



Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zurich  
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# Operating Systems and Networks

## Assignment 5

Assigned on: **22nd Mar 2014**

Due by: **27th Mar 2014**

### 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?
- b) What was the original value in hexadecimal?

### 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?
- b) When B is sending to A, what other communications are possible?
- c) When B is sending to C, what other communications are possible?

#### 2.2 MACA

Six stations, A through F, communicate using the Multiple Access with Collision Avoidance (MACA) protocol.

- a) Is it possible for two transmissions to take place simultaneously? Explain your answer.

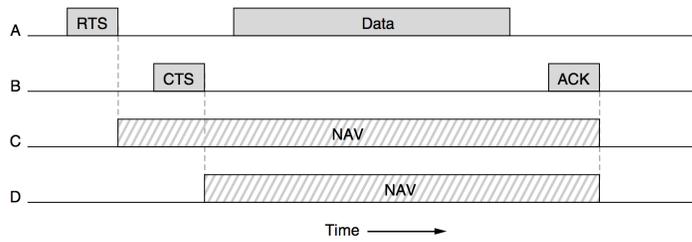


Figure 1: Virtual channel sensing using CSMA/CA

## 2.3 CSMA/CA

To reduce ambiguities about which station is sending, 802.11 defines channel sensing to consist of both physical sensing and virtual sensing (see Figure 1). Physical sensing simply checks the medium to see if there is a valid signal. With virtual sensing, each station keeps a logical record of when the channel is in use by tracking the NAV (Network Allocation Vector). Each frame carries a NAV field that says how long the sequence of which this frame is part will take to complete. As shown in Figure 1, four stations, A, B, C, and D, are shown.

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

## 2.4 CSMA/CD

If signal propagation speed in twin lead is  $2.46 \times 10^8$  m/sec and signal propagation speed in multimode fiber is  $1.95 \times 10^8$  m/sec,

- a) what is the length of a contention slot in CSMA/CD for a 2-km twin-lead cable?
- b) what is the length of a contention slot in CSMA/CD for a 40-km multimode fiber optic cable?

# 3 Network tools

## 3.1 Capture the traffic

Now we use the tool **Wireshark** to capture and analyze the website downloading traffic.

- a) Download the website [www.netsec.ethz.ch/about/index](http://www.netsec.ethz.ch/about/index) by using `curl`. Select the correct interface in **Wireshark** to capture traffic related to website Downloading.
- b) Describe what you observed in the packet headers, e.g., protocol number and IP address fields, according to the **Wireshark** manual ([http://www.wireshark.org/docs/wsug\\_html\\_chunked](http://www.wireshark.org/docs/wsug_html_chunked))