Let me tell you what I heard at a conference… (Instructor Version)

Instructor Note: Red font color or Gray highlights indicate text that appears in the instructor copy only.

Objectives

Describe the purpose and function of the data link layer in preparing communication for transmission on specific media.

- Students will discuss how communication within a single data-link layer domain can be performed immediately by addressing the intended node directly. They will also consider the increasing difficulty of communication if multiple nodes in a single domain need to communicate.

Background /Scenario

You and your colleague are attending a networking conference. There are many lectures and presentations held during this event, and because they overlap, each of you can attend only a limited set of sessions. Therefore, you decide to split up, each of you attending a separate set of presentations, and after the event ends, you share the slides and the knowledge each of you gained during the event.

Answer the following questions:

- How would you personally organize a conference where multiple sessions are held at the same time? Would you put all of them into a single conference room, or would you use multiple rooms? Explain your answer.
- Assume that the conference room is properly fitted with audiovisual equipment to display large-size video and amplify the speaker's voice. If a person wanted to attend a specific session, does it matter which seat will the person takes, or is it sufficient for the person to sit anywhere as long as it is in appropriate conference room?
- What are the potential consequences or benefits if the speech from one conference room somehow leaked into another?
- If questions or inquiries arise during a presentation, should an attendee simply shout out his/her question, or should there be some process of assuring that attendees are given an opportunity to ask questions that everyone can hear? What would happen without this process?
- Can a session run out of time without going through the entire intended content if an interesting topic elicits a larger discussion where many attendees have questions? If you did not want this to happen, what would be the best way to ensure that it does not occur?
- Imagine that the session is in a panel format, which allows more free discussion of attendees with the panelists and among themselves. If a person wants to address another person within the same room, can he/she do it directly? If so, how is this possible? How would a panelist invite another person to join who is not presently in the room?
- What benefit, if any, was achieved by the isolation of multiple sessions into separate conference rooms if, after the event, people could meet and share the information?

Instructor note: This Modeling Activity is not intended to be a graded assignment. Its purpose is to encourage students to reflect on their perceptions of how a network is prepared to use specific media in data transmission for personal and corporate practice. Facilitation of the discussion should be initiated as a result of this activity

Required Resources

- Recording capabilities (paper, tablet, etc.) for reflective comments to be shared with the class.

Reflection

1. How would you personally organize a conference where multiple sessions are held at the same time? Would you put all of them into a single conference room, or would you use multiple rooms? What would be the reason? Explain your answer.

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   If multiple independent sessions are being held, it is necessary to put them into separate rooms. Otherwise, the speakers would overlap, making it very hard, if not impossible, to understand what the presenters are saying. Keeping separate sessions in separate rooms is not done for the purpose of security (although there can be private sessions only for invited guests with restrictions on who can join and what can be shared after the session) but rather for the purpose of keeping the communication separated for better clarity and efficiency.

   Our networks are separated into multiple data-link layer domains (broadcast domains) for the purpose of containing the communication of similar properties – workgroups, applications, floors, security requirements, etc. This is similar to separating all sessions into multiple conference rooms according to their topics.

2. Assume that the conference room is properly fitted with audiovisual equipment to display large-size video and amplify the speaker's voice. If a person wanted to attend a specific session, does it matter which seat will the person takes, or is it sufficient for the person to sit anywhere as long as it is in appropriate conference room?

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   It is sufficient to visit the proper conference room. A particular seat is not important as long as from each seat, an attendee can hear and listen without obstructions.

   The relative independence on the particular seat is similar to the relative independence of a node within a network from its particular host address. For the purpose of communication within a single network, it is sufficient that the nodes are in the same data-link layer domain and have unique addresses but it is not important what exact addresses these are. Two nodes in a common data-link layer domain can talk to each other and hear each other immediately.

3. What are the potential consequences or benefits if the speech from one conference room somehow leaked into another?

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   It would definitely be at least annoying and distracting, if not directly damaging to the flow of the session.

   In real networks, there are situations where two data-link layer domains originally intended to be separate become joined (incorrect wiring, misconfiguration, bug…) and leak information from one to another. This is not a correct situation. Even if nodes from two different data-link layer domains are to communicate together, their connection must be done in a controlled way using routers that interconnect separate data-link layer domains – similar to a person attending a single session and then, afterwards, sharing the knowledge with (i.e. routing the knowledge to) another person who did not attend.

4. If questions or inquiries arise during a presentation, should an attendee simply shout out his/her question, or should there be some process of assuring that attendees are given an opportunity to ask questions that everyone can hear? What would happen without this process?

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   Questions, comments, inquiries etc. from the audience should be given in a controlled manner. Otherwise, two or more people will be talking at the same time, causing their neighbors to not understand

any of them, and each speaker would need to repeat what he/she said. Usually, a raised hand indicates that a person has something to say.

In networks, there are two main methods of accessing the medium – either deterministic or random. Raising a hand and waiting to be given a turn is a deterministic approach, similar to token passing. Seizing an opportunity to raise a question in a moment of silence without waiting to be given a turn is a random, or stochastic approach. Note that either of these approaches allows for the information to be exchanged both ways – between the audience and the presenter, i.e. a sort of duplex is present. However, because a conference room is a domain of a shared medium where only one person can speak at a time, otherwise collisions occur, the duplex here is a half-duplex.

Can a session run out of time without going through the entire intended content if an interesting topic elicits a larger discussion where many attendees have questions? If you did not want this to happen, what would be the best way to ensure that it does not occur?

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Absolutely – with increasing amount of information to be shared over the same medium, each speaker must wait for others to finish their speech. This in turn delays every speaker, possibly resulting in the presenter not making it through the whole content of the presentation. With increasing number of stations in a network, especially if the communication has a one-to-all nature, it may become more and more difficult to transmit data in time.

5. Imagine that the session is in a panel format, which allows more free discussion of attendees with the panelists and among themselves. If a person wants to address another person within the same room, can he/she do it directly? If so, how is this possible? How would a panelist invite another person to join who is not presently in the room?

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Within the same room, attendees can address themselves directly – they are in the same domain, on the same medium, they can hear each other immediately. There is no need for any intermediate process to deliver the data. Even if there is a device that aids to relay the information just to the intended recipient within the room (such as one person asking another to relay his message to the faraway neighbor), if any person stood out and started shouting, everyone could hear it.

If a panelist wanted to invite another person to the room, he/she would need to ask the assistants to search for that person and invite him. These assistants would need to purposefully route the invitation further until it reaches the invited person.

Communication within the same network is done immediately. Communication with nodes outside the network is mediated by routers.

6. What benefit, if any, was achieved by the isolation of multiple sessions into separate conference rooms if, after the event, people could meet and share the information?

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As explained, the isolation was not done to provide security in the first place. The isolation was to contain the communication of the same or similar properties into a well-managed environment that allows the participants to interact directly, and to talk in a mediated, routed way to those who are not within the same domain. This reduced the number of possible collisions and also reduces the impact of broadcasts (shouting) on the network.

Identify elements of the model that map to IT-related content:

- **Conference room** – Data-link layer domain, broadcast domain
- **Seat in a conference room** – Corresponds to a particular L3 or L2 address
- **Questions, inquiries** – Correspond to bi-directional, duplex communication

- **Method of asking a question** – Corresponds to media access control method
- **Shouting over a conference room** – Corresponds to broadcast