Problem 1  Wired vs. Wireless LANs

Solution:

1. Both wired LAN and wireless LAN use physical layer and MAC layer.

Error rate: Unlike wired LANs, wireless LANs have high error rate due to interference and noise. Wireless LANs need to implement ARQ and/or error correction to increase the reliability of the communication channel.

Station mobility: Unlike wired LANs where stations connected to the LANs are static, in wireless LANs, the stations can be mobile and portable. Wireless LAN protocols may have to implement dynamic traffic routing and service handoff when the station moves from one service area to another.

Collision detection: Collision detection is not effective in wireless LANs due to the hidden station problem. Consequently, the sender must wait for explicit acknowledgment (e.g. RTS/CTS) from the receiver to know whether or not a frame has been received. The wireless LAN protocol implements a collision avoidance algorithm rather than the collision detection in wired LAN, and the delay in the contention period is longer than three round-trip delay of $2d_{prop}$ of wired LAN because of waiting for the receiver's acknowledgment.

Other differences:

Security: In a wired LAN, the transmission medium is usually physically secure. In a wireless LAN, any device within the geographic transmission area can intercept the transmissions. To provide data security, wireless LANs need to implement encryption at the expense of higher cost and reduced performance.

Power consumption: Portable and mobile devices are usually battery powered, and thus have limited power capacity. The wireless LAN protocol must be designed to be power efficient.

All these issues are addressed in the IEEE 802.11 wireless LAN protocol.

2. Both wired LAN and wireless LAN use physical layer and MAC layer.

Problem 2  LAN Bridges

Solution:

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<td>Port</td>
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<td>$S_5$</td>
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<td>$S_3$</td>
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<th>$B_2$</th>
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<tr>
<td>Station</td>
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Problem 3  The Spanning Tree Algorithm

Solution: One possible answer is

Problem 4  Bridge vs. Repeater

Solution:

10 Mbps LAN
$R = 100 \text{ kbps}$
efficiency $= 0.80$

Bridge:

Each station is equally likely to transmit to any other stations in the extended LAN. Then $R/2$ traffic is local.

$$\frac{100 \text{ kbps} \cdot \frac{1}{2} N}{10 \text{ Mbps}} \leq 0.8 \quad N \leq 160$$

Repeater:

$$\frac{100 \text{ kbps} \cdot N}{10 \text{ Mbps}} \leq 0.8 \quad N \leq 80$$
Problem 5  Source Routing Bridges

Solution:

a. Show the paths of the single route broadcast frames when S1 wants to learn the route to S2.

b. Show the paths of all routes broadcast frames returned by S2.

c. List all possible routes from S1 to S2 from part (b).

LAN1 → B2 → LAN3 → B5 → LAN5
LAN1 → B1 → LAN2 → B3 → LAN3 → B5 → LAN5
LAN1 → B1 → LAN2 → B4 → LAN4 → B6 → LAN5
LAN1 → B2 → LAN3 → B3 → LAN2 → B4 → LAN4 → B6 → LAN5

d. How many LAN frames are required to learn the possible routes?

Four frames

Problem 6  Ethernet Packets Live

Solution:

1. Physical address: 08-00-20-C0-A4-F2.
2. Physical address: 00-D0-05-2C-98-00. (You may get a different MAC address.)
3. Source IP: 129.105.5.8. (You may get a different answer.)