



School of Computer Science and Software Engineering

CSE3020 Network Technology Semester 2, 2003

Tutorial 7 - Week 8

Question T7.1 - What is the purpose of the IEEE 802 committee? Define and explain the data link layer in IEEE Project 802?

- *Purpose: To develop LAN standards.*
- *The data link layer is divided into two sublayers:*
 - *The LLC layer: is non-architecture specific and is the same for all IEEE-defined LANs. The LLC protocol handles the end user portion of the frame: logical address, control information and data.*
 - *The MAC layer: contains a number of distinct modules; each carries information specific to the LAN product used and resolves the contention for the shared media.*

Question T7.2 - Instead of LLC, could HDLC be used as a data link control protocol for a LAN? If not, what is lacking?

HDLC has only one address field (usually use to address the secondary station in a primary and secondary configuration). In a LAN, any station may transmit to any other station. The receiving station needs to see its own address in order to know that the data is intended for itself. It also needs to see the sending address in order to reply.

Question T7.3 - Compare and contrast the SSAP and DSAP on the LLC PDU with the source and destination address of the MAC frame.

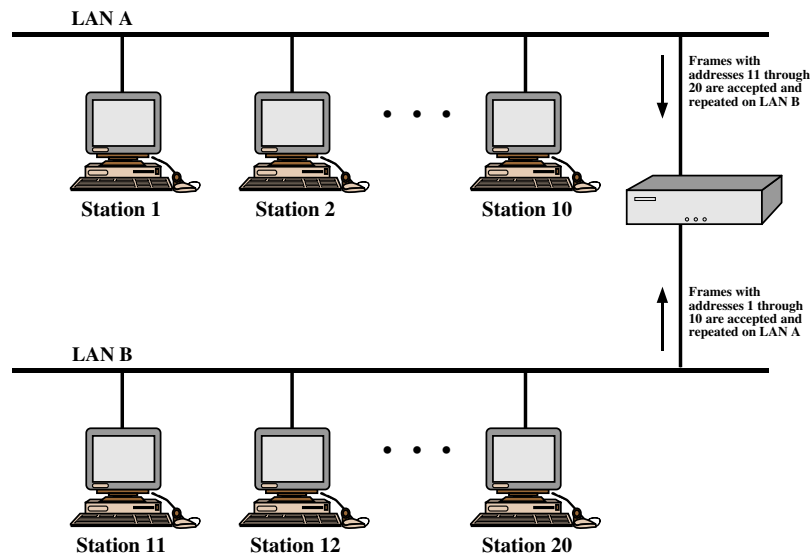
- *The DSAP is the address of the destination service access point and the SSAP is the address of the source service access point. Both addresses identify the protocol stacks that are generating and using the data.*
- *The MAC frame on the other hand contains the physical address of the packet's next destination (DA) and the physical address of the last device that forwarded the packet.*

Question T7.4 - What is network topology? List four common LAN topologies and briefly describe their methods of operation.

- *Network topology: refers to the way in which the end parts or stations attached to the network are interconnected.*
- *Bus: All stations attach, through appropriate hardware interfacing known as a tap, directly to a linear transmission medium, or bus. Full-duplex operation between the station and the tap allows data to be transmitted onto the bus and received from the bus. A transmission from any station propagates the length of the medium in both directions and can be received by all other stations. At each end of the bus is a terminator, which absorbs any signal, removing it from the bus.*
- *Tree: a generalization of the bus topology. The transmission medium is a branching cable with no close loops. The tree layout begins at a point known as the headend. One or more cables start at the headend, and each of these may have branches. The branches in turn may have additional branches to allow quite complex layouts. Again, a transmission from any station propagates throughout the medium and can be received by all other stations.*
- *Ring: the network consists of a set of repeaters joined by point-to-point links in a closed loop. Each station attaches to the network at a repeater and can transmit data onto the network through the repeater. Transmission is unidirectional. Frame is removed by the transmitter after one trip around the ring.*
- *Star: each station is directly connected to a common central node. Typically, each station attaches to a central node via two point-to-point links, one for transmission and one for reception.*

Question T7.5 - Why a bridge is needed in a network? With the aid of sketches, briefly explain the operations performed by a bridge?

- *Why: expand beyond a single LAN:*
 - **Reliability:** *A fault on the network may disable all devices. Partition network into self-contained units.*
 - **Performance:** *Reduce the number of devices on a single length of wire. Improved performance when intranetwork traffic exceeds internetwork traffic.*
 - **Security:** *Keep different levels of secure information on separate physical media.*
 - **Geography:** *Multiple LANs separated by geographical distances. May use a microwave bridge.*



- *Operations: For a bridge that connects LANs A and B: (1) Read all frames transmitted on A and accept those addressed to any station on B. (2) Using the medium access control protocol for B, retransmit each frame on B. (3) Do the same for B-to-A traffic.*

Question T7.6 - What is the difference between a shared medium hub and a switching hub?
What is the difference between a store-and-forward switch and a cut-through switch?

- *Shared medium hub : only one attached station may transmit at a time.*
- *Switching hub: can accommodate multiple simultaneous transmissions.*
- *Store-and-forward switch: accepts a frame on an input line, buffers it briefly, and then routes it to the appropriate output line.*
- *Cut-through switch: takes advantage of the fact that destination address appears at the beginning of the MAC frame. The switch begins repeating the incoming frame onto the appropriate output line as soon as it recognizes the destination address.*

Question T7.7 - List the differences between bridges and switching hubs.

- *From Stallings 7th Edition: page 493-494:*
- *Bridge frame handling is done in software. A switching hub performs the address recognition and frame forwarding functions in hardware.*
- *A bridge can typically only analyze and forward one frame at a time, whereas a switching hub has multiple parallel data paths and can handle multiple frames at a time.*
- *A bridge uses store-and-forward operation. With a switching hub, it is possible to have cut-through instead of store-and-forward operation.*

Question T7.8 - What is a spanning tree?

For any connected graph, consisting of nodes and edges connecting pairs of nodes, there is a spanning tree of edges that maintains the connectivity of the graph but contains no closed loops. Forouzan's textbook Appendix I has a good example.