NETWORK – CSC329

Mid-1 Questions

1. **Define the concept of layer in communication architecture?**
    - Set of tasks implement separately to process data during communication.

2. **Define the concept of protocol?**
    - **Protocol** Is a set of rules that governs the exchange of data between two entities of the network.

3. **Name the seven layers defined in the ISO OSI Reference Model and state the functions of the lowest three layers?**
    - Layer 7: Application.
    - Layer 6: Presentation
    - Layer 5: Session
    - Layer 4: Transport
    - Layer 3: Network – is responsible for delivers of individual packets from source host to destination host.
    - Layer 2: Data link – is responsible of movements of frames from one hop to the next
    - Layer 1: Physical – is responsible of movements of bits from one hop to the next
4. **Give the Shannon's theorem that describes the data rate of a physical medium with respect to signal to noise ratio?**

5. **Calculate theoretical highest bit rate of a regular telephone line that has a bandwidth of 3000 hz. The signal to noise is 3162.**

    - $C = B \log_2 (1 + SNR) = 3000 \log_2 (1 + 3162) = 3000 \log_2 3162$

      $= 3000 * 11.62 = 34{,}860$ bps

6. **Explain the concept of bit staffing in bit-oriented synchronous transmission.**

    Stuffing done at the bit level:
    - Frame flag has six consecutive 1s (01111110)
    - On transmit, after five 1s in the data, a 0 is added
    - On receive, a 0 after five 1s is deleted

7. **Suppose the following bit string is received by the data link layer from the network layer: 011101111011111101111110. What is the resulting string after bit stuffing process?**
    - 011101111011111111111010

8. **A sender (S) wants to send a message M = 1010001101. It uses the CRC method to generate the frame check sequence FCS.**

    The used generator polynomial is given by $G(x) = X^5 + X^4 + X^2 + 1$.

    1. **Give the polynomial M(x) that represent the message M.**
        - $M(x) = X^9 + X^7 + X^3 + X^2 + 1$
    2. **Determine the sequence of bits (5 bits) that allows detecting errors.**
        -
    3. **Represent the binary whole message (T) send by the sender (S).**
    4. **How does the receiver check whether the message T was transmitted without any errors?**

9. **Briefly explain the difference between transmission time and propagation time.**
    - **Transmission time:** time to put M-bit message "on the wire".
    - **Transmission time =** M (bit) / rate (bit/sec) = M/R seconds
    - **Propagation time:** time for bits to propagate across the wire.
    - **propagation time =** length / speed of signals = D seconds.

10. **Assume that two hosts, A and B are connected by a single link with rate R bps (bits per seconds). A and B are separated by m meters and the propagation speed along the link connecting them is s meters/seconds. Host A is sending a packet of L bits to host B. Ignoring processing and queuing time, obtain an expression for the end-to-end delay.**
    - Latency = M/R+D

11. **We consider the sliding window protocol figure 2. Does this figure indicate that Go-Back-N is being used or selective repeat is being used?**

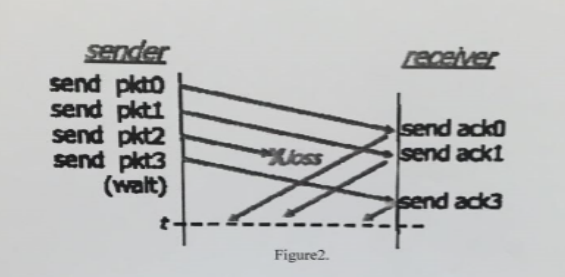


Figure2.

12. **If we suppose that the protocol uses k bits for the sequence number. What is the maximum sliding window size of the emitter for the two rotocols:**

    Go-Back-N ARQ and Selective Repeat ARQ.

13. **We consider a sliding window protocol used to ensure tha exchange between A and B. we suppose that the sender and the receiver are both of them using N(S) and N(R) of 3 bits. The sliding window size is 7. Before sending "I,0,0", the frames is the sender sliding window of A are 0,1,2,3,4,5 and 6.**

    Draw A's sender sliding window after steps (1),(2),(3),(4),(5) and (6), by clearly identifying left and right limits of the window as well as the middle pointer of this window.

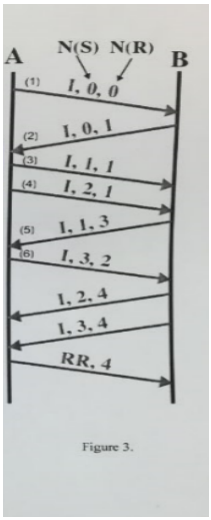


Figure 3.

Mid-2 Questions

1. **Explain csma.**
    - A node should not send if another node already sending.
    - Inverted the minimize collisions.

2. **Explain slotted aloha.**
    - Time is divide to equal size slots.
    - Frames are of the same size.

3. **Explain the difference between csma and slotted aloha.**
    - CSMA is less collision than slotted aloha.
    - Slotted aloha use generate random number to repeat send.
    - Aloha protocol does not try to detect whether the channel is free before transmitting.
    - CSMA protocol verifies that the channel is free before transmitting data.
4. **Explain the difference between the inter-frames in IEEE.**
    - SIFS : highest priority, for ACK, CTS, polling response.
    - PIFS : medium priority, for time-bounded service using PCF.
    - DIFS : lowest priority, for asynchronous data service.

5. **Explain the concept of sliding window.**
    - Sequence numbers
    - Sent frames are numbered sequentially
    - Sequence number is stored in the header
    - to hold the unacknowledged outstanding frames
    - In Go-back-N ARQ the receiver window size always 1

6. **Explain the period contention in csma-ca.**
    - Used by all carrier sense variants.
    - Provides random access to the channel.

7. **Explain the difference between Go-Back-N and selective repeat.**
    - **GO-BACK-N**
        - Retransmits all the frames that sent after the frame which suspects to be damaged or lost.
    - **Selective Repeat:**
        - Retransmits only those frames that are suspected to lost or damaged.

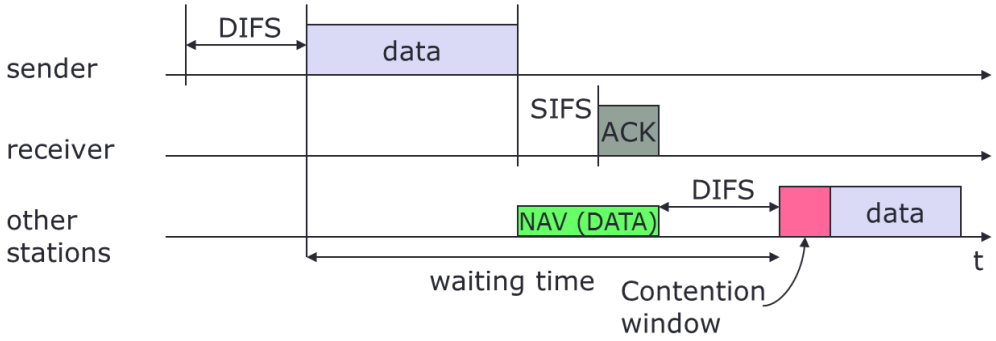
Final Questions

1. **Why the RTS and CTS are not used in CSMA/CD?**

   Because of hidden node problem in CSMA/CD -“occurs when a node is visible from a access point (AP), but not from other nodes communicating with that AP"

   Because wireless is more complicated than wired. In wireless we cannot detect collisions so we have to avoid them!

2. **Explain with a diagram how the CSMA/CA uses different inter frame between the frames?**



- station has to wait for DIFS before sending data
- receiver acknowledges at once (after waiting for SIFS) if the packet was received correctly (CRC)
- automatic retransmission of data packets in case of transmission errors

eathernet protocol uses CSMA/CD for multiple access control when collision is detected. How does the eathernet back-off to avoid future collision CSMA/CD.

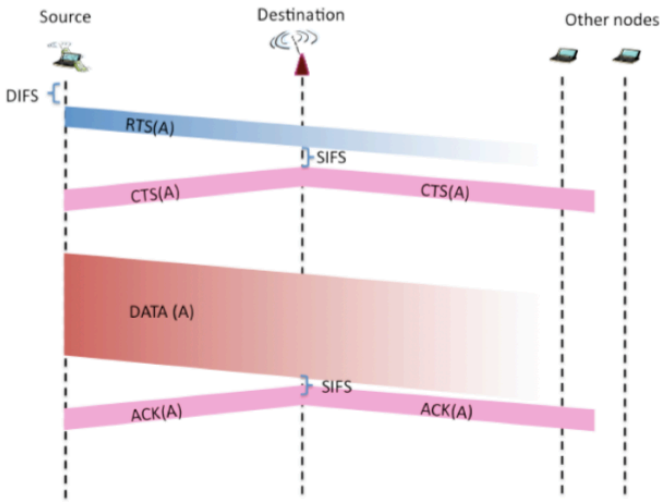
detecting voltage level on the line

detecting power level

detecting simultaneous transmission & reception

use this figure to explain the concept of hidden node problem is wireless communication

Use diagram below to explain how CSMA/CA is realized in the case of the IEEE 802.11 protocol. For your explanation, assume that A wants to send a frame to the destination.



why are ACK used in 802.11 but not in wired Ethernet

> *Usually no packet loss in wired Ethernet. This is much more likely in a wireless scenario. Robustness is increased through retransmissions. To be able to perform retransmissions ACKs are required.*

Use the figure below to explain the “hidden node” problem. What happens when nodes A and C start sending a message simultaneously?

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cannot detect a transmission from C and vice versa. If A and C start sending simultaneously to B a collision at B will happen but A and C will not become aware of the collision