Networking

5- point

* Idea ⇒ Reality
  - Drive
  - tenacity
  - persistence

Multiple Access Protocol
- Random Access protocol
- controlled Access prot.
- Channelization Protocol

* The Data link layer is responsible for transmission of Data between two nodes.

Func^{n}:- • Data link control • Multiple Access contn.

* **Data link** - The Data link control is responsible for reliable trasmissio of message over transmission channel by using techniques like framing, error control and flow control. For Data link control refer to Stop and Wait ARQ. (Back)

* **Multiple Access control** - If there is a dedicated link b/w the sender and the receiver then Data link control layer is sufficient, however if there is not dedicated link present then multiple Stations can access the channel simultaneously. Hence Multiple Access protocol required to decrease collision and avoid cross talk.

Ex:- If Teacher asked a question & all student (Stud Started Answering Simultaneously so then Data (Answ is overlapped and collision occured. So, Teacher control the students to 'Answer one at a time'

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Random Access protocol :-

↳ ALOHA ↳ CSMA ↳ CSMA/CD ↳ CSMA/CA

⇒ In Random Access :- All Stations have same Superiority that is no station has more priority than another Station. Any station can send data depending on medium's state (idle or Busy).

ure:- (1) There is no fixed time for sending Data.
(2) There is no fixed sequence of stations sending data.

> ALOHA :- Desined for Wireless LAN, But also applicable for shared medium. In this, Multiple Stations can transmit data at the same time and can hence lead to collision and data being garbled.

> Pure ALOHA :- When a station sends data it waits for an acknowledgement. If Acknowledgement doesn't come within the Allotted time then the station waits for a Random amount of time called back-off time (Tb) and re-sends the Data.
Since, different Stations wait for different ~~sta~~ amount of time, the probability of further collision decreases.

Pure ALOHA

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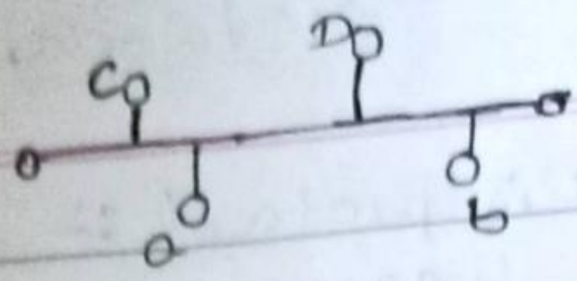
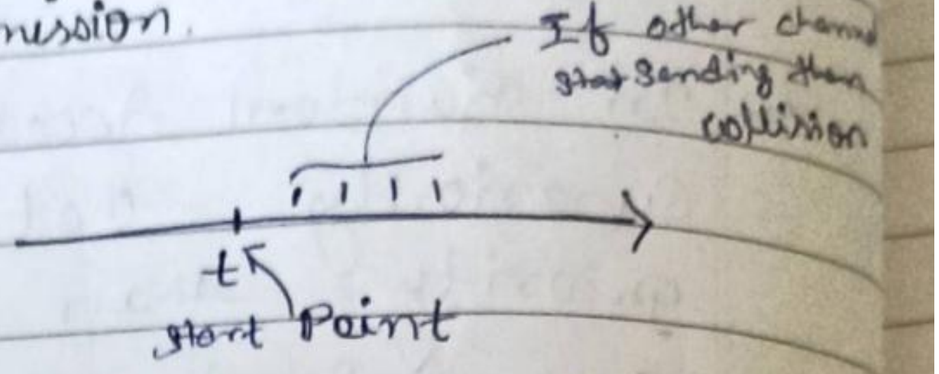


Features:-

→ Random Access prot.
→ Ack. is there
→ LAN Based / Any time transmission
→ only transmission time, No propagation time



→ Vulnerable time ? (V_t)
→ Efficiency η = ?

$e = e^{-1}$

Efficiency $\eta = G \times e^{-2G}$

$$\frac{d\eta}{dG} = G \times e^{-2G}(-2) + e^{-2G}(1) = 0$$

$$= e^{-2G}(-2G+1) = 0$$

$$= -2G + 1 = 0$$

Max Eff. $G = 1/2$

G:- No. of station looking for particular T_t

Note

If 2 station available & 1 (one) is only transmitting message. So efficiency 'High'

Example:- TT: Assumed some tot. All

$$TT = \frac{M}{B.W} = \frac{100 \text{ bits}}{100 \text{ bps}} \times 10^{-3} =$$

$$= 10 \text{ msec}$$

Vulnerable time = $2 \times T_t$

TT/Tt :- Transmission Time

M = message size
B.W = Bandwidth

$V_t = 2 \times 10 \text{ ms} = 20 \text{ ms}$.

Note: If 'Vt' time is given and in that time other channel should not send the message in past and also after trasmission of station A. Then collision will not occur.

Max efficiency $\eta = \frac{1}{2} \times e^{-2 \times \frac{1}{2}} = \frac{1}{2} \times e^{-1}$

$= 0.184 = 18.4\%$ for $G = 0.5$

Slotted ALOHA

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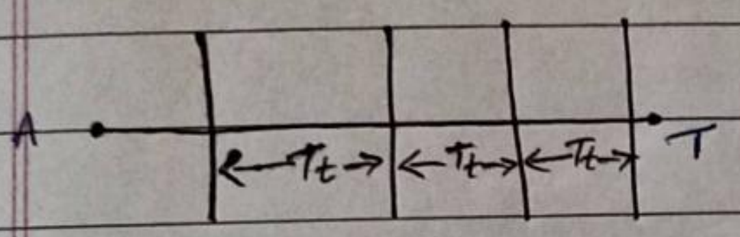
⇒ It similar to pure aloha, except that we divide time into 'slots' and sending of data is allowed only at the beginning of these slots.

If a station misses out the allowed time, it must wait for the next 'slot'. This reduces the probability of collisio

Note:- Max-throughput/efficiency $= 0.368 = 36.8\%$ for $(G=1)$

(11) $VT = Tt$



* It divided

Note
Tt is Fixed for All

Rule:- In this topic Any station can start sending message 'at beginning', Not after begin. or (In mid). But If No. of stations started at beginning then collision occured.

$\frac{dn}{dG} = A \times e^{-G}(-1) + e^{-G}(1) = 0$

$= e^{-G}(-G+1) = 0$

$= -G + 1 = 0$

$= G = 1$

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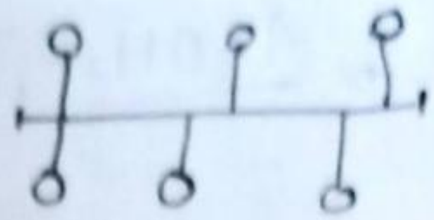
CSMA



Path : channel

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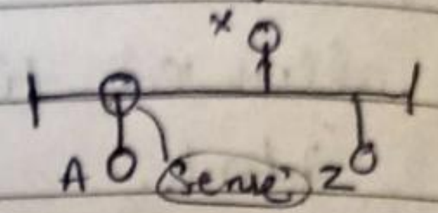
⑥ Carrier - Sensor Multiple Access (CSMA)

[1-persistent 0-persistent P-persistent.]

→ It (M) sense only own path and point.

ex:-



* 1- persistent :- It sense continiosly that path & point is idle or Not. And if idle then immediately ~~send~~ start sending message.

* 0- persistent :- It also sense the channel if it get busy than it fix a timer, & so To wait till that. Some time it can be in wait state for too long period.

* P- persistent :- (Hybrid) Same working as a 1- persistent, But if channel is free then it 'P' value & follow them to start transmitting message.

* Wifi = follow the P- Persistent concept.

* Key Points *

1. Persistent :- दृढ / निष्ठा
2. Carrier :- वाहक
3. Vulnerable :- असुरक्षित / क्षेत्र
4. Propagation :- प्रसारण / प्रचार
5. efficiency :- क्षमता
6. Superiority :- श्रेष्ठता / प्रधानता
7. garbled :- विकृत
8. Acknowled. :- स्वीकृति / प्राप्ति सूचना

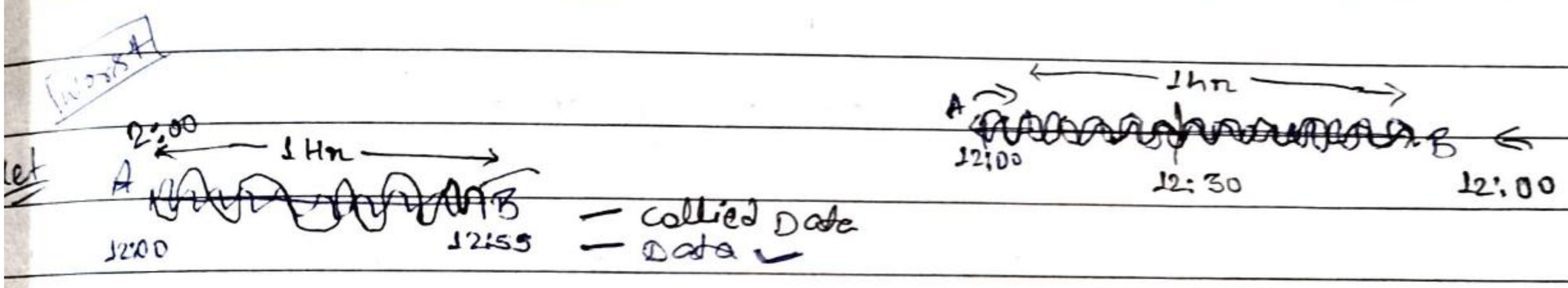
CSMA/CD (Wire medium)

* Carrier Sensor Multiple Access / Collision Detection

↳ Three Energy level :-

① E

* No Ack. is There ⊗



* In above fig. A is Started trasmission at 12:00. but 'B' started at 12:59 before getting A's Data. do, this is "Worst case" for A because A got collied Data at 2:00 and if A is transmitting Data at 2:00 than get that their Data collided but 'A' is idle then they will not understood

IMP. $TT \geq 2 * PD$

$L \geq 2 * PD * BW$

TT: Transmission Time
PD: Propagation Delay
L: Length of the message.
BW: Banth Width

$TT = \frac{L}{B}$

* efficiency $\eta = \frac{1}{1 + 6.44a}$

$a = \frac{PD}{TT}$

CSMA/CD

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* → It used in Ethernet/LAN Technology.
  * Bus Topology.
  * Not used in Star Topo. or point to po

Efficiency conclusion:-

1. If distance ↑ increases, the efficiency of CSMA Decreases ↓
2. It CSMA is not suitable for long-distance N/w like WAN.
3. If Length of packet is bigger, the efficiency of CSMA also 'increase'
   But Max limit for L. is 1500 Bytes.

CSMA CA

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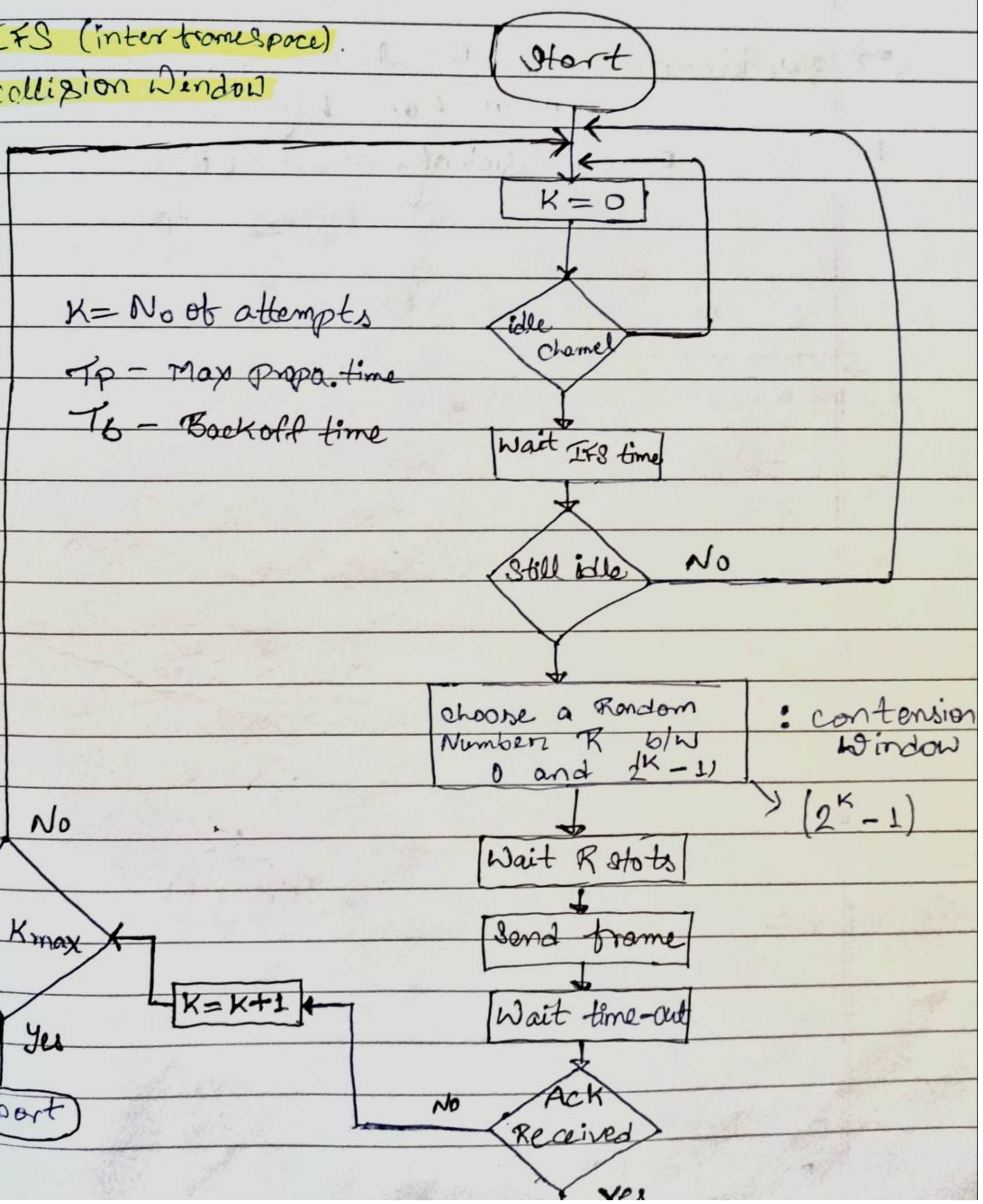
⇒ It used in 'wireless'.

- In wireless N/w, much of the sent energy is lost in transmission. The received signal has very little energy. Therefore, A collision may add up 5 to 10% additional energy. This is not effective collision Detection.

* IFS (interframespace)
* collision Window



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⇒ Advantages of CDMA/CA :-

- CMSA/CA prevents collision.
- Due to acknowledgements, Data is not lost Unnecessarily.
- It avoids wasteful transmission.
- It is very much suited for wireless transmissions

⇒ Disadvantage :
- The Algo. calls for long wait.
- It has high consumption.
- Less efficiency than CDMA/CD.