

LE 517

Data Communications and Networks

Week 5:- Contention Protocols and Data Compression

By

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Contention Protocols and Data Compression

- Contention Protocols
 - Aloha Protocols
 - Carrier Sense Multiple Access (CSMA)
 - Collision Detection
 - Token Passing
- Data Compression
 - Huffman Code
 - Run Length Encoding
 - Relative Encoding
 - Lempel-Ziv Encoding
 - Others Encoding

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Contention Protocols

- Multiplexer can transmitted multi-channel over one communication.
- A large number of users push the protocol to manage over the transmission medium.
- Contention Protocols organize traffic in network to flow from many users.
- It could be a like as traffic light on the road.

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Aloha Protocol

- Initially, University of Hawaii launch “Pure Aloha”
 - Simple Protocol, when it collided then wait for random time.
- Improved version, “Slotted Aloha”
 - A station allow to transmit wait for slot time T where T units each
- $S = Ge^{-2G}$ (pure Aloha)
- $S = Ge^{-G}$ (Slotted Aloha)
 - S is the average number of successful frames sent per slot
 - G is the traffic rate measured as the average number of frames generated per slot

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Carrier Sense Multiple Access (CSMA)

- CSMA
 1. Listen to the medium for any activity.
 2. If there is no activity, transmit; otherwise wait.

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Collision Detection

- CSMA/CD
 - If a medium is busy, the station waits per the persistence algorithm.
 - If the medium is quiet the station transmits the frame and it continues to listen.
 - If it detects a collision it immediately stops transmitting and sends a short jamming signal.
 - After a collision it waits a random amount of time before trying to send again.

Collision Detection

- Binary Exponential Backoff
 - If it collides for the 1st time, wait 0 or 1 time slot (randomly)
 - If it collides for the 2nd time, wait 0, 1, 2 or 3 slots (randomly)
 - Therefore, after n collisions, wait range is 0 to 2^{n-1} slots.
- After 16 collisions, stop. And other software must investigate this error.

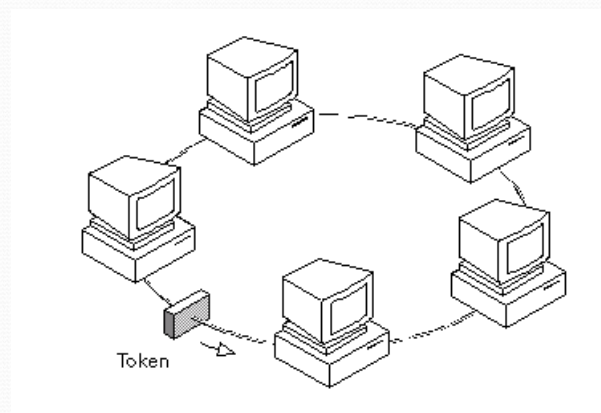
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Token Passing

- Token Ring:- Token is travelled around the network.
 - To send data simply reserved the token and send data.
- Slotted Ring:-
 - Improve from Token Ring that one host may block the next host from sending.
- Token Bus:-
 - Specific the number to the station and token is travelled from highest number to lowest number.

Token Passing



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Huffman Code

Letter	Frequency
A	50%
B	25%
C	25%

Letter	Code
A	0
B	10
C	11

A A B C
0 0 10 11



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Run Length Encoding

- In some case, e.g. fax, it does not use frequency to encode effectively.
- Fax uses 0 & 1 as white and dark.
- Therefore, repeating number of “0” can be cut down by telling how many repetitive.
- E.g. **0000010000100000** -> 5,4,5

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Relative Encoding

- Relative Encoding or Differential Encoding
 - Video Format is not much repetitive the value.
 - However, it is little change from frame to frame.
 - Therefore, it use 0 for non-change and 1 as change.
 - Then, it can use run length to encode the repetitive number of 0.

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Lempel-Ziv Encoding

- This encoding looks for often-repeated string and store them just once. Then it replaces multiple occurrences with a pointer.
- E.g. **Then, they start the theme by themselves.**
 - “**The**” is repeated for several times. It will save once and put the pointer for the repetitive.

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Q & A