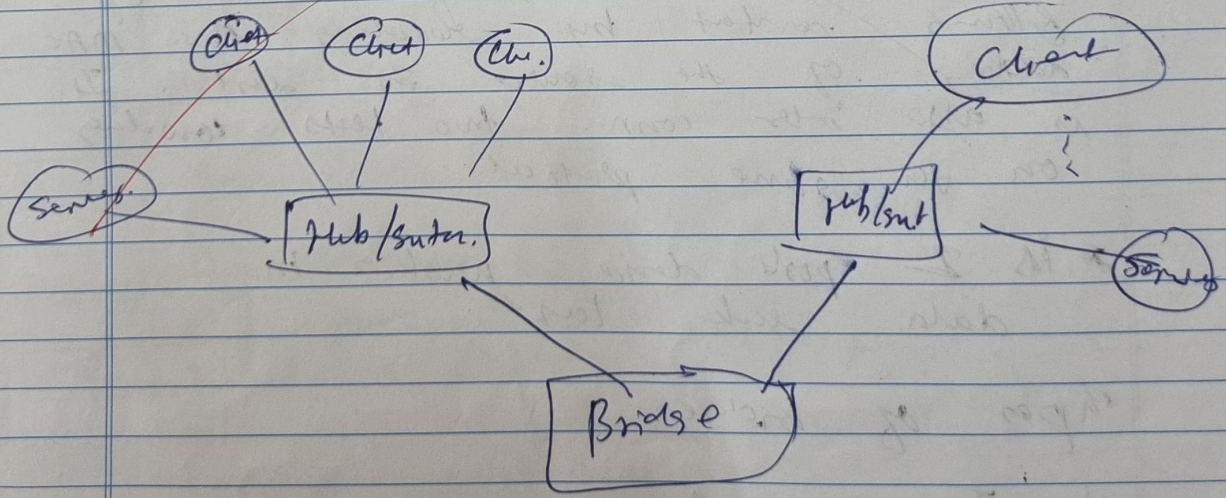
1) Segmentation & traffic is bottleneck.
2) Extending Network reach.
3) LAN expansion.

Adv of it.

1) Improved latency.
2) Network expansion.

Dis adv:

1) Limited scope:
2) Performance bottlenecks.



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4) Switch: It is a multipoint bridge with a buffer & a design that can boost its efficiency on large no. of ports imply less traffic & perf. & switch is a data link layer device.

Large no of type in it.
like

1) Unmanaged
2) managed.
3) Smart
4) Layer 2 switch
5) .... etc.

Reason to use.

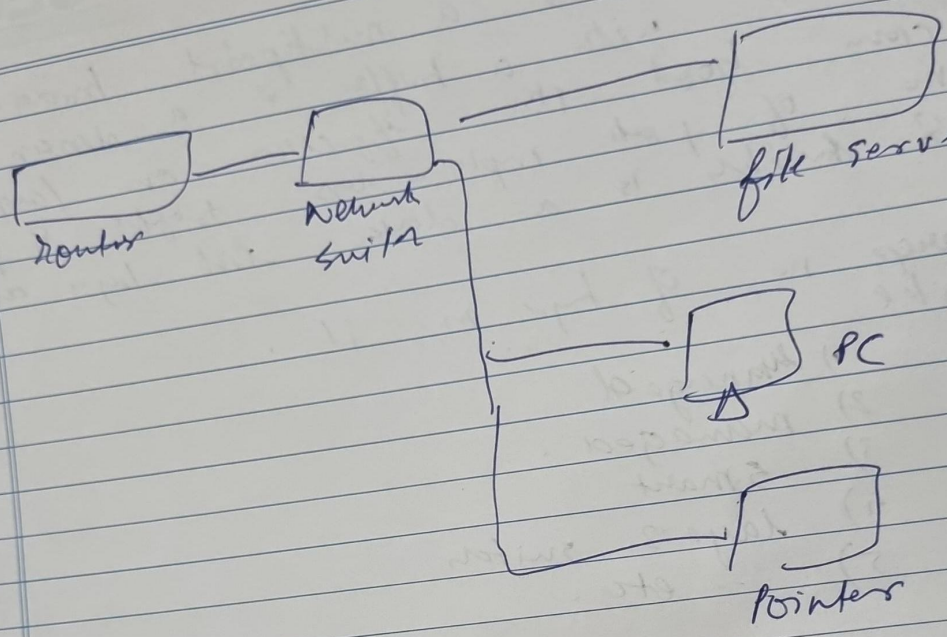
1) Data forwarding.
2) Traffic isolation.
3) Bypass Latency.

Adv

1) full duplex.
2) network scalability.

Dis adv.

1) Complex config.
2) Single point failure.



5) Routers:- It is a device like a switch that data packets based on their IP addr the router is mainly a Network layer device. Homely computer have a dynamic updating routing table based on which they make decision on

use for reason.

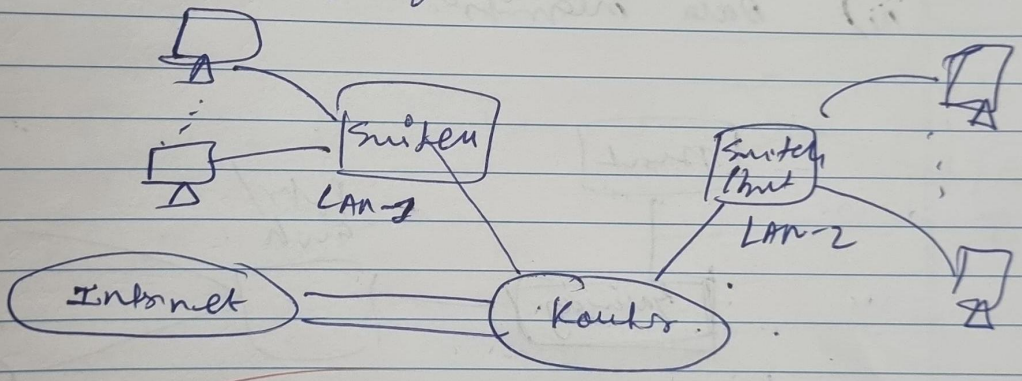
1) Inter connecting network.
2) Packet forwarding.
3) Dynamic routing.

Adv:

1) Interconnectivity.
2) Quality of service.

Dis Adv

1) Cost.
2) Config. complexity.
3) Single point of failer.



6) Gateways :- It's a passage to connect 2 network that work on diff. network model they work as message agent. Take data from 1 system & can operate at any network layer.

Use of it:

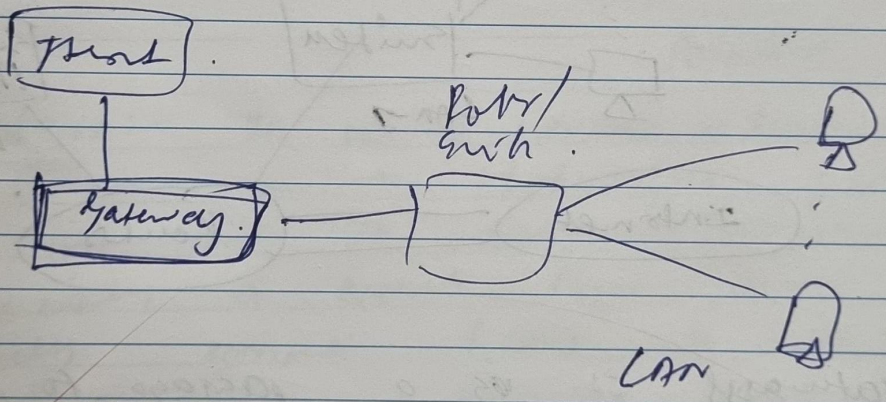
1) Protocal translation.
2) Interoperability.
3) load balance.

Adv.

i) Security enhancement.
ii) flexibility.
iii) Centralized mang.

Dis Adv.

i) Complexity.
ii) Single point of failure.
iii) Data integrity.



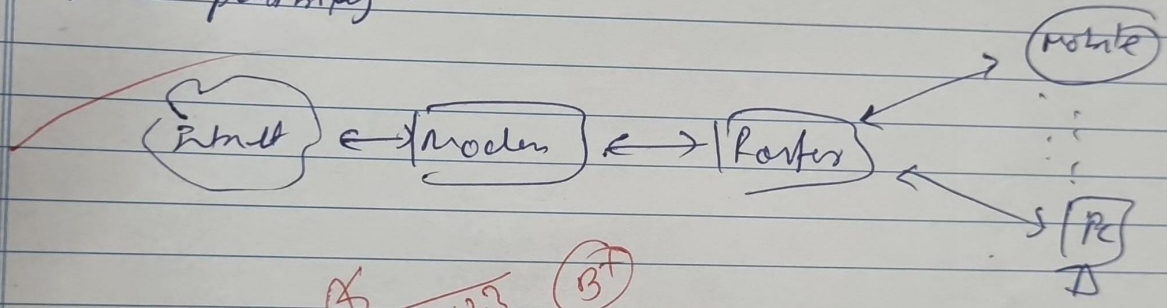
7) Modem : in short for "modulator demodulator", is a device. that allows devices such as comps. to communicate with each other over analog lines. It converts digital data from comp. understand.

Adv:

1) Internet connectivity.
2) Ease of use.
3) Cost.

Disadv:

1) Limited speed.
2) Latency.
3) Compatibility.



4 23/10/23 3T

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-: Assignment 2 :-

⇒ Write Short Note on.

i) Ethernet :- It is a widely used networking technology that defins how devices communicate over a LAN. It operates at the Data Link Layer (layer 2) of the OSI model and uses frams to transmit data betw devices. Ethernet frames includes source and destination MAC addresses as well as other consol information it supports various physical media like twisted pair cables and fiber optices.

ii) IPv6 :- Internet Protocal version 6 (IPv6) is an upgraded version of the IP protocal that is used to uniquely identify and locate devices on the internet. It was developed to address the limitation of IPv4, mainly the shortage of available IP addresses IPv6 uses 128 bit address providing a significantly larger address space which is essential for the growing number of devices connected to the internet.

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Q2)

SSH :- it stands for Secure Shell or Secure Socket Shell. It is a cryptographic network protocol that allows two computers to communicate & share the data over an insecure network such as the internet. It is used to login to a remote server to execute commands & data transfer from one machine to another.

It provides a strong password encrypted & password authentication communication with a public key over an insecure channel. It is used to replace unsecure shell login protocol such as telnet, rlogin.

Adv :

1) It provides confidentiality.
2) It is used strong authentication.
3) SSH ensures port forwarding.

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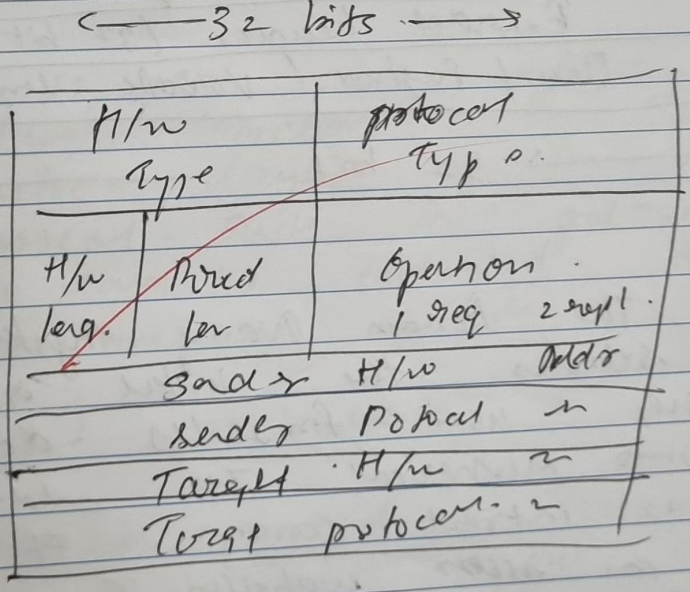
Q2) Explain the purpose of following protocols with their header format.

Ans: i) **ARP** : The (Addr. Resolution protocol) is fundamental network protocol that plays a pivotal role in local network communication by mapping known IP addr. to their corresponding physical MAC addr. It enables devices on network to discover & associate MAC addr. with IP addresses.



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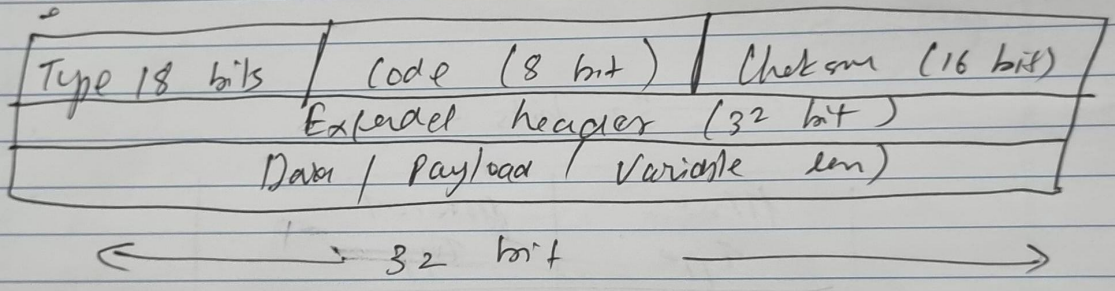
ii) ICMP: it is used for error reporting if two devices comm over the internet & some error occurs. so the router sends an ICMP error msg to some info about the error. for eg. whenever a device sends any message which is large error. for the reciver, in that case the reciver will drop the msg & reply back.



iii) DNS: The Domain Name System (DNS) serves the vital role of translating user-friendly domain names into numerical IP addr. enabling people as internet comm. It ensures users can access websites & services using easily memorable names, simplifying browsing & resource loc. It also provides data packet addr & routing.

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0 15	16 31
Identification	Flags.
No of Quties	No of ans RRs. (All of is query msg
No of authorities RRs	No of additional RRs.

Q3) Discuss the persistat & non-persitat protocol used in trasport & applicat layers of TCP / IP protocol suite.

Ans :- if is are two different opproches to handling connection in the Trasport & Application layer of the TCP IP protocol suite. Thse protocols govern how data is exchanged between devices one a network.

Persistent protocol :-

1) Connection oriented :- Persistat protocols are connection oriented which meas they establish a connection betw the sndr & reciev before data exchange beigen.

ii) eg: The most common example of a persistent protocol in the TCP/IP suite is the Transmission Control Protocol (TCP). TCP ensures reliable ordered & error checked delivery of data.

iii) Use cases :- Are suitable for applications that require reliable & ordered data. Both web browsers, email clients & file transfer & remote server interactions. They are ideal for situations where data are critical.

iv) Overhead :- They typically have more overhead due to the need for connection setup & teardown msg & error recovery mechanisms.

Non-persistent Protocol:

i) Connectionless :- Non-persistent protocols are connectionless meaning they don't establish a continuous connection between sender & receiver instead a new connection is established for each data exchange.

ii) eg : A common eg. is User Datagram Protocol (UDP).

iii) Use case :- it suitable for appli. that prioritize speed & efficiency over reliability.

iv) overhead :- lesser overhead as compared to any skip connection setup.

23/10/23 A