

Computer Facilities and Network Management

BUS3150

Tutorial - Week 8

*** FOR TUTORS ONLY ***

The answers provided here are only brief guides. If you have any comments or suggestions for improvement to this, please let me know so that your improvements may be included in this document.

Objective of this tutorial:

The objective of this tutorial is to strengthen the conceptual understanding of the material covered in the lecture by reflecting on the material in small groups. The tutor will provide feedback to enhance your understanding and diminish misunderstandings, if any.

How to participate in the tutorial:

Form groups of four to five students in each and discuss the answers for the following reflective questions with the group members. After spending about ten minutes for each question, discussing with group members, discuss your solutions with the tutor and other groups. The tutor will provide feedback on your solutions.

Question 1 - Describe how a LAN can be used for resource sharing in an organisation.

Week 7 lecture notes, slides 4, 5 and 6.

- **Information** - *Most business organisations have sets of financial rules, data, policy and other vital information. This information must be kept consistent and secure, given restricted timely access to the authorised persons only and must be managed in an efficient way. The types of information that an organisation might want to centrally locate and share or control include inventory, company letterhead and letter style, sales contact information, company procedure manuals, sensitive financial records, employee records, company memos etc.*
- **Hardware** - *A company can make use of its expensive devices in an efficient and cost-effective way through the use of LAN. Hardware devices that are usually shared include printers, plotters, fax modems, scanners, expensive high capacity hard disks, CD-ROM writers, tape backup units etc.*
- **Software** - *Software resources can also be used more effectively over a network. From the administration point of view it makes installation, configuration, maintenance of software packages more easier, efficient and less time consuming.*

Question 2 - Consider the bus and star topology LANs.

- (a) When using the bus topology for a LAN, one station may decide to transmit continuously for a long period of time. What are the implications?

The bus topology uses a shared medium and all frames are broadcast on this medium. If one station decides to transmit continuously on this shared resource for a long period of time, then no other station can transmit for that long period of time.

- (b) When using the bus topology LAN, two stations on the bus may attempt to transmit at the same time. What are the implications?

When two stations transmit at the same time, there will be a collision on the bus. The two frames will interfere with one another and the communication on the bus will be garbled.

- (c) A star topology LAN can have the same problems found in parts (a) and (b) of this question. Why is this the case?

A star topology can use a broadcast hub. When using a broadcast hub, the star topology operates much the same way as the bus topology. A frame sent on a bus topology is received by all stations connected to that common bus. For a star topology, a frame received by the hub is broadcast to all stations. While the network is physically a star, logically it operates like a bus. Since it is operating like a bus, it experiences the same issues as the bus, such as collisions.

- (d) A star LAN topology can also improve on the problem found in part (b) of this question. How is this achieved?

Week 7 lecture notes, slides 17, 18 and 19. If the hub in the star network is a switching hub, then the issue of collision can be reduced. A switch only forwards frames to stations for which the frame is addressed, rather than broadcasting the frame to all stations. This reduces the collision domain to single stations.

Question 3 - The functions typically associated with OSI layer 2 are grouped into 2 layers in LAN protocols, namely Logic Link Control (LLC) and Medium Access Control (MAC).

- (a) Discuss the functions of each of these layers.

- *LLC: Week 7 lecture notes, slide 24.*
- *MAC: Week 7 lecture notes, slides 25 to 29.*

- (b) Discuss the reasons for the above separation into 2 layers.

There are many LAN topologies, each of which requires a specific method of medium access control. However, the interface to the data link layer of a LAN should be the same for higher layer protocols (such as IP) regardless of the underlying topology. The separation of the data link layer into LLC and MAC achieves this goal. The LLC layer provides a common interface to the data link layer for higher layer protocols, while the MAC layer supports different protocols for each of the LAN topologies. For example, there are separate MAC layer protocols for bus (e.g. 802.3), ring (e.g. 802.5), and wireless (e.g. 802.11) topologies, while there is a single LLC layer (e.g. 802.2).

- (c) How would the method of medium access control for a ring topology be different from the medium access control for a bus topology?

Both would use an asynchronous and distributed access control. The bus style uses contention while the ring uses a round robin scheme.

Question 4 - A bridge is designed to connect multiple similar LANs together. The bridge will read all frames transmitted on one LAN and accept those address to any station on another LAN. Each accepted frame is then transmitted on the destination LAN. For example, if in Figure 1, station 1 on LAN A wishes to transmit to station 8 on LAN D, the bridge would copy the frame from LAN A to LAN D only. However if station 1 wants to transmit to station 2, the bridge will ignore this frame. It appears to all stations on multiple LANs as if they are on one single LAN, while reducing the collision domain on any one LAN.

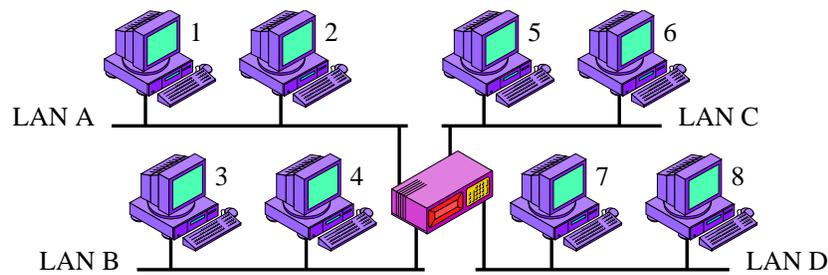


Figure 1: Example connection of multiple LANs by a Bridge.

- (a) Looking closely at a bridge, we should be able to see similarities in operation to a switched hub used in the star topology LAN. What are the similarities and differences between a switched hub and a bridge?

Both a bridge and a switched hub receive frames on one port and retransmit those frames on another port. In the case of a bridge, the frames are coming from one of many stations and are being broadcast to multiple recipients. For a switched hub however, a frame comes from a single station and is sent to a single station. Both the bridge and switched hub decide which port to retransmit the frame on based on the MAC layer physical address. A bridge needs to know the addresses of all stations connected to each port. A switched hub needs to know the address of each station connected to each port. Both the switch and bridge reduce the collision domain of the LAN to a single station (switch) or a smaller group of stations (bridge).

- (b) Consider a situation in which two LANs are located in two geographically distant locations. As a result, the two LANs are linked using two bridges that are connected by a microwave point-to-point link. The point-to-point link uses a HDLC style protocol. Draw a figure similar to Figure 2 for this configuration.

Figure 3 shows the configuration. The MAC layer frames are encapsulated in HDLC frames by the bridge and sent over the wireless link. At the receiving end, the MAC frames are taken out of the HDLC frames by the bridge and sent over the LAN.

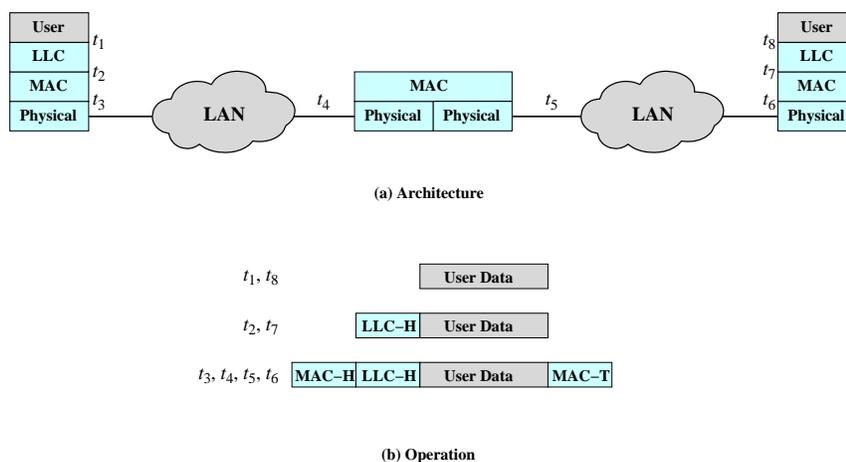


Figure 2: Example connection of two LANs by a Bridge for Question 4(b).

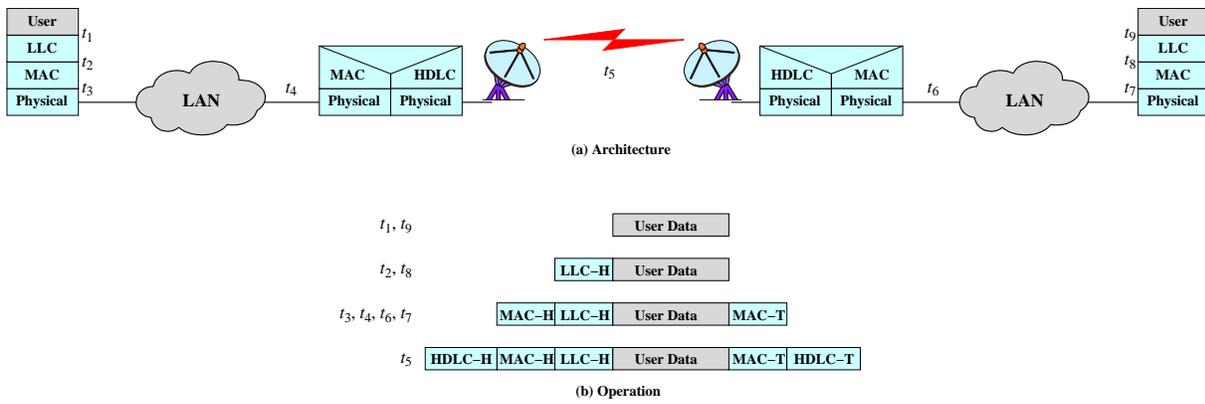


Figure 3: Answer for Question 4(b).