Tutorial 7 Solutions

Instructions

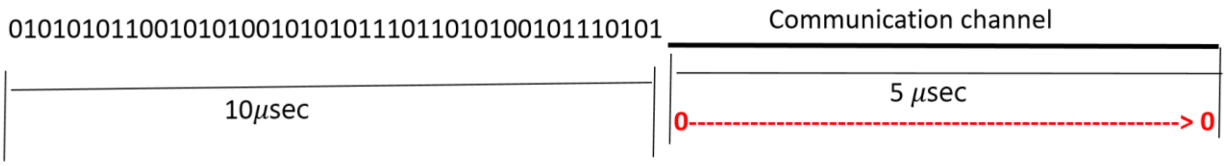
1. Form ad-hoc groups of 2 to 3 students to solve this week's exercise.
2. Each group must answer the following review Q's
3. Each group will use shared google docs to work with all group members and tutor. The document must include the group members' names and the tutorial sheet number.

Review Questions

1. Q5-25. Assume the propagation delay in a broadcast network is **5 *microseconds*** and the frame transmission time is **10 *microsecond***.
   a) How long does it take for the first bit to reach the destination?
   b) How long does it take for the last bit to reach the destination after the first bit has arrived?
   c) How long is the network involved with this frame transmission (vulnerable to collision)?

   The **last** bit is 10 μs behind the **first** bit.
   a) It takes 5 μs for the **first** bit to reach the destination.
   b) The **last** bit arrives at the destination 10 μs after the first bit.
   c) The network is involved with this frame for a total of (5 + 10) microsec = 15 μs.
   d)

Frame takes 10 μs to be assembled on the communication link it's called transmission delay.



2. Q5-27. Can two hosts in two different networks have the same link-layer address (MAC address)?

   The answer is theoretically yes.
   A link-layer address has a local jurisdiction. This means that two hosts in different networks can have the same link-layer address, although this does not occur today because each NIC has a unique MAC address. The Ethernet address is 6 bytes (48 bits), normally written in hexadecimal notation, with a colon between the bytes. For example, the following shows an Ethernet MAC address: 4A:30:10:21:10:1A.
   4A:30:10
   4A:30:10:00:00:00 ====> 4A:30:10:FF:FF:FF
   The maximum devices for this prefix **is 2^{24} combinations = 16777216 16-million** Possible devices, This means that manufacturer can use this prefix to produce this amount of devices, but it didn't mean that he already manufactured them all or he had a plan to do. And if This Manufacturer used all possible devices for this prefix he had to buy a new prefix from the IEEE to manufacture extra devices.

3. Q5-29. Do we need a multiple access protocol when we use the DSL service provided by the telephone company to access the Internet? Why?

   We do **NOT** need a multiple access protocol in this case. The DSL provides a dedicated **point-to-point** connection to the telephone exchange office.

4. Q5-33. How is the preamble field different from the SFD (Start Frame Delimiter) field in an Ethernet frame? *(Hint: refer to the figure 5.55)*

   The preamble is a 56-bit field (101010…..…..10) that provides an alert and timing pulse. It is added to the frame at the physical layer and is not formally part of the frame. SFD (Start Frame Delimiter, flag 10101011) is a one-byte field that serves as a flag.

5. Q5-35. Why is there no need for CSMA/CD on a full-duplex Ethernet LAN?

   In a full-duplex Ethernet, each station is connected to the **switch** and the media is divided into two channels for sending and receiving. No two stations compete to access the channels; each channel is dedicated.

6. Q5-37. What are the common Standard **Ethernet** implementations?

   The common traditional Ethernet implementations are 10Base5, 10Base2, 10- Base-T, and 10Base-F.

7. Q5-41. Four stations are connected to a **hub** in a transitional Ethernet network. The distances between the hub and the stations are 300m, 400m, 500m and 700m respectively. What is the length of this network and when we need to calculate T_P?

   For calculating **Tp= (propagation delay)** we need to consider the maximum length of frame transmission between any two stations. In this case, the maximum length is 500 + 700 = 1200 m.
   So **T_P = propagation delay** is the amount of time it takes for the head of the signal to travel from the sender to the receiver.
   It can be computed as the **ratio between the link length and the propagation speed over the specific medium**.
   T_P = propagation delay =(1200mts/2 x 10^8 mts/sec) = 6 µs (microsec).

8. Q5-43. What is ***VLAN?*** What does it mean to say that they "***communicate with each other as though they were on a single, isolated LAN***"? Define the purpose of VLAN and how VLAN help companies save time and money?

   A VLAN is when a group of workstations within a LAN that can communicate with each other as though they were on a single, isolated LAN.
   A VLAN provides broadcast packets sent by one of the workstations will reach all the others in the VLAN. Broadcasts sent by one of the workstations in the VLAN will not reach any workstations that are not part of that VLAN. The workstations can all communicate with each other without needing to go through a gateway. The workstations can communicate with each other using non-routable protocols.

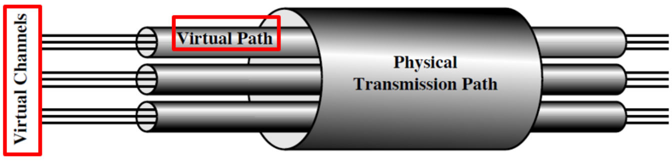
The purpose of VLANs is to split flat networks into VLANs is to reduce congestion on a large LAN. In a flat LAN, every packet that any device puts onto the wire is sent to every other device on the LAN.
As the number of workstations on the typical LAN grew, they started to become hopelessly congested; there were just too many collisions, because most of the time when a workstation tried to send a packet, it would find that the wire was already occupied by a packet sent by some other device. A VLAN saves time and money because re-configuration is done through software. Physical reconfiguration is not necessary.

9. Q5-47. In ATM, what is the relationship between TPs, VPs, and VCs?

A **Transmission Path (TP)** is the physical connection between a user and a switch or between two switches.
It is divided into several **VPs (virtual paths),** which provide a connection or a set of connections between two switches.
VPs in turn consist of several **VCs (virtual circuits)** that logically connect two points.

ATM Terminology – Connection address

- **Virtual channel** connection (VCC)
  - Logical connection in ATM
  - Basic unit of switching in ATM network
  - Analogous to a virtual circuit in packet switching networks
  - Exchanges **variable-rate**, full-duplex flow of fixed-size cells
- **Virtual path** connection (VPC)
  - Bundle of VCCs that have the same end points



10. QP5-13. A simple parity check bit, which is normally added at the end of the word (changing a 7-bit ASCII character to a byte), **cannot detect even numbers of errors**. For example, two, four, six, or eight errors cannot be detected in this way. A better solution is to organize the characters in a **table and create row and column parities**. The bit in the row parity is sent with the byte, the column parity is sent as an extra byte (Figure below).
EVEN PARITY is used!

	C1	C2	C3	C4	C5	C6	C7	Row parities
R1	1	1	0	0	1	1	1	1
R2	1	0	1	1	1	0	1	1
R3	0	1	1	1	0	0	1	0
R4	0	1	0	1	0	0	1	1
Column parities	0	1	0	1	0	1	0	1

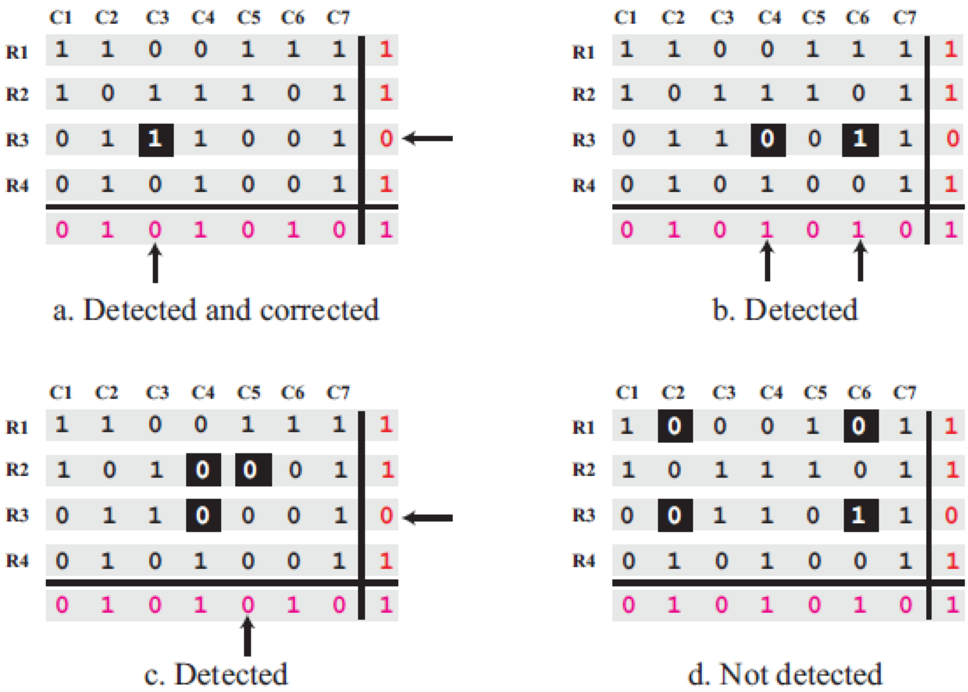
R*n*: Row *n*
C*m*: Column *m*

Show how the following errors can be detected?

a. An error at (R3, C3).
b. Two errors at (R3, C4) and (R3 , C6).
c. Three errors at (R2, C4), (R2, C5), and (R3, C4).

d. Four errors at (Rl, C2), (Rl , C6), (R3, C2), and (R3, C6).

The following shows the errors and how they are detected.



a. Detected and corrected

b. Detected

c. Detected

d. Not detected

11. QP5-17. This problem shows a special case in checksum handling. A sender has two data items to send: $(4567)_{16}$ and $(BA98)_{16}$. What is the value of the checksum?

The sum in this case is $(FFFF)_{16}$ and the checksum is $(0000)_{16}$. The problem shows that the checksum can be all 0s in hexadecimal. It can be all Fs in the hexadecimal only if all data items are all 0s, which makes no sense.