L28: Go Back N ARQ Protocol in Data Communication Network | Sliding Window Protocols | DCN Lectures

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Sliding window Protocols:- In Go-Back-n ARQ, Several frames are sent before receiving acknowledg.

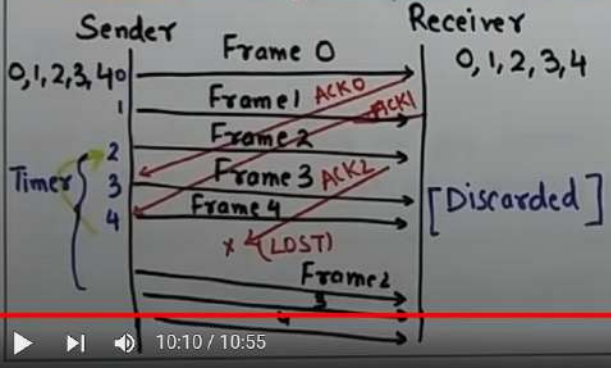
[GO-BACK-N ARQ]

IMP Points:- (N>1)

i) Sender window Size = N

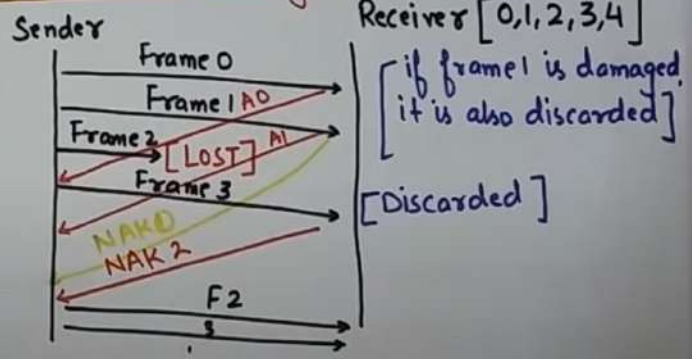
ii) Receiver window Size = 1

Normal operation of Go-Back-N:- ACK is LOST



In this method if one frame is lost/damaged, all frames sent since the last frame ACK are retransmitted.

Data Frame Lost/damaged:-



[IMP:- STOP and WAIT is a special Case of Go-Back-N ARQ where size of send window is 1.]

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L26: Introduction of Flow Control in Data Link Layer | Automatic Review Request(ARQ) | DCN Lectures

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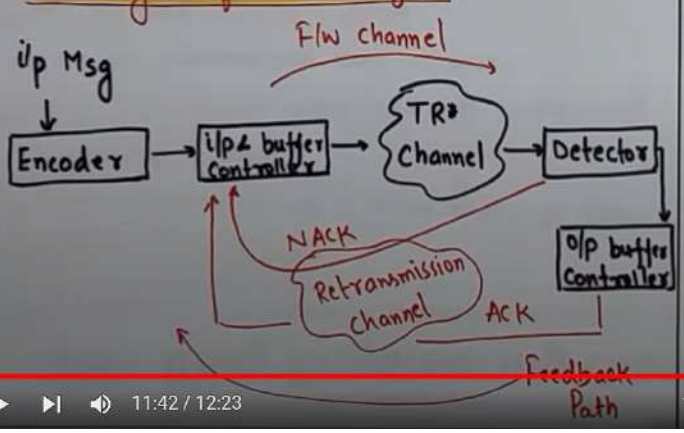
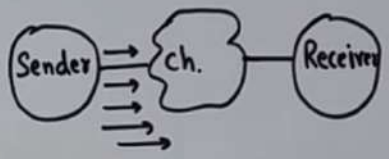
Automatic Review Request (ARQ) Techniques:- In ARQ System of error control, when an error is detected, a request is made for the retransmission of that signal.

↳ Feedback channel is required.

Block Diagram of basic ARQ System:-



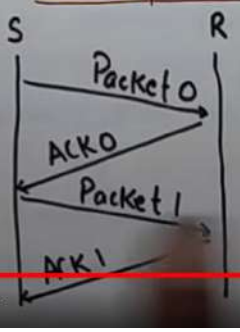
Types of ARQ System:-



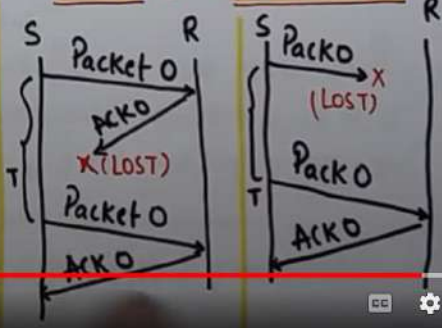
i) Stop and wait ARQ
ii) Go back n ARQ
iii) Selective Repeat ARQ

Flow Control:- It is a set of procedures which are used for restricting the amount of data a transmitter can send before waiting for acknowledgment.

Normal operation



Timeout & Retransmission



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L29: Selective Repeat ARQ | Difference between Go Back N and Selective Repeat ARQ | Computer Network

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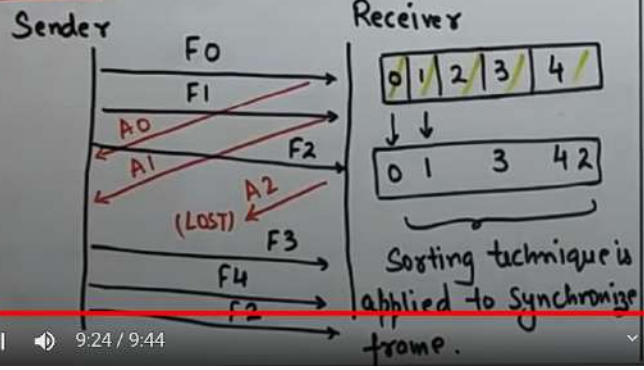
Selective Repeat ARQ:- In this method, only the specific damaged or lost frame is retransmitted.

IMP Point:-

i) Sender window size = Receiver window size > 1

Operation:-



Sorting technique is applied to Synchronise frame.

Difference b/w Go-Back-N and Selective Repeat

Go-Back-N	Selective Repeat
i) Retransmits 'N' no. of frames in case of any error.	i) Retransmits only those frames that have problem.
ii) If Error-rate is ↑, it wastes lot of Bandwidth.	ii) Less wastage of Bandwidth.
iii) Less Complicated.	iii) More Complex (Storage, Sorting)
iv) Sorting is not Req.	iv) Required.
v) Most often used.	v) Less used due to ↑ Complexity.

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(Data Communication and Networking)(CSMA/CD-2)

L34: Carrier Sense Multiple Access(CSMA) Introduction | Persistence Method | DCN Lectures in Hindi

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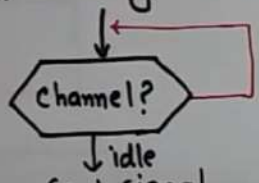
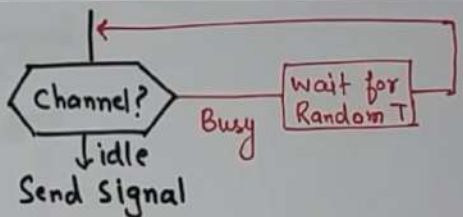
Persistence Methods in CSMA:-

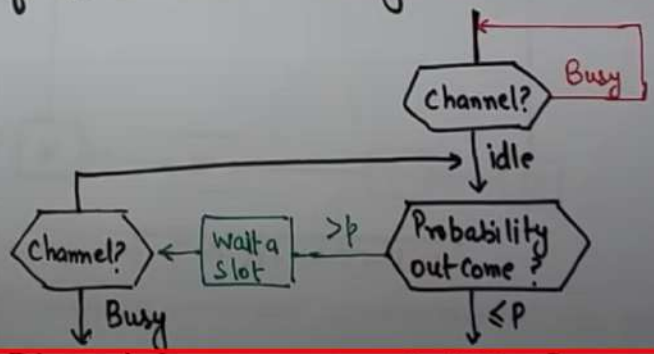
(i) 1-Persistent Method:- if the station finds the line idle, it sends frame immediately (with probability 1).



(ii) Non-Persistent Method:- if the line is idle, Station sends the frame immediately. if the line is not idle, it waits for a random amount of time and then senses the line again.



(iii) p-Persistent Method:- It combines the advantages of the other two strategies.



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Data Communication and Networking

Switching → Process of fwdg. Packets coming from one port to another port.

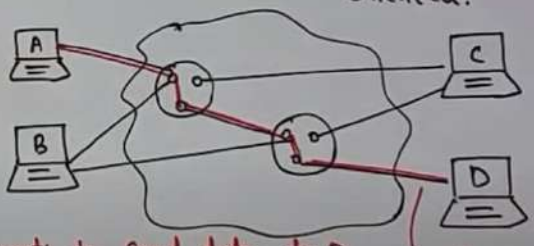
Switching Methods

Switching Sends data along different routes.

Switching → Connectionless
→ Connection-Oriented.

(i) CIRCUIT SWITCHING:- It is a transmission mode that involves setting up a dedicated end to end Conn^{n}.

- ↳ Commonly used in Telephone Systems.
- ↳ Connection Oriented.
- ↳ No delay in data flow
- ↳ Link of the Conn^{n} Can't be used to send any other data even when free.
- ↳ More bandwidth is required.
- ↳ Conn^{n} establish time is more.



A wants to Send data to D.

→ Route for A→D.

Three Phases:-

↳ i) Circuit establishment
ii) Data Transfer
iii) Circuit disconnection.

2

Data Communication and Networking

Switching Methods:

(ii) MESSAGE SWITCHING :- There is no dedicated path b/w two Communicating devices.

↳ Each Msg is treated as an independent unit and includes its own destination and Source addr.

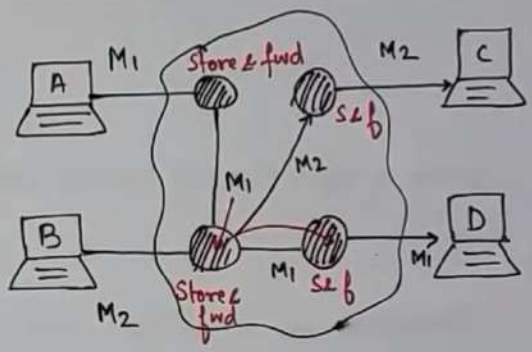
→ Also called as Store and Forward N/w. →

→ Efficient traffic management.

→ Reduces N/w traffic congestion.

→ Some delay due to storing and forwarding.

→ Large storing Capacity is required.



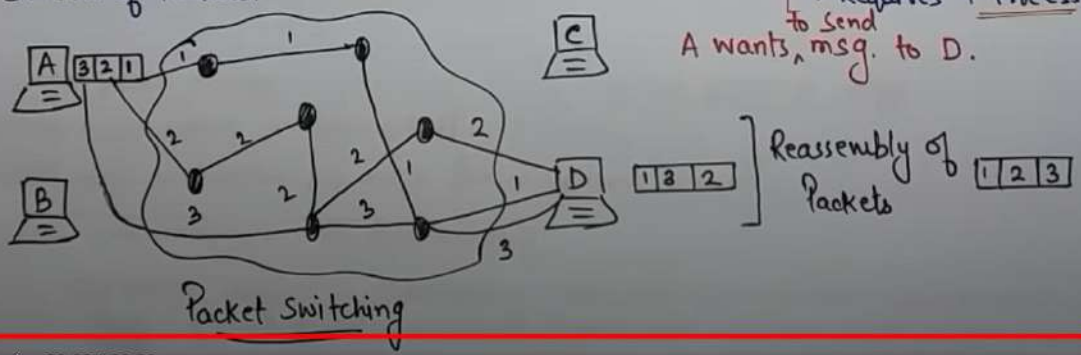
Data Communication and Networking

Switching Method:

(iii) PACKET SWITCHING:- In this Messages are broken up into packets.
↳ Individual Packets take different routes to reach the destination.
↳ Advantages:- (i) Required Bandwidth ↓
(ii) In link failure diff. route can be chosen for remg. packets.

Datagram Packet Switching:- Message is divided into Stream of Packets.

Virtual Circuit Packet Switching:-
Logical connection is establish b/w the sending and receiving devices.
↳ All the packets travel through the logical conn" → Virtual Circuit.
→ ↑ the bandwidth
→ ↓ transmission delay
→ Large amount of RAM is required.
→ Requires ↑ Processing Power.



L20: Introduction to Data Link Layer | Error Detection, Correction | Parity Checking with examples

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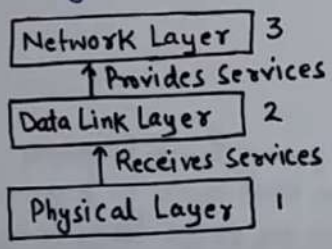
Data Link layer:- It is the second layer. This layer receives services from physical layer and provides Services to the N/W Layer.

Data Link layer Position:-



Functions of Data Link Layer:-

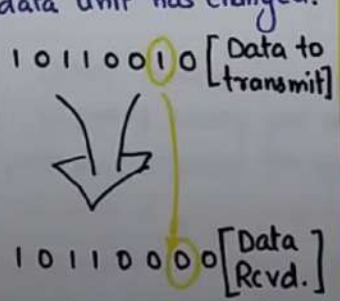
i) Provides Services to N/W Layer.
ii) Frame Synchronization.
iii) Flow Control.
iv) Error Control. IMP.
v) Addressing.
vi) Link Management.

Error Detection and Correction:- Noise can introduce the error in the binary bits. It means '0' may change to '1' or '1' may change to '0'.

Types of Errors

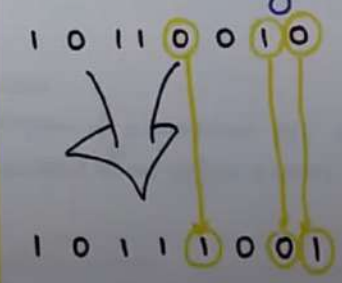
Single-Bit Error

In this only 1-bit in the data unit has changed.



Burst Error

In this 2 or more bits in the data units changes.



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Error Detection Methods:-

(i) **Parity checking:-** In this an extra bit (Parity bit) is added to each word before transmitting.

↳ Even Parity :- No. of 1's in given word including Parity should be even.

↳ Odd Parity :- No. of 1's in the given word including parity should be odd.

Data = 1 0 0 1 0 1 1 → [P | Data]

Even parity

P = 0, 0 | 1 0 0 1 0 1 1

0 0 0 0 1 0 1 1 → Error

Receiver:- No Error.

ODD Parity

P = 1

1 | 1 0 0 1 0 1 1

1 | 1 1 0 1 0 1 1 → Error.

Limitation of Parity checking:-

↳ (i) NOT Suitable for detection of multiple errors.

(ii) Cannot reveal the location of erroneous bit. It Cannot correct the error.

Even Parity:-

0 | 1 0 0 1 0 1 1 {No. of 1's = 4 = Even}

2-bit changes

0 | 0 1 0 1 0 1 1 {No. of 1's = 4 = Even}

L25: Hamming Code for Error Detection and Correction with Example | Data Communication Network

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Hamming Codes:- They are Linear Block Codes. (n, K) Hamming codes for $m \geq 3$ is defined by the following equations:

i) Block Length, $n = 2^m - 1$

ii) No. of message bits : $K = 2^m - m - 1$

iii) No. of Parity bits : $(n-K) = m$

iv) Minimum distance, $d_{min} = 3$

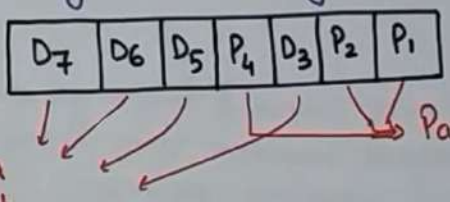
v) Efficiency $= \frac{K}{n} = \frac{2^m - m - 1}{2^m - 1}$

$$= \boxed{1 - \frac{m}{2^m - 1}}$$

Hamming Code Structure:- Error Correcting Code.

→ Parity bits are inserted in b/w data bits.

→ Commonly 7-bits Hamming code is used.



Selection of Parity Bits:-

i) $P_1 \rightarrow 1, 3, 5, 7$

ii) $P_2 \rightarrow 2, 3, 6, 7$

iii) $P_4 \rightarrow 4, 5, 6, 7$

} Adjusted to '0' or '1' depending on the condition.

8:19 / 17:53

L25: Hamming Code for Error Detection and Correction with Example | Data Communication Network

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Hamming Code - Example:-

Ques1) A bit word 1011 is to be transmitted. Construct even parity 7-bit Hamming code.

D_7	D_6	D_5	P_4	D_3	P_2	P_1
1	0	1		1		

P_1

Calculate P_1 :- checks bits 1,3,5,7.

$[P_1, 111] = P_1 = 1$

P_2 :- 2,3,6,7 $[P_2, 101] = P_2 = 0$

P_4 :- 4,5,6,7 $[P_4, 101] = P_4 = 0$

1	0	1	0	1	0	1

ANS..

Detection and Correction of Errors:- At the receiver, decoded data is checked for the following groups. (1,3,5,7), (2,3,6,7) and (4,5,6,7) and if all group Contains even-parity, then there is no error.

Example:- Codeword Received = 1011011, Assume even parity, State whether received codeword is Correct or wrong. If wrong, locate the bit in error.

1	0	1	1	0	1	1
D_7	D_6	D_5	P_4	D_3	P_2	P_1

[Error in the 5th bit of Code]

G_1:- (1011) → odd no. of 1's.

G_2:- (1001) → Even

G_3:- (1101) → odd.

Error word = | P_4 | P_2 | P_1 |

E = | 1 | 0 | 1 |

E = (5)

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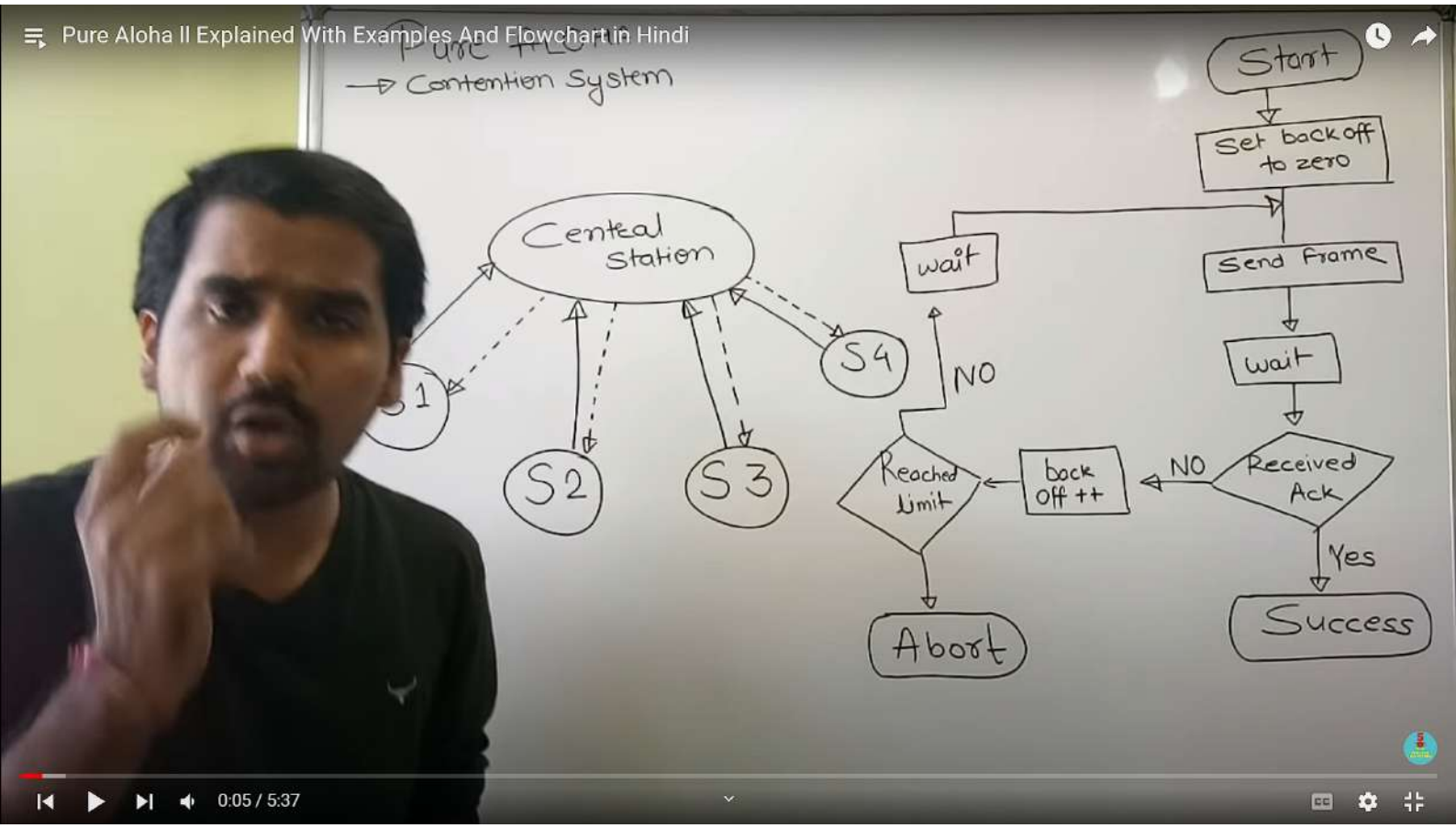
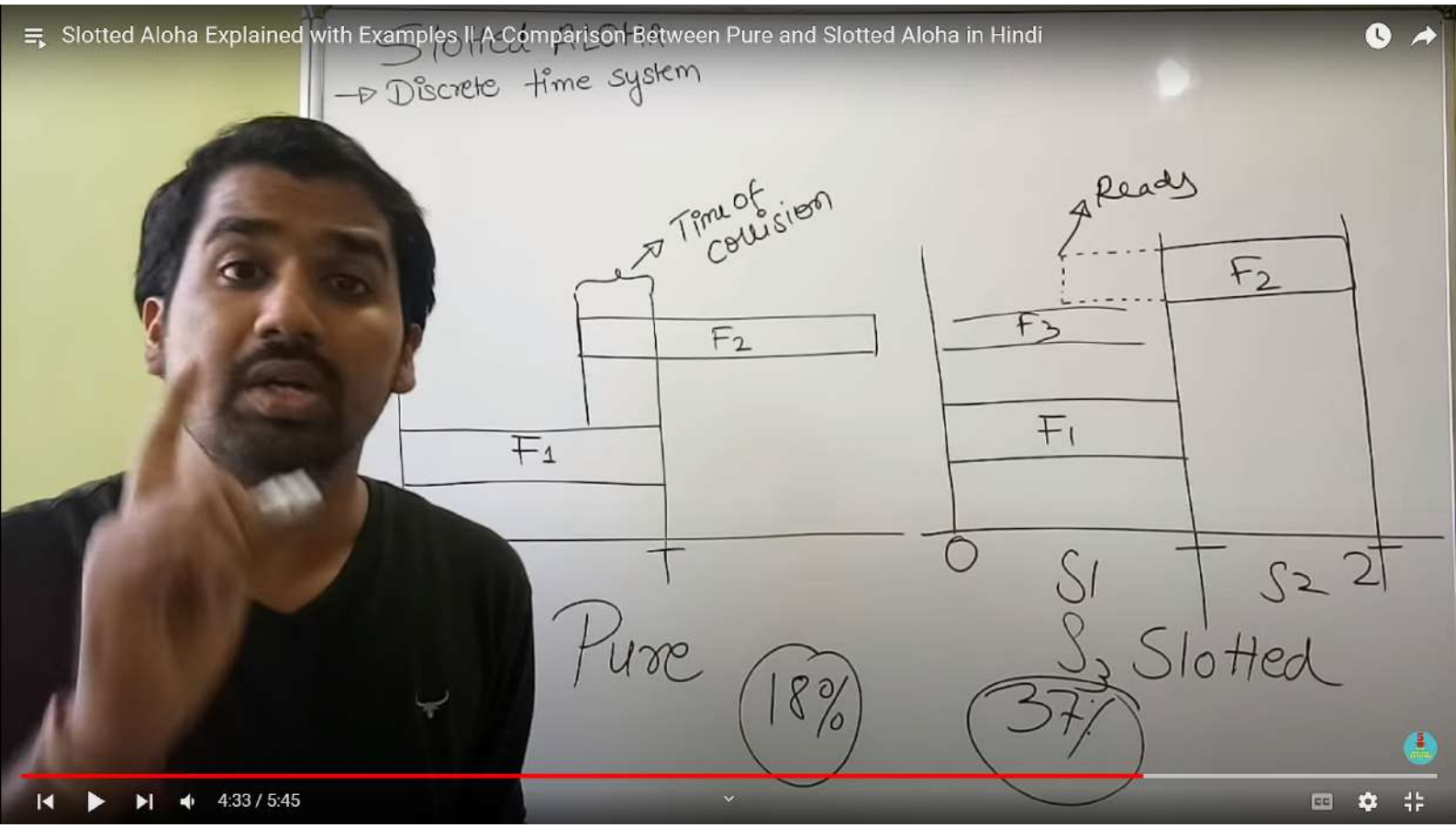

Pure Aloha II Explained With Examples And Flowchart in Hindi
Contention System
Centeal Station
S1
S2
S3
S4
Start
Set backoff to zero
Send Frame
wait
Received Ack
NO
back Off ++
Reached limit
NO
wait
Yes
Success
Abort
0:05 / 5:37


Slotted Aloha Explained with Examples || A Comparison Between Pure and Slotted Aloha in Hindi
Discrete time system
Time of collision
Ready
F1
F2
F3
Pure
18%
Slotted
37%
0
S1
S2
2T
4:33 / 5:45

L35: Carrier Sense Multiple Access with Collision Detection(CSMA/CD) | Computer Network Lectures

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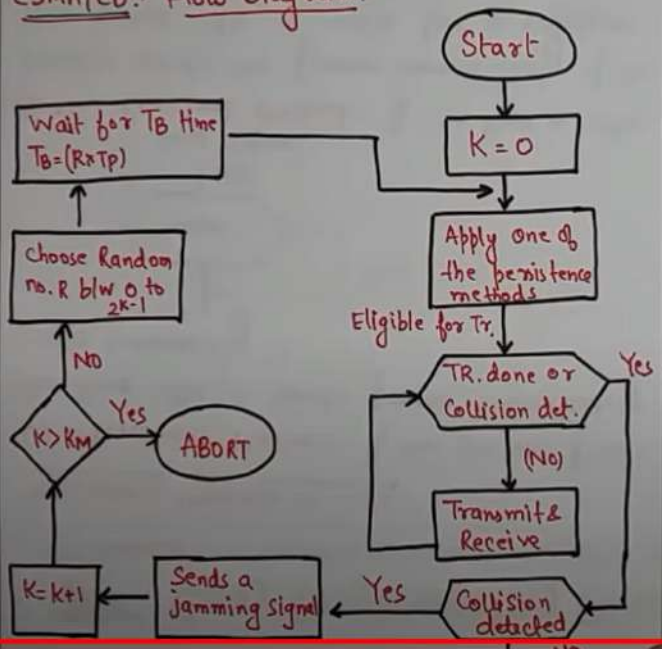
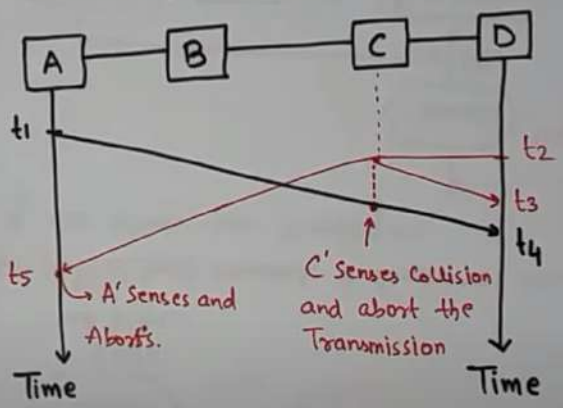
CSMA/CD:- Flow Diagram:-



Collision of first bit in CSMA/CD:-

K = no. of attempts



Theory:- In this a station monitors the medium after it sends the frame to see if the Tr. was Successfull. If so, the station is finished work, else if there is a collision, the frame is sent again.

11:12 / 11:33