Q1 Frame size = 11

Go back n protocol : In go back n protocol all the 11 frames would be discarded. * show the scenario & give reason

Selective repeat : In selective repeat only the 1st frame would be discarded. Thus only 1 frame.

* show the scenario & give reason

(2) PPP vs. HDLC

(a) PPP - byte stuffing
HDLC - bit stuffing

(b) PPP - Frame format has field for protocol
HDLC - Does not contain protocol field

(c) Checksum field larger in PPP.

or

(b) PPP has Link Control Protocol (LCP)

(c) PPP has Network Control Protocol (NCP)

Xiaoming Ru

Jacob Thompson

(3)

Given. $C = 1G$ bps.

$\frac{1}{M} = 20,000$ bit.

$L = 10000$ frame/sec

$$T_{delay} = \frac{1}{MC - L} = \frac{1}{\frac{1,000,000,000}{20000} - 10000}$$

$$= \frac{1}{50,000 - 10000} = \boxed{0.000025 \text{ sec}}$$

$$T_{TPM} = n T_{delay} = 10 \times 0.000025 \text{ sec}$$

$$= 0.00025 \text{ sec}$$

(4) Carrier sense: Protocols in which stations listen for a carrier (i.e. a transmission) and act accordingly are called "carrier sense Protocols".

There are 2 types of CSMA protocols:

Persistent CSMA &

Nonpersistent CSMA

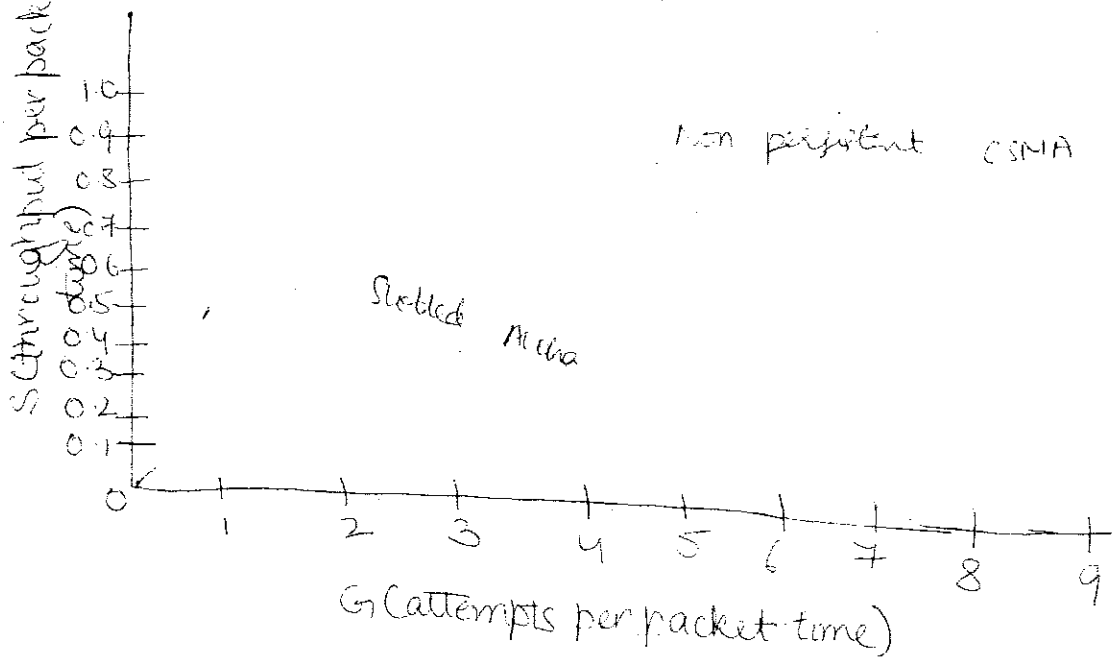
Nonpersistent CSMA: This protocol is less greedy compared to the 1 persistent CSMA. If the channel is already in use, the station does not continually sense it for the purpose of seizing it immediately upon detecting the end of previous transmission. Instead, it waits a random period of time and then starts transmitting.

Slotted Aloha: Here, time is divided into discrete intervals so that everyone agrees on intervals boundaries. A special station emits a signal to denote the start of an interval. Using slots halves the vulnerable period compared to the Pure Aloha

and hence the throughput per frame time now becomes

$$S = G_1 e^{-G_1}$$

Maximizing S w.r.t. G_1 gives $S = 1/e$ or about 0.37, twice pure ALOHA.



5//

a RTS request-to-send

(signal for the MACAW, Multiple Access with Collision Avoidance for Wireless)

If station A wants to send to station B, it first sends a RTS with the frame length it will send.

All machines hearing this will stay silent until B's response period passes.

b CTS clear-to-send, response to RTS

If B is not receiving from another station, it sends a CTS with the frame length given in the RTS.

c NAV network allocation vector.

After an RTS or CTS, other machines can use the given frame length to estimate how long until it is possible for them to send.

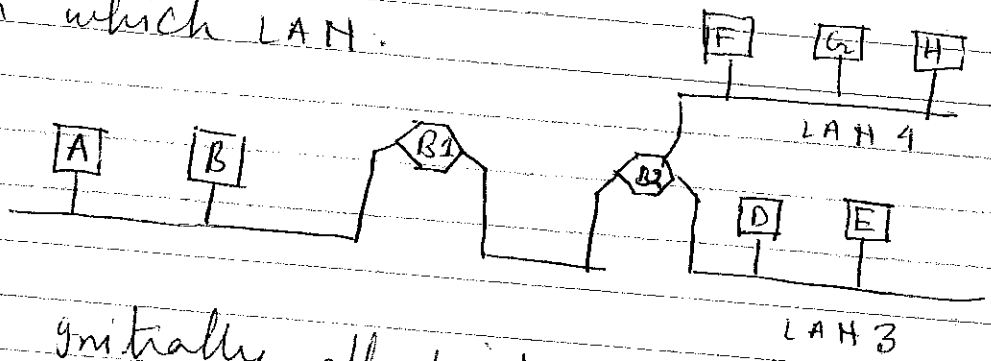
d Fragment bursts

Once a channel has been acquired by the sending station, the station sends in a sequence of fragment bursts rather than the whole frame to reduce the likelihood that ~~the whole frame contains a bit error caused by a noisy network.~~ a bit error ruins the whole frame in a noisy network.

Backward Learning:

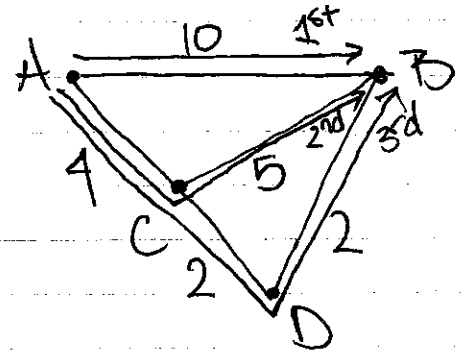
The algorithm used by the transparent bridges is backward learning.

The bridges operate in promiscuous mode, so they see every frame on any of their LANs. By looking at the source address, they can tell which machine is accessible on which LAN.



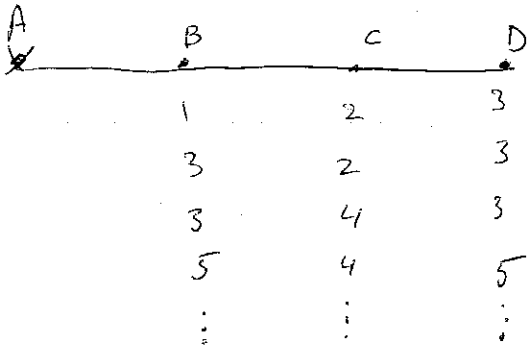
Initially, all bridges have empty tables. When a frame from a destined to ~~be~~ b enters a bridge from LAN i, the bridge checks if there is a table entry for b and makes an entry (a, i) into its table. If b is in its table it sends according to that entry otherwise, it floods each of the other LANs it is on with the frame onto LAN i.

7.



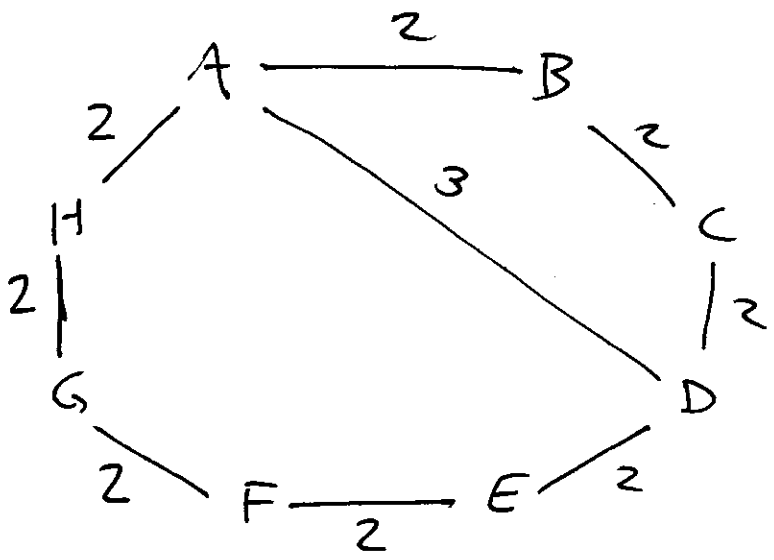
Using Djikstras algorithm the entry for B will first be the direct path of length 10. This will be replaced by the path A→C→B which is length 9. Finaly the entry for B will be updated with the path A→C→D→B which has a length of 8, the shortest path.

(8)



in distance vector routing, it may take a long time to identify when a router is down because the adjacent routers will think that there is a route through one of the adjacent routers. Routers continually update their tables with longer & longer distances until they reach a threshold.

9]



A

SEQ	AGE
B	2
D	3
H	2

B

SEQ	AGE
A	2
C	2

C

SEQ	AGE
B	2
D	2

D

SEQ	AGE
A	3
C	2
E	2

E

SEQ	AGE
D	2
F	2

F

SEQ	AGE
G	2
E	2

G

SEQ	AGE
F	2
H	2

H

SEQ	AGE
A	2
G	2

10 - The leaky bucket algorithm is implemented with a finite internal queue of outgoing packets maintained by each host. If the queue is full, any packets bound for the queue are immediately discarded. When all packets in the queue are of the same size, the host is allowed to transmit one packet per clock tick. When variable-size packets are used, a fixed number of bytes are then allowed to be transmitted per clock tick.

For example: Let's say the fixed number of bytes allowed is 1024. And here's the sizes of packets in the following sequence: A-1024, B-512, C-256, D-768, E-256, ...

1st clock tick - Packet A goes through.

2nd clock tick - B goes through, and now there is 512 bytes more allowed in the same tick so C also goes through. Now, 768 have been transmitted and 256 remain for this tick. However, D is bigger than 256 bytes so it has to wait till the next tick.

3rd clock tick - D goes through, and 256 bytes remain. Now E also goes through since its size is <= 256 bytes.

This converts a potentially uneven flow of packets from user processes into an even flow onto the network, eliminating bursts of packets and avoiding network congestion in the process.