Transport Network DLL Physical
Segment → packet → Frame → bit

CompE560: Practice Exam for DLL-MAC Layer

1. Answer the following questions: [20]
   1. Name two channel access protocols that are used in the Data Link Layer:
      CSMA / ALOHA
   2. Which term is used specifically to identify the entity that is created when encapsulating data inside data link layer headers and trailers?
      frames
   3. Which layer defines the standards for cabling and connectors?
      physical
   4. Which layer defines the standards for data formats and encryption?
      application
   5. Which sub-layer is concerned with channel contention mechanisms?
      Data link layer
   6. Between an optical fibre and a co-axial cable, which one guarantees higher data integrity?
      optical fiber
   7. Does star topology offer higher reliability and bandwidth than the bus and ring topologies? (Yes) or No
   8. Does topology govern the choice of transmission medium? (Yes) or No
   9. Does the area over which a network sprawls govern the choice of the transmission medium? (Yes) or No
   10. Does the number of users and amount of traffic on a network shape the design and feasibility of a MAC algorithm?
       yes
   11. The scheme commonly implemented to ensure fairness and success of data transmission in case of collisions in the CSMA/CA protocol is called exponential backoff
   12. The latency encountered by a packet while it is being put out on the link bit by bit
       Transmission Delay
   13. Name the category of network (in terms of coverage area) of which Bluetooth is a member
       PAN
   14. The layer that allows you to compose text messages
       Application layer
   2. Under what conditions does a packet switched network have a lower delay than a circuit switched network with the following network characteristics: x bit message, k hop path, d sec/hop of propagation delay, b bps of data rate, s secs of circuit setup time, p bits/pkt [5]

Delay for packet switch
$x/b + kd + (k-1)p/b$

Delay for Circuit switch
$\frac{x}{b} + kd +$ Circuit setup
$(k-1)p/b \times$ Circuit setup time

3. What is the probability of successful transmission on the third attempt, when two stations have already collided in their first and second transmission attempts? Assume they are using CSMA/CA protocol with binary exponential backoff algorithm for collision recovery. Show your work (just don't write the answer). [5]

4. If you were properly using https in a browser over WiFi in a cafe, which of the following is the greatest risk to your losing credit card information when making an online purchase?
   a. Someone captured the packets that were sent across the WiFi
   b. Someone captured the packets in the gateway router
   c. Someone captured the packets as they passed through a core Intenet router
   d. You have a virus on your computer that is capturing keystrokes

5. Your company has a LAN in its downtown office and has now set up a LAN in the manufacturing plant in the suburbs. To enable everyone to share data and resources between the two LANs, what type of device(s) are needed to connect them? Choose the most correct answer.
   a. Modem
   b. Cable
   c. Bridge
   d. Router

6. CSMA/CD cannot be implemented in wireless networks:
   A. True B. False

7. The number of users and amount of traffic on a network shape the design and feasibility of a MAC algorithm:
   A. True B. False

8. Suppose that two wireless stations A and B are contending for the channel and 'C' is in the middle of a transmission. Based on this information, answer the following questions: [12]

   a) How long (give the IFS name) will A sense the channel for idleness before it transmits data?

   D.I.F.S

   b) How long will B sense the channel for idleness before it transmits data?

   D.I.F.S + back off

   c) How long will C sense the channel before it transmits the next fragment?

   S.I.F.S

I.F.S. is continual transmission

d) Rank the channel sensing time of A, B and C in order of magnitude (lower to higher)

~~C > A & B "C is greater~~ C is lowest SIFS
A & B greater DIFS

e) In case of a collision, how many transmission attempts does CSMA/CA allow before the data is purged?

~~16~~ ~~16~~ 16

f) In the exponential backoff algorithm, what is the largest backoff interval allowed?

1023 $2^{10}-1$

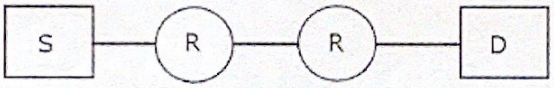
9. A sender wants to transmit a 10-bit binary data (1101011011). The sender uses CRC for error detection and hence uses a bit pattern of 10011 as the divisor. How many bits are actually transmitted by the sender? If all bits are received correctly, what is the bit pattern that the receiver receives? [2+6]

received seq

Actual bits transfered are 10+4 = 14bits

11010110111(1110)

10. Assume that source S and destination D are connected through two intermediate routers labeled R. Determine how many times each packet has to visit the network layer and the data link layer during a transmission from S to D. [2]



A. Network layer – 4 times and Data link layer-4 times
B. Network layer – 4 times and Data link layer-3 times
C. Network layer – 4 times and Data link layer-6 times
D. Network layer – 2 times and Data link layer-6 times