ETH
Eidgenössische Technische Hochschule Zürich
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# Operating Systems and Networks
# Sample Solution 5

## 1 Data Link Layer

### 1.1 Hamming code

A 12-bit Hamming code whose hexadecimal value is 0xE4F arrives at a receiver. Assume that not more than 1 bit is in error.

**a)** *Which bit is not correct?*

If we number the bits from left to right starting at bit 1, in this example bit 2 (a parity bit) is incorrect.

**b)** *What was the original value in hexadecimal?*

The 12-bit value transmitted with Hamming encoding was 0xA4F. The original 8-bit data value was 0xAF.

## 2 Multiple Access Control Sublayer

### 2.1 Wireless Communication

Consider five wireless stations, A, B, C, D, and E. Station A can communicate with all other stations. B can communicate with A, C and E. C can communicate with A, B and D. D can communicate with A, C and E. E can communicate A, D and B.

**a)** *When A is sending to B, what other communications are possible?*

Since all stations will see As packet, it will interfere with receipt of any other packet by any other station. So, no other communication is possible in this case.

**b)** *When B is sending to A, what other communications are possible?*

Although B's packet will not be seen by D, other nodes, e.g., E, or C, cannot send to D because the packets from these nodes will interfere with the packets from B at A. Therefore, other comminications is not possible at the same time.

**c)** *When B is sending to C, what other communications are possible?*

B's packet will be seen by E, A and C, by not by D. Thus, E can send to D at the same time.

### 2.2 MACA

*Is it possible for two transmissions to take place simultaneously? Explain your answer.*

Yes. Since they are in a straight line and that each station can reach only its nearest neighbors, A can send to B while E is sending to F.

### 2.3 CSMA/CA

*Which of the last two stations do you think is closest to A, and why?*

Station C is the closest to A since it heard the RTS and responded to it by asserting its NAV signal. D did not respond, so it must be outside A's radio range.

### 2.4 CSMA/CD

**a)** *What is the length of a contention slot in CSMA/CD for a 2-km twin-lead cable?* Signal propagation speed in twin lead is $2.46 * 10^8$ m/sec. Signal propagation time for 2 km is 8.13 $\mu$sec. So, the length of contention slot is 16.26 $\mu$sec.

**b)** *What is the length of a contention slot in CSMA/CD for a 40-km multimode fiber optic cable?*

Signal propagation speed in multimode ber is $1.95 * 10^8$ m/s. Signal propagation time for 40 km is 205.13 $\mu$sec. So, the length of contention slot is 410.26 $\mu$sec.

## 3 Network tools

### 3.1 `Wireshark`

**a)** *discussed in the recitation session*

**b)** *We can use* `Wireshark` *to capture the traffic and inverstigate the packet header.*