Network Protocol Design and Evaluation

Exercise 2

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Summer 2009
Exercise 2

1. **UML diagrams**
   Specify the alternating bit protocol in UML using an appropriate diagram type. In which state does the protocol start? Give an example for a message exchange between two terminals and present it in UML.

2. **Alternating Bit Protocol**
   Prove that the alternating bit protocol works correctly, i.e. no message is lost and no duplicates are accepted.
The Alternating Bit Protocol

Notation: ! = send, ? = receive, “msg,0” = message with 0 bit appended, I/O = accept message, fetch new message

[Bartlett, Scantleburst, Wilkinson 1969]
Exercise 2, Task 1

UML state chart of the Alternating Bit Protocol. The counterpart ABP’ is defined analogously.
Exercise 2, Task 1

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Exercise 2, Task 2

- To show: every message fetched by A is
  (a) received at least once by B
  (b) accepted at most once by B

- We start in $q_2,q_2$ where A fetches a message and begins with alternating bit = 0. B waits for this message.

(we do not consider initialization here)
Exercise 2, Task 2

- (a) ... received at least once by B

- A sends msg,0
  - B receives msg,0 → ok, received
  - B receives err → state q₁, i.e.
    - B sends msg,1 until msg,0 arrives
    - A receives msg,1 (or err) and retransmits msg,0
      i.e. it is retransmitted until B receives it
Exercise 2, Task 2

- (b) ... accepted at most once by B

- B receives msg,0 and answers with msg,0 (q5)
  - A receives msg,0, switches to q5 and fetches a new message (no duplicate after this point).
  - A receives err and sends msg,0 again
    - B can only accept the next character if msg,1 arrives (not a duplicate)