FACULDADE DE COMPUTAÇÃO – FACOM
GBC056 – Arquitetura de Redes de Computadores

"Design and Validation of Computer Protocols" - Gerard Holzmann

Problems extracted of the Text Book
Chapter 01 – Introduction

01 - The transmission code developed by Polybius for his torch telegraph divided the 24-letter Greek alphabet into five groups. The first four groups had five letters each, and the fifth group had the remaining four. The telegraph worked with two groups of torches: one was used to encode the group number, the other to transmit the character number within that group. Transmission took place character by character, by raising and lowering torches in the two groups. There were no codes for spaces to separate words, nor for any kind of punctuation. (Punctuation was not used yet in written Greek either.) There was, however, one additional control message to signal the start of a message: two torches raised simultaneously (see the quotation from Polybius on page 2). What are the possible synchronization problems, in the absence of a proper agreement on the order in which the torches in the two groups are to be lowered and raised?

02 - Estimate the transmission speed of the torch telegraph and compare it with Chappe's system. How long does it take to transmit the message "protocol failure?"

04 - If the signalmen at the Clayton tunnel had had the complete character set on their needle telegraphs, consider how they could have used it to resolve the problem. The length of the tunnel is 1.5 miles, the speed of the trains was approximately 45 miles per hour, and the transmission speed of a needle telegraph is about 25 symbols per minute. The problem for the signalmen was to establish the whereabouts of the second train. At the crucial moment the second train was backing out of the tunnel to where the third train was waiting. The signalman at A assumed that the second train had already left the tunnel; the signalman at B did not know that a second train was involved.

05 - Try to revise the protocol for the Clayton Tunnel to avoid completely the possibility of the accident. Do not assume that the number of trains in the tunnel is always either zero or one, and do not assume that trains always travel in one direction.