Computer Network

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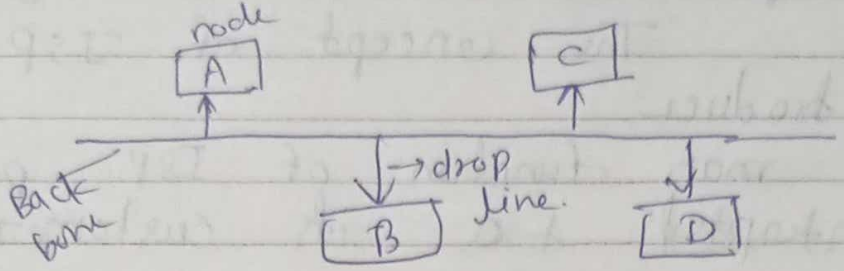
Bus topology - It is simple topology.



Bus

Computer Network - It is a set of ~~A~~ computer or electronic divice that share resorces located in network nodes but computer uses common comunication protocels to communicat which other.

* History of computer Network -

① ARPANET — advince Research project adjancy Network

(i) It was stabilished by US department of diferience.

② It was started at only 1960.

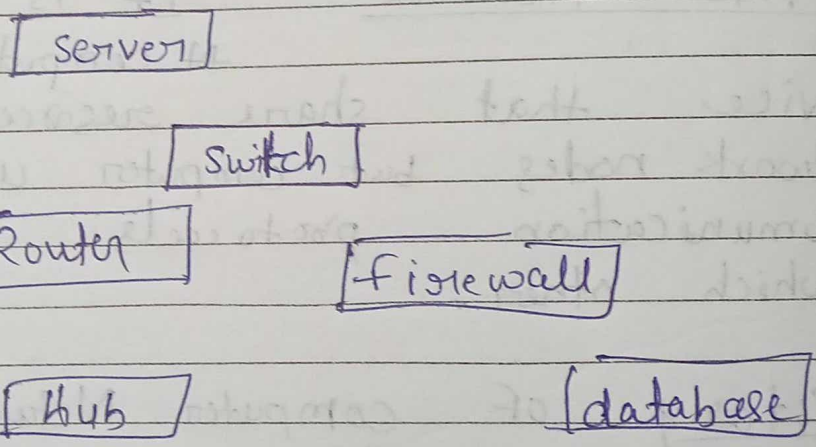
③ There were 4 nodes of university of Collforniya

④ UTH

(3) Santa barbara
(4) San stand ford
(5) on October 19 GO, the first message was exchange.

(2) Telnet — It was first com
The concept of ISP. come in introduce
- The main function of ISP provide an interpted to its customer
-

(3) INTERNET —



→ Network topology — is arrangement of nodes in a Computer Network. It is a graphical representation was a link.

~~type~~ —
BUS, star, Mesh, Ring, Hybrid
Tree,

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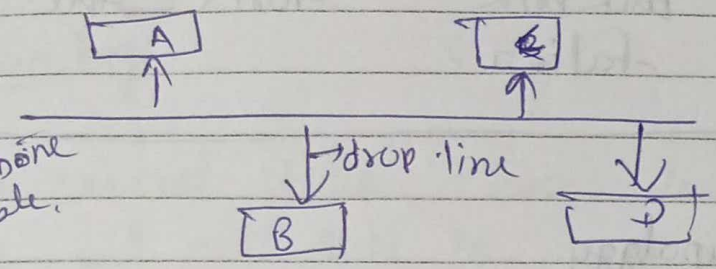
Bus topology –



a topology is design a search all the station are conected thrue a signal cable called backbone cable.

The contribution of bus topology IS very simple as compare to other topology

✱ advantages –

① nodes are connected to the backbone cable directly. so the intial cost of instalation is less
② Bus topology is familiour technology as instation and trouble shooting techiniqes are well none.
③ hardware components are easily avilable
④ A failer one node not affects other nodes

Disadvantage –

① A bus topology is required
② If two nodes sends a message time then the signal of the ~~cod~~ colide the each

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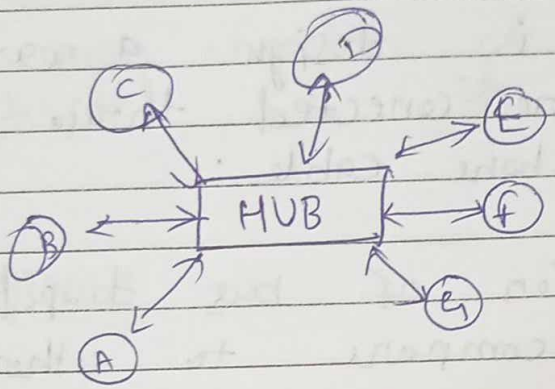
other
③ If the back bone force the entire network falier.

✱ Start toupology



start toupology in arrangement of a network in which all the station are two connect to a central

The central computer is known as server on the peripery devices are known as client

Advateges -

① trouble shooting is privide ~~as~~ erde
start an bus toupology all the Station are conected to centrilizer

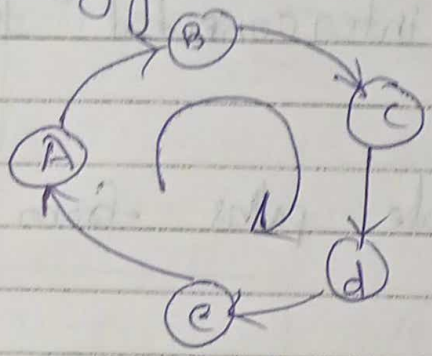
② has each station is connected to the hub, the failer in one cable will not effect the other.

③ It is easily expandble

Disadvantage

① if the central HUB Those down then all the nodes will not able to communicate with each other

* Ring taupology



Ring taupo. is lie to bus taupology but with connected end
the data flow one direction

advantages.

① as the data flow as one direction the chance of polysion is very low
② It is easy to identify single failure point
③

Disadvate

① It is more expensive then bus taupoly
② If one device fillers the entire network fills

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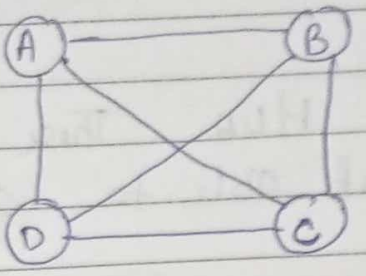
Mesh taupology —



high security

Mesh taupology is an arrangement in which the computer are interconected thru various connection

② There are multiple paths from one computer to another

③ It does not contain switches etc.
It is used for wireless network.

Advantages —

The mesh taupology network are very reliable as if any link next ~~out~~ down it will not affect the communition between the computer

communication is very fast betn the node.

adding new devices does not distraped the communeation between the devices.

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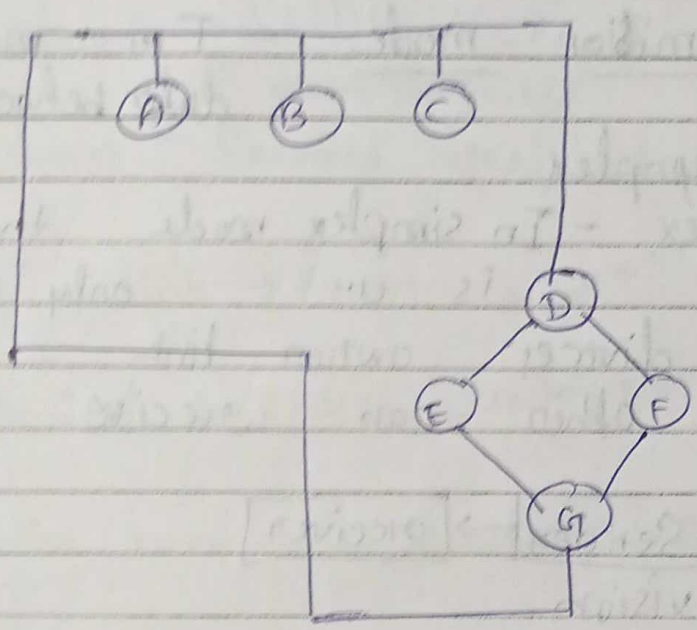
Disadvantages

① A mesh taupology contains large number of connected devices and hard it is very difficult to manage.
② difficult to truble shoot

Hybrid Taupology



Hybrid Taupology
It is a combination of ~~two~~ versious taupology.

ad
① If a fault occures ^ Part of the netwo it will not affect the desh top the network.
② The size of the network
③ very flexible.

disadvantages.
① Complex desige
② Costly

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Types of computer network -

① LAN ② MAN ③ VAN
highspeed ○ ○ ○

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Transmision mode - Tm · means tranfering date between devices.

~~cro~~ symplex
① Simplex - In simplex mode the communication is u.. only ~~of~~ one of the two divices owner link on other can recive.

[Sender] → [reciver]

Eg · television

② Half depclex - In Half each station can transimitte and recive but not at the same time then when one divices in reciving then other ony send vice - versa.

③ [D1] ⇄ [D2]

③ full duplex - In ⁝ both the station can transmidte and recive and transimite

Eg. telephone

Transmission media Imp

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why is there need of layer archatecture

(1) [Application layer]
↓
[Presentation]
↓
Session
↓
Segment — Transport — (UDP, TCP) Imp — unique Data protocol
↓
packets — Network — Rounting, logical address
↓
Data-link → framce ⇒ data on frame
↓
Physical ⟶ Bits

} PDU (protocal data unit) — Data

Imp difference

acknowledge ment
text - TCP
Send video - UDP

what is the need for archatocture

This techanique device unmanagement into timing and managable job it minimize complecity design layer archatacture has higher level of moduarity. It is easy to comprent and apply. It is easy to study and test changes in one layer does not implement on other level.

presentation layer {
- format
- incription
- De compertion

[TCPI]

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PDU Protocal Data Unit

CN Date - 1/9/22

Same work

Application	Application	Application	
Presentation			
Sesoor			
Transport	Transport	Transport	
Network	Internet	Internet	
Data-link	Data-link	Network access	
Physical	physical		
	TCP/IP	TCP/IP	

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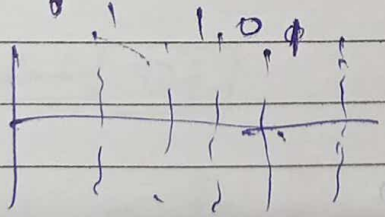
Bipolar

None fraction zero.

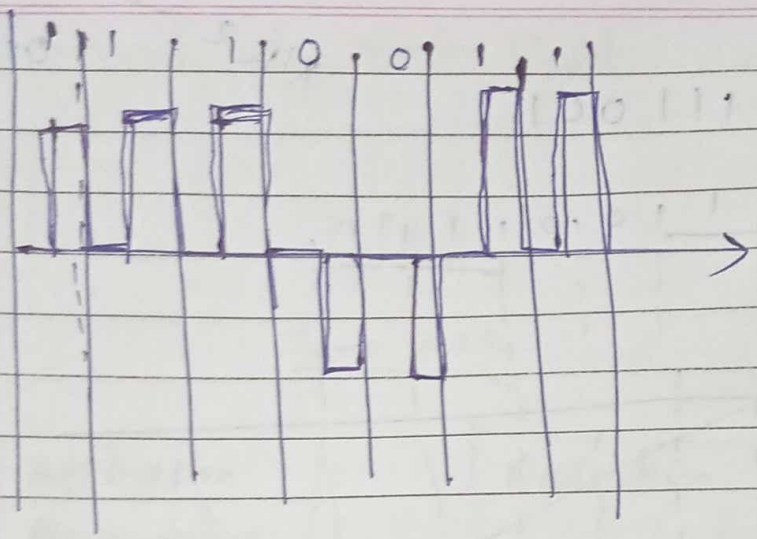
NRZ - L level

NRZ - I Inversion

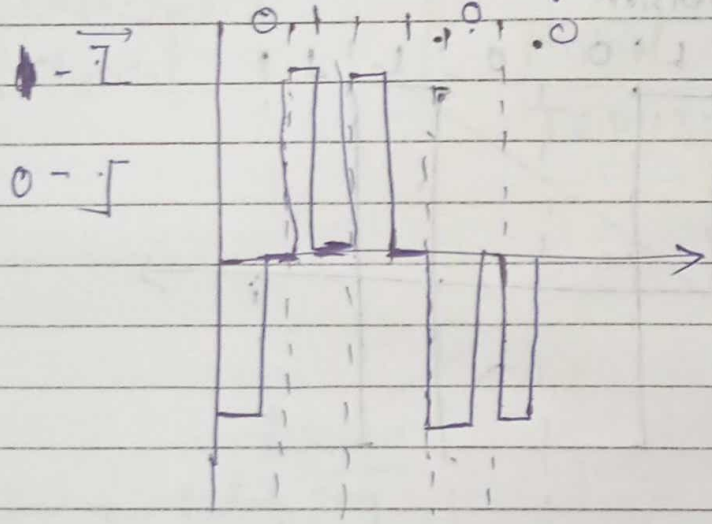
NZ



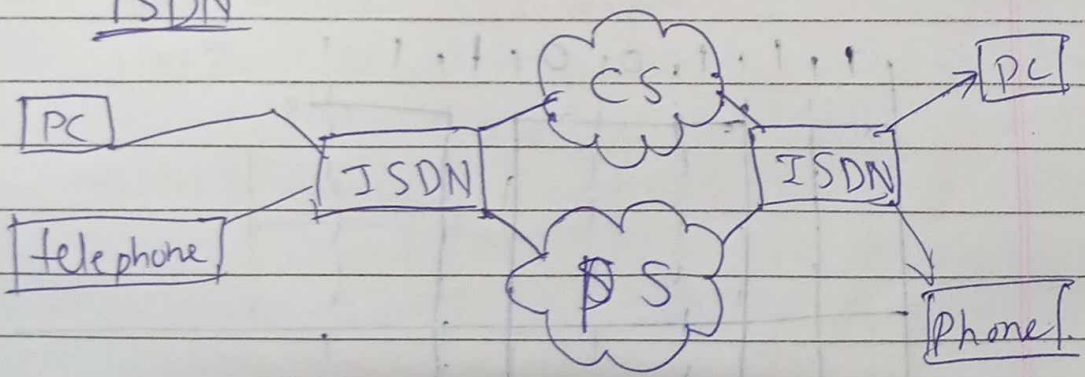
NRZ



Manchester Encoding



ISDN



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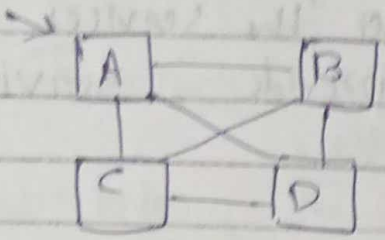
Imp

differ { Circuit Switching - CS
package switching - PC



ATM

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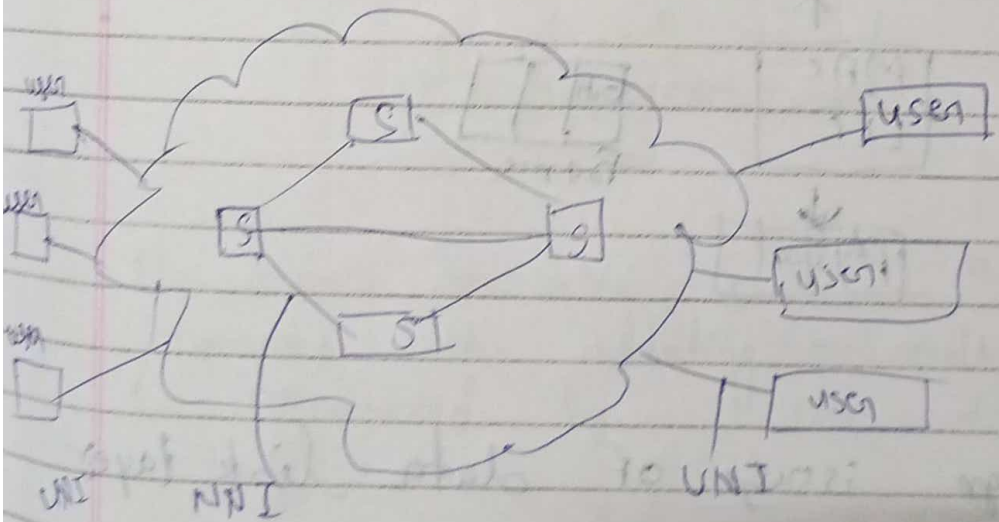
- Asynchronous transfer Mode.

AAL ↑ ATM ↑ physical — adaptation ATM Layer



Cells - 53 bits

5 bytes 48 bytes

Cells | H | | addon

Unit-2

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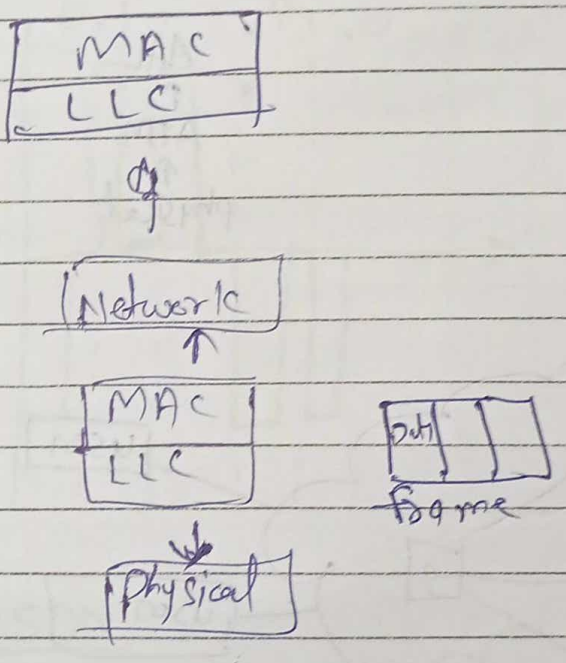
Data link layer - The data link layered is a hardware layer. Information It this layer is an from of frames. It takes the services from the physical layer an provide services to the network layer.

The data link layer is further devided into two sublayer.

1. MAC Media Access control
2. LLC logical link control



Imp Design issues of data link layer

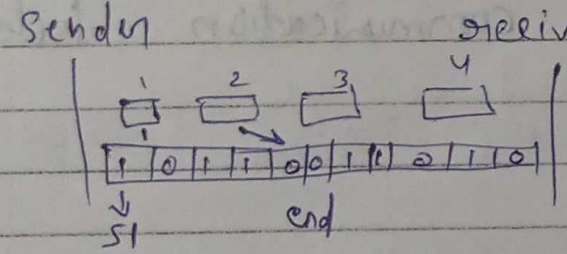
1. Data transfer
2. frame synchronization
3. Flow control

(4) error control
(5) link management.

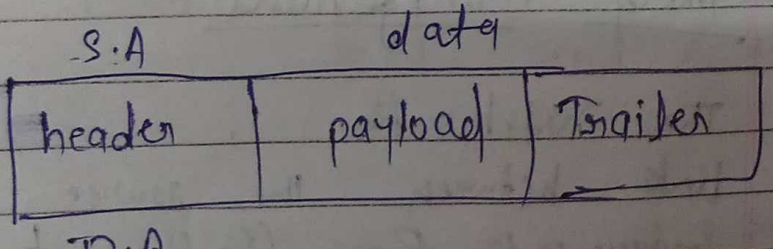
① Data Transfer — the data link layer provide a well define services to the network layer. The principle of the service is to transfer data from network layer on the source machine to the network layer on the destination machine.

There are Two Types of Tranfer —
① Connection less ② Connection oriented

② Frame syncronization —



the source machine sense a block of data for each frames the starting and ending of frames must be reconized by the destination machine



③ Flow control –

the source machine should not send a data frame at a fast rate as compare to the destination machine the reciving the data when the sender sends a data in a high speed the slow reciver will not be able to handle it and there will be a chance of loosing of frame.

④ Error control – The error made in bits during the transmission from source to destination machine must be detected and connected this layer and source error free comunication –

1. error detection techen
2. error communication tech

Addressing –

each frame comprises of ahead a which contain the destination and source address

⑤ linked management –

The initialization, terminations of a link between the source and destination is required for effective transmission of data

Character count

Stuffing

bit

Framming -

flag	header	011100	Trailer	Flag
01111/0				0111110

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Framing -

Framing in data link layer is a point to point connection between sender and receiver.

The data link layer receives packets from the network layer and converts it into frames.

small frames are more efficient for flow and error control.

Flage	Header	payload	Trailer	Flag

Header :- The source & destination address is placed in the header part of the frame.

payload - It contains the actual message that the sender wants to send to the destination.

Trailer - It comprises of error detection & error correction techniques.

Flag - It shows the beginning and ending of the frame.

Types of frames -

i) fixed size frames
ii) Variable size frames

i) fixed size frame - This frame has a fixed size and there is no need for defining the boundaries of the frame to mark beginning & end of the frame.
Eg. : ATM cells.

② Variable Size frame - In variable size frames we need a way to define the end of the frame & the beginning of the frame.

If the flag pattern occurs in the message To overcome This there are two ways -
Imp 1) Byte Bit Stuffing & Byte Stuffing

Byte stuffing - It is a process of adding extra bytes when there is a flag character in the text. ~~is a flag~~

Bit Stuffing - It is a process of adding extra bit when there is a flag character in the text.

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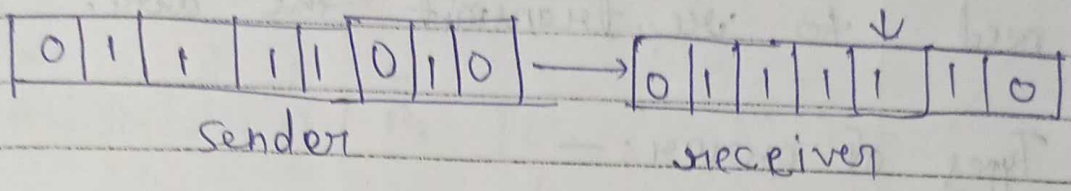
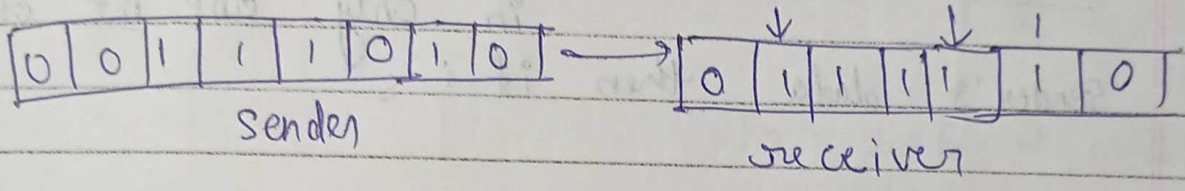
IMP

Types of Error :-
- Single bit error
- Multi-bit error
- Burst error

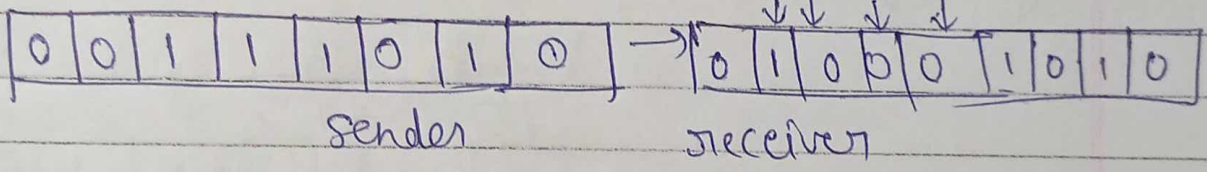
i) Single bit error -



2) Multi-bit error :-



3) Burst error -



Error detection

1) Parity check

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Hamming Code

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Data bit -
Parity bit

even - 0
odd - 1

$D_4 D_3 D_2 D_1$
1101

7	6	5	4	3	2	1
111	110	101	100	011	010	001

8	7	6	5	4	3	2	1
P_4	D_4	D_3	D_2	P_3	D_1	P_2	P_1
	1	1	0		1		

$P = 2^n$
$2^1 =$
2^2
$2^3 =$
$2^4 =$

right 1

$P_1 = 1\ 3\ 5\ 7 = 0$
$\times\ 1\ 0\ 1$

$P_2 = 2\ 3\ 6\ 7 = \boxed{1}$
$\times\ 1\ 1\ 1$

$P_3 = 4\ 5\ 6\ 7 = 0$
$\times\ 0\ 1\ 1$

~~flow control~~

8	7	6	5	4	3	2	1
P_4	1	1	0	0	1	1	0

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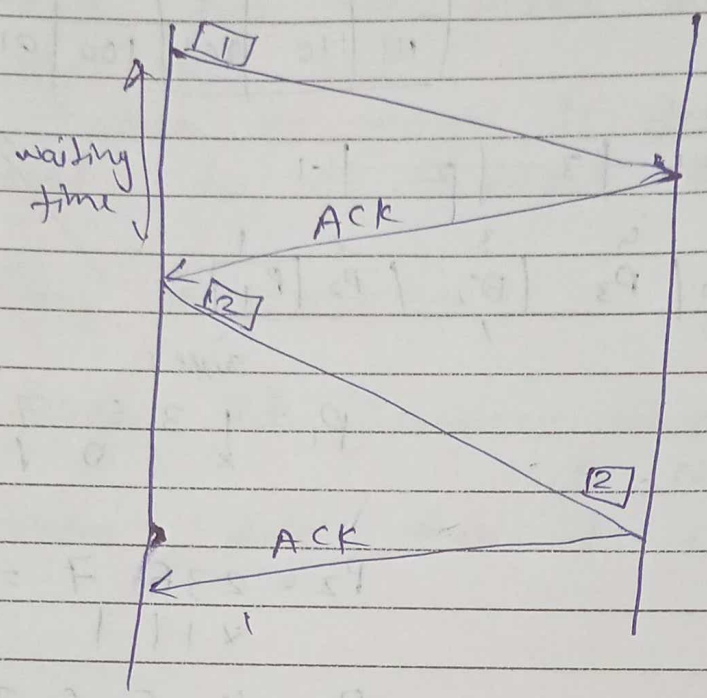
Flow control -



Stop & wait

① It is a set of producser that can the sendor How much data can be send

② the receiving device has limited speed and limited memory to store the data desf the receiving device must be able to inform the sending device, two stop the transmission temporary.

There are two methods for flow control -

① stop and wait

② sliding window

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① stop and wait - - In stop and wait method the sender which wait for an acknowlagement after each frame in sense.

② when acknowlagment has receive then only the next frame in send

advantages -

① This methode is simple as each frame is checked and acknowlegale before sending the next one.

disadvantages -

The sender has to wait for unlimited time if he does not receive an acknowlegement.

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~~SWP~~

Sliding - Sliding window method of flow control in which the sender can send several frames before getting an acknowlegement.

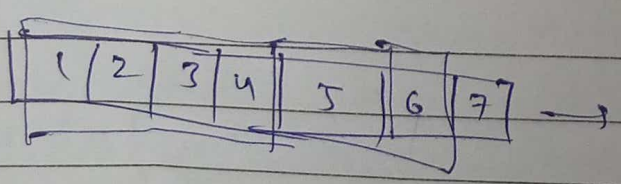
The frames can be acknowleged even if the window size is not completly field.

A single acknowleged for multipal frames There are imagnary boxes on both sendor and reciever

stop and wait ARQ - (Automatic Repeat Request) -

It is techanique is used to retrasmit the data in case of damage of lost frame. the sending device keeps the last transmitted frame untill the acknowlamed that reciever.

① Go Back N



If one frame is lost or damaged all the frame for which does not recieve the positive acknowlengement.

selective reject. -

It is more efficient then Go Back N.

In this techenique only those frame are retransmitted for which negative acknowlegement has recive.

The resiver store buffer to keep all the damaged frame on hold untill the frame in error his recieve the correctly.

HDLC

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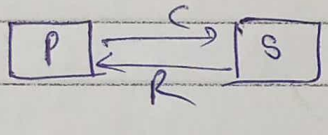
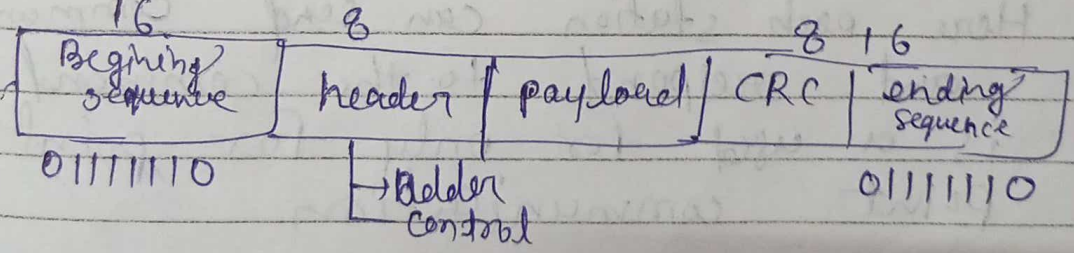
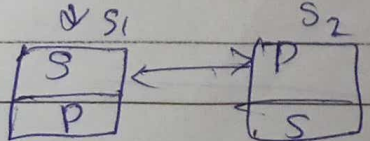


NRM



Control frame
I - 00
S - 01
U - 11

NRM
ABM



NRM

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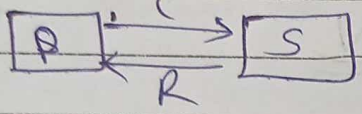
HDLC

(high level Data link control)

It is a group of communication protocal of data for transmitting data between network. It supports two type of transfor mode.

1. Normal responce Mode (NRM).
2. Asyncronous Bilance Mode (NBM)

① NRM — a primary station send command and secondary To the recive command. It is used in both point to point and point to multiplication.



point

Here each station can send commands and respond to the command with is a used for only for point to point communication

HDLC frome —

Beagining sequence	

Multiple access control protocal

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The beginning and ending sequence marks. It is of sixteen bits.

Ad header - header contain source and destination and control feild contains type of frame -

It is contain the excess data.

It contain error detection bits

* Type of HDLC frame -
1. Iframe - It carryes the information data from the network layer
2. S f - It is the super wisen frame used for flow control

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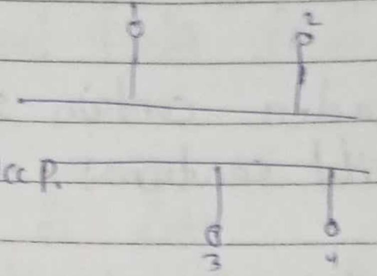
Calision कोई भी दो data आपस मे कोलाइड करें।
Calision high रहता है

Multiple access Protocal -



Random Acc P.
- Aloha
  - Pure
  - stalled
- CSMA/CD
- CSMA/CA

Imp CSMA Carier Sence Multiple Access

~~MA~~ Multiple

The data linke layer is suprated into two sublayer the upper layer is responsible for flow control and error control it is called logical link control layer.

The ~~Nodes~~ lower sublayer is responcible for Multiple access resulation that ~~the~~ i.e ~~called~~ called MAC (media access control)

The ~~media~~ ~~ac~~ MAC divided into 3 Protocals

1. Random access protocal
2. Control access protocal
3. chanelization protocal

Random access protocal - In Random access protocal all the system have equal proority. No any one system depend an control another system

No any onther

if more then one station attemps to transmit if more then one station attempt to transmit data there is chance of collision due to which the frams can be damage or lost. Random access protocal are further divided into. — ① aloha

Aloha — it is used from multiple access in ~~a de netwoork~~ access protocal which is used for random access in the n/w, it was disigned for wireless any user can transmit the data at any time aloha is divide into two type

Aloha is divided into two type -

① Pure
② slotted

① Pure - It is the simplest protocal whenever The station has a data it transmit the data frame continuously due to which there is a high chance of risk of collision it sends the data without checking the cannel is idle or not when any station transmit the frame it acknowlegement. If the ② stotted acknowledge is not recieved the station waits for a random time which is called back off time.

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slotted alloha was developed to improve efficiency of pure alloha the type is divide into slots the systed one frame at a time during slots if the system can not send frame of the
It is better then pure alloha because it has comparitavely less collision rate

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① CSMA / CA collision Avidence
② collision detection
③

CSMA (Carior sense Multiple Access)

It is based on media access protocal to sense the traffic on a chanel before transmitting the data.
If the channel is ideal the station can send the data. other wise it will wright for the channel to be Ideal
It reduces the chance of collision

CSMA / cd (carier sense multiple detection)

① It first sense the shared channel before sending the frame. If the channel is Idle It transmit the frame

② If the frame is sucessfully recive the station send the another frame.
If the collision is detective the station

sense a Jamps signal to terminat the data transmission.

The Algorithm of CSMS/DS when a forum is ready the transmitting station ck check whether the channel is either or vasy.

(1) if the channel a vesy the station wight untill the channel becoms either
(2) if the channel is ideal the station start transmitting and monitering the channel to detect the collision.
(3) If the collision is electected the station start the colleision resolution Algorithm.

* CSMA/CA (Carior Sense Multiple Action / Colision Avodensa)

It is a network protocal that works with mackayer when a data frame send to a channel It recive an aknowlegement wether the channel is wether or not It the station recive single acknowlegment It means the data frame is Sucessfuley transmitted if it recive two signal a collision a frame occure in the save channel

Algorithm of CSMA/CA

when A frame is ready the transmitting station checks whether the channel is besy or ideals

(1) If it does besy it waks untill the channel become ideal

HUB

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③ if the channel Is ~~Ideal~~ the frame weight for inter frame gape. and then sense the frame

④ After sending the frame It sets a timer

⑤ ~~It~~ The station weight for the acknowlegement ~~on~~ if It recive the acknowlegment ~~on the~~ before it expary of timer it is macked up succesfull transition.

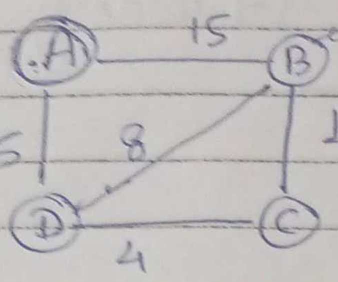
& topic likhana hai

Unit - 3

Date: 9/11/22

Distance Vector Routing

fluding



A

destination	distance	source
A	0	A
B	15	B
C	∞	–
D	5	D

B

A	15	A
B	0	B
C	1	C
D	8	D

C

A	∞	–
B	1	B
C	0	C
D	4	D

D

A	5	A
B	8	B
C	4	C
D	0	D

(A)

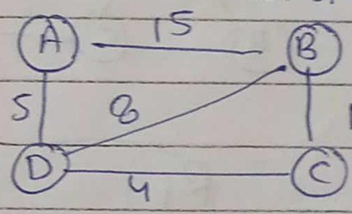
15	5
0	8
1	4
8	0
B	D

(A)

A	0	A
B	13	D
C	9	D
D	5	D

Link-State routing

Ex.



A / Packets

B	15
D	5

B

A	15
C	1
D	8

C

B	1
D	4

D

A	5
B	8
C	4

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link state Routing

(increase - bandwidth
(flooding - information)

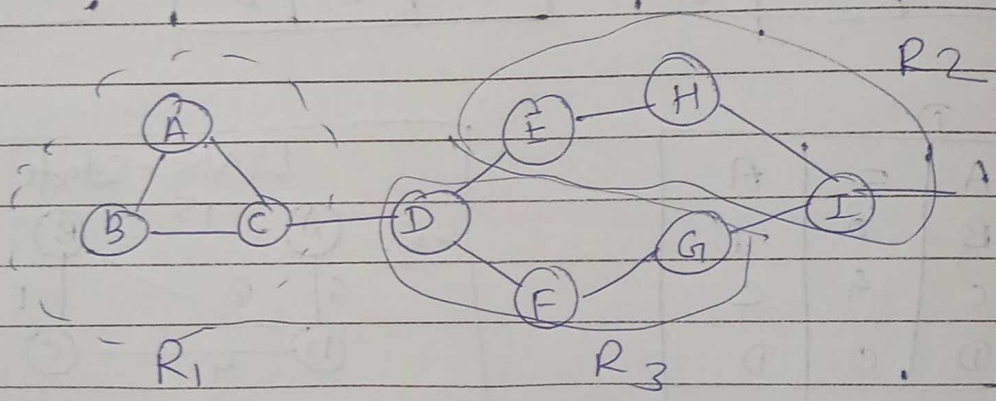
(A)

A	0	A
B	10	D, C
C	9	D,
D	5	D

CN

Date - 10/11/22

Routing

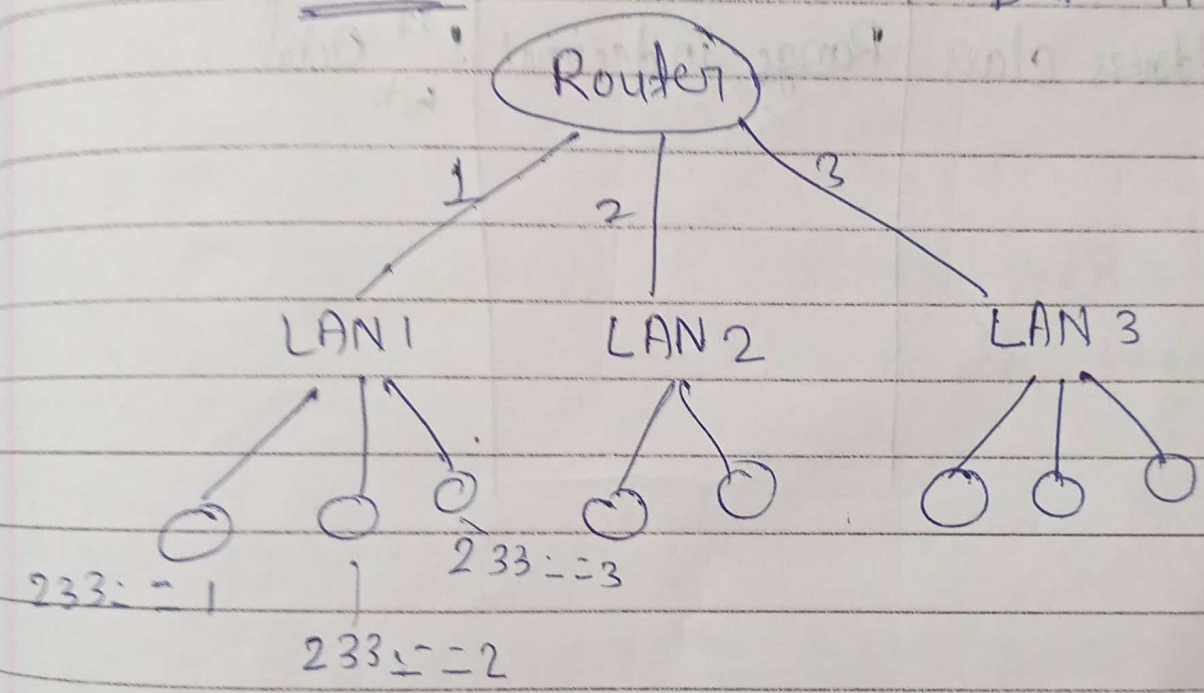


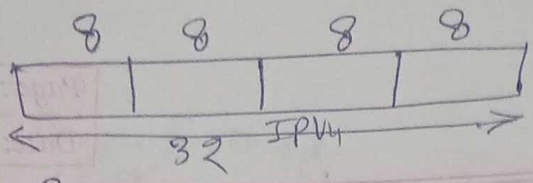
A

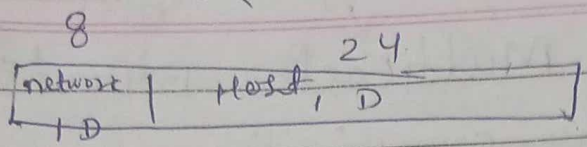
B	1	R_1
C	2	R_3
D	3	R_3
E	4	R_3

CN

Date - 11/11/22





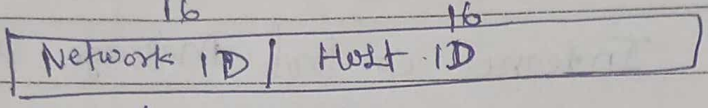


2^{8-1} 2^{24}

first bit

Class A = No. of Net ID = 128

00000000



2^{16} 2^{16}

Class - 10
Class - 11

* Classless

CN

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* classful addressing.

address class	Range in decimal	1st octet bits	N/w and host portion	No. of possible n/w & host.
A	0-127	0	N.H.H.H	2^7, $2^{24}-2$
B	128-191	10	N.N.H.H	2^{14}, $2^{16}-2$
C	192-223	110	N.N.N.H	2^{21}, 2^8-2
D	224-239	1110	multicast	
E	240-255	1111	Experimental	

	default mask
A	255.0.0.0
B	255.255.0.0
C	255.255.255.0
D	—
E	—

→ subnet.

Q. Identify the class, network IP address and direct broadcast address.

(i) 10.15.20.60.

Ans. Class class-A, network IP address - 10.0.0.0
direct broadcast. - 10.255.255.255.

Q. given IP address = 227.12.14.87, class, Network IP address and direct broad

Q. 193.14.56.22

Q. given IP address = 201.20.31.65, class find the subnet mask of the given IP

↓

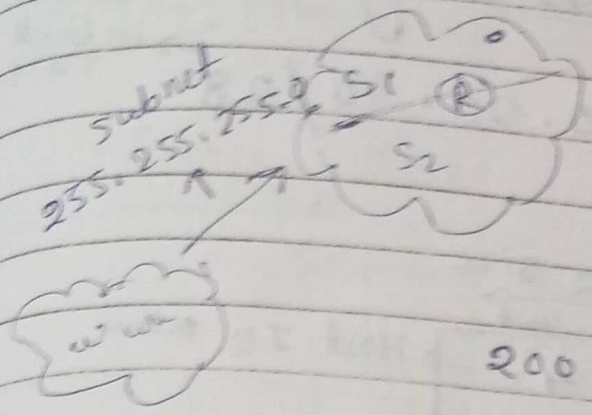
255.255.0.

Subnetting

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

Date 15/11/22

Sub - Extract
net - network



$S_1 = 255.255.255.128$

200.10.20.40

Network Id change nhi hoga

Class full

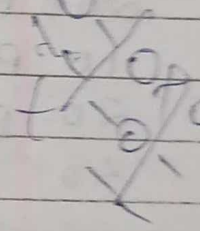
$2^1 = 2$
$2^2 = 4$
$2^3 = 8$

S1 — S_1 — 00000000 = 0
01111111 = 127

S2

10000000 = 128
11111111 = 255

1 — — — — — — — —
0 — — — — — — — —



1.0 — — — — — — —
0 — — — — — — —

$\frac{128}{15}$?

↓

Convert Binary & perform And op.

10000000 = 128
11111111
10000000

1.0 = 0
1.1 = 1
0.1 = 0
0.0 = 0

16+4 11110000

CN

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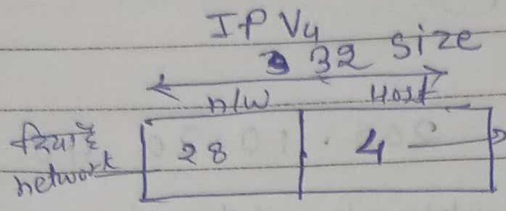
classless addressing

Q 200.10.20.40/28 → Network ID दिया होगा है

IP V4 → 32 size



11111111.11111111.11111111.11110000

Subnet mask value 255 . 255 . 255 . 240

40 → 0010 1000

Q.

11111111.11111111.11111111.00101000

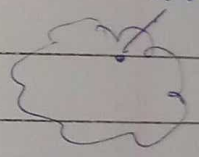
N/w Id

200 Binary Conversion. 11001000

10 Binary Conversion 00001010

20 Binary Conversion 00010100

40 ——— 11 ———



11001000 . 00001010 . 00010100 . 00101000

200 10 20

28 bit network ID change नहीं होगी

32

Unit - 4

Transport layer. Services

TCP - quality degrad

(Port address)

physical port address. → logical port address

TCP (Transmission control Protocal)

Source Port 16 bit	destination Port 16 bit
Sequence No. 32 bit	
Acknowledge No. 32 bit	
HLen 4bit / URG / ACK / PSH / RST / SYN / FIN	window size (16 bits)
check sum 16 bit	URgent powler 16 bit
option & Padding 40 bytes.	

PSH - 4 segement Size.
Hi

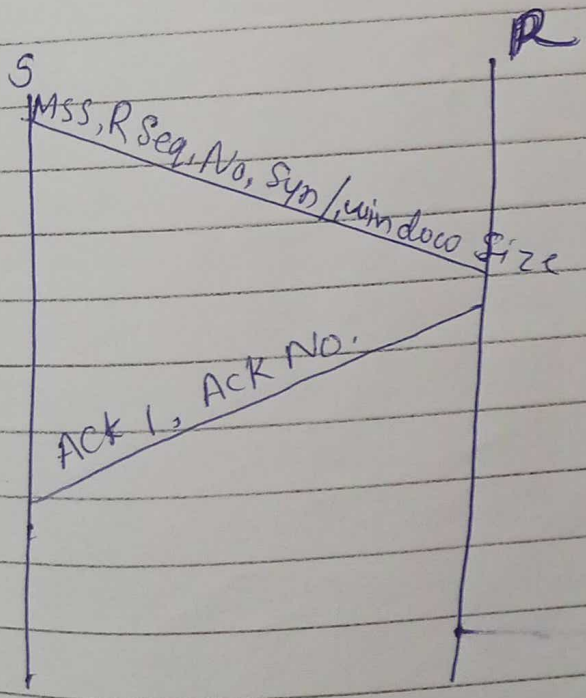
RST - Reset , SYN = FIN = finish

* Connection Stablish

MSS - max segment size

Rseqno - Random sequence No.

ACK - Acknowlegment.



TCP - connection Oriented, Full duplex, Pigi backing