

Solutions and Analysis of Quiz 2

1 Short answers:

- a. Any network which has a shared medium. In order to moderate the contention for the medium, MAC is needed.
- b. Yes, it can occur in both CSMA and CSMA/CD, as it is possible for two terminals to detect the channel as idle and transmit at the same time. In CSMA/CD, on hearing the collision, an abort signal is sent. Thus, the collision period is reduced.
- c.
 - i) To connect two different buildings or departments of an organization
 - ii) To share resources, printers.
 - iii) It is possible that the number of hosts in a network is limited (subnet).
- d. Hubs – Repeater, retransmit the signal. Ports are pre connected.
Switches – Can a MAC address table, and Ports connected only when they are addressed.
- e. Routing – Find routes to the destination.
Forwarding – pass the packet to the next hop in the path to the destination, which was found by routing. ☺
- f. Virtual Circuits:
 - a. Advantages: In order delivery of data, (assuming errors handled well by link layer).
 - b. Disadvantages: Initial setup requiredDatagrams:
 - a. Advantages: Multiple routes possible. More robust.
 - b. Disadvantages: only best effort, no guarantees.

2. Define:

- a. Store and forward: Store the received packet, process it to find the destination (or next hop), look it up in the routing table (if need be) and forward to the next hop along the path towards the destination.
- b. Next-hop forwarding: Send to the next hop in the path towards destination and hope that it will forward it further, till it reaches the destination.
- c. Routing Table: Map of essentially Destination and Next hops.

3. Fill in the blanks:

- a. Token Ring, Token Bus.
- b. Contention based.
- c. Ethernet.
- d. Routing and forwarding.
- e. Network layer
- f. Telephone Network, Internet.

4. Longer answers: (I outline only the key issues. ☺)

- a. Help distribute the channel usage among the different users, in order to maximize channel utilization; provide fair distribution of channel etc. TDM - Divide channel into time slots and at each slot one user transmits. FDM – Divide the channel bandwidth into different frequencies and each user transmits in one frequency.
- b. Scheduled-access MAC: Channel divided into slots and each user assigned a slot in round robin fashion, (with or without preemption or priority).
Round-Robin MAC: Centralized or decentralized mechanism by which each user gets to use the channel in a sequence.
Contention-based MAC: The nodes compete for the channel and the winner of a contention slot (either on FCFS or node –ids etc, based on whether we are using collision detection or avoidance) gets to transmit.

For this question it would be simpler to take an example and explain rather than a general scheme, but I have accepted a general scheme also.

- c. Aloha – “Free for all” – bad throughput.
Slotted Aloha – Introduced time slots and nodes can only transmit at the beginning of a slot.
CSMA – Sense the channel to see if free. If busy – backoff else transmit.
CSMA/CD – similar to CSMA, but on detecting collision abort transmission and back off.
- d. Ethernet – best under light, bursty traffic. Heavy traffic causes more collisions.
Token Ring – best under heavy traffic. Under light traffic, overhead of ring and token maintenance.
- e. Ethernet – No fair sharing, as nodes backing off, keep backing off while those, which win in a contention slot keep winning. Some of you have argued that this according to you is fair. If you have made a good argument, in favor of it, I have given you points.
Token Ring – Fair, as it allows use in a round robin fashion, which is always fair.

- f. DCF – Distribute Coordination Function – distributed – use carrier sensing, broadcast duration of transmission.
PCF – Point Coordination Function – point-to-point – Point coordinator – uses polling – need to know (maintain) list of nodes with data.
- g. Max Frame Size – to restrict the amount of data that a node can transmit, to allow other nodes also to transmit. Impacts on internetworking – packets have to be fragmented, also different link layers have different frame size, therefore fragmentation and reassembly is an important consideration.

Statistics for Quiz 2

Min: 36/100

Max: 100/100

Average: 79.7658

Std. Deviation: 14.235

