ALBERT-LUDWIGS-
UNIVERSITÄT FREIBURG

Network Protocol Design and Evaluation

Exercise 2

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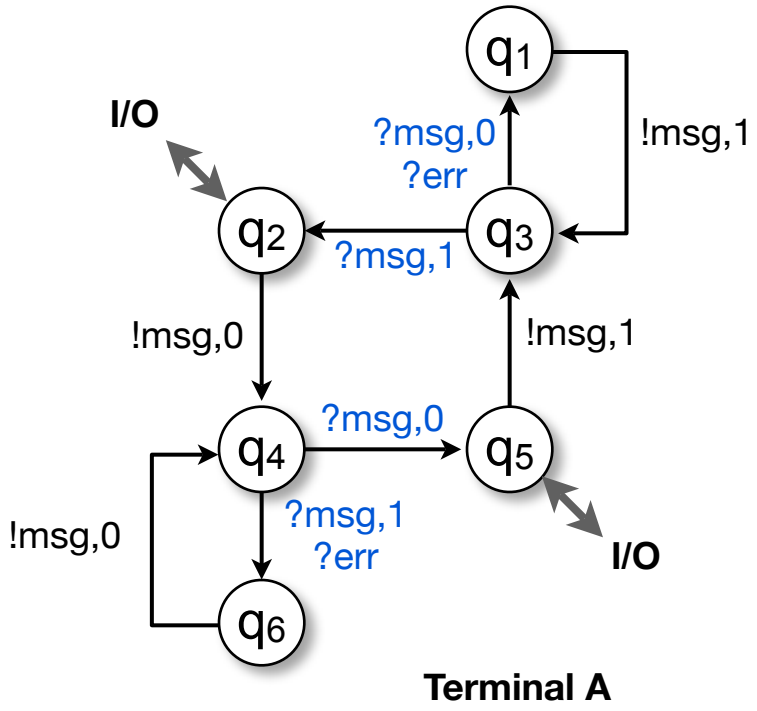
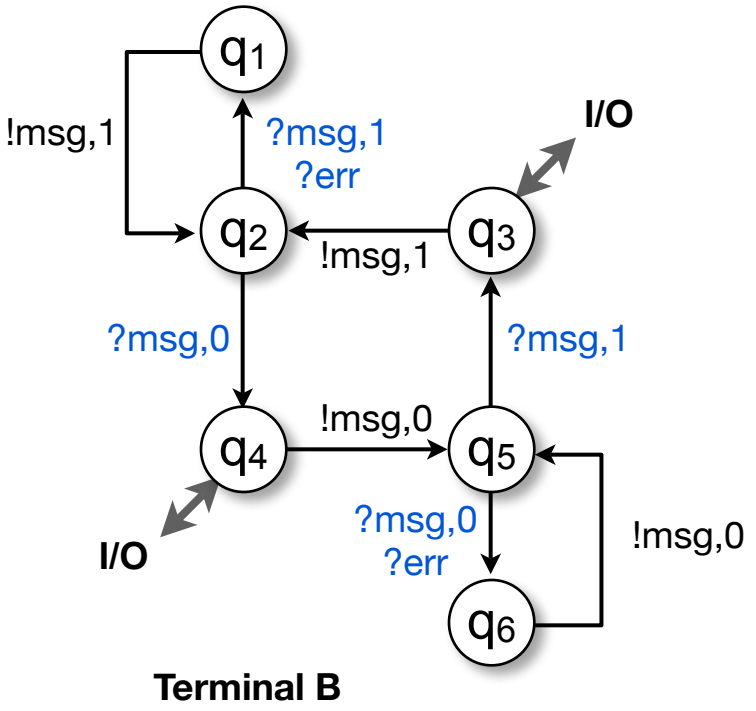
Exercise 2

1. *UML diagrams*
   Specifiy 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



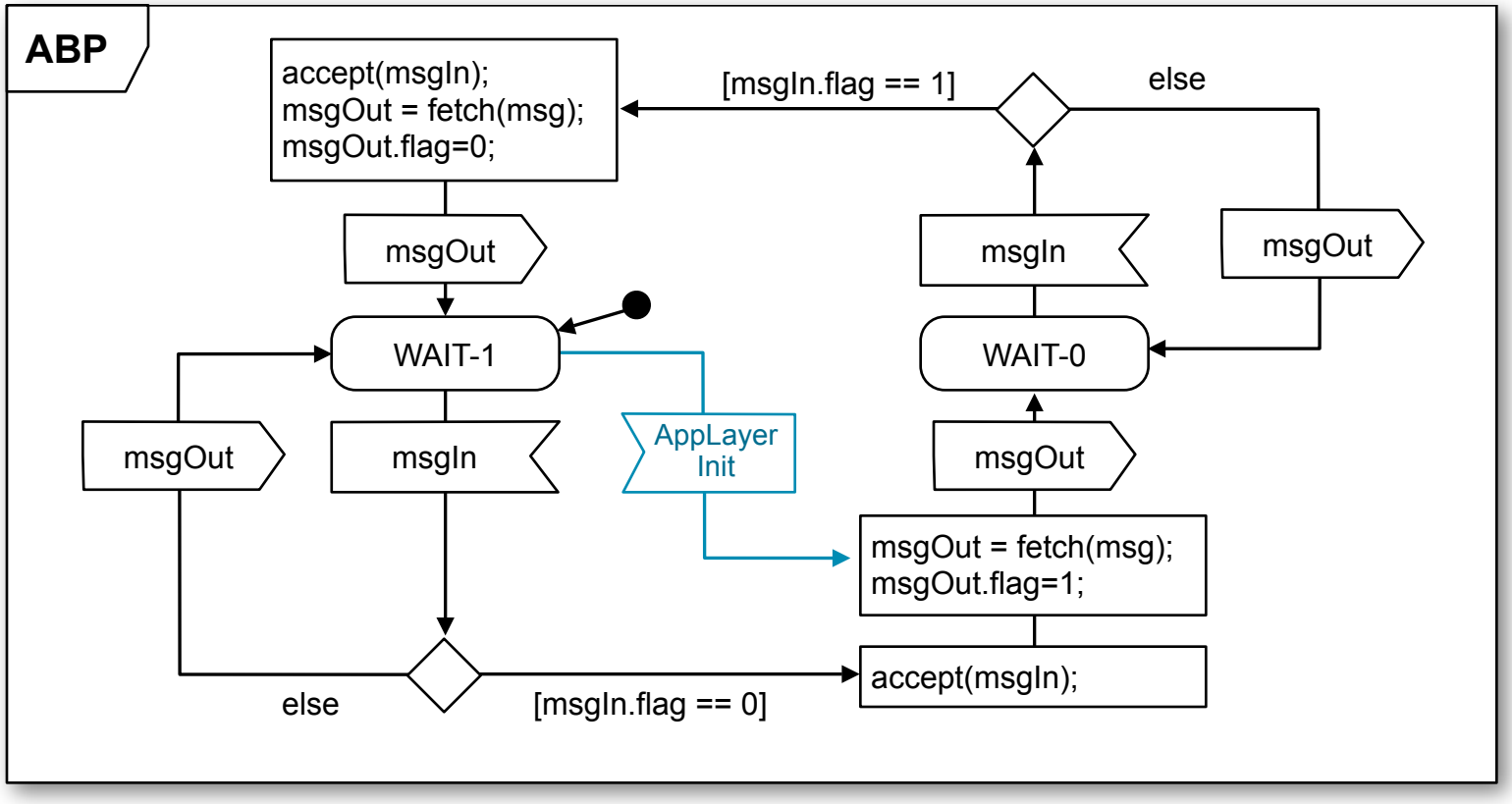


Notation: ! = send, ? = receive,
“msg,0” = message with 0 bit appended
I/O = accept message, fetch new message

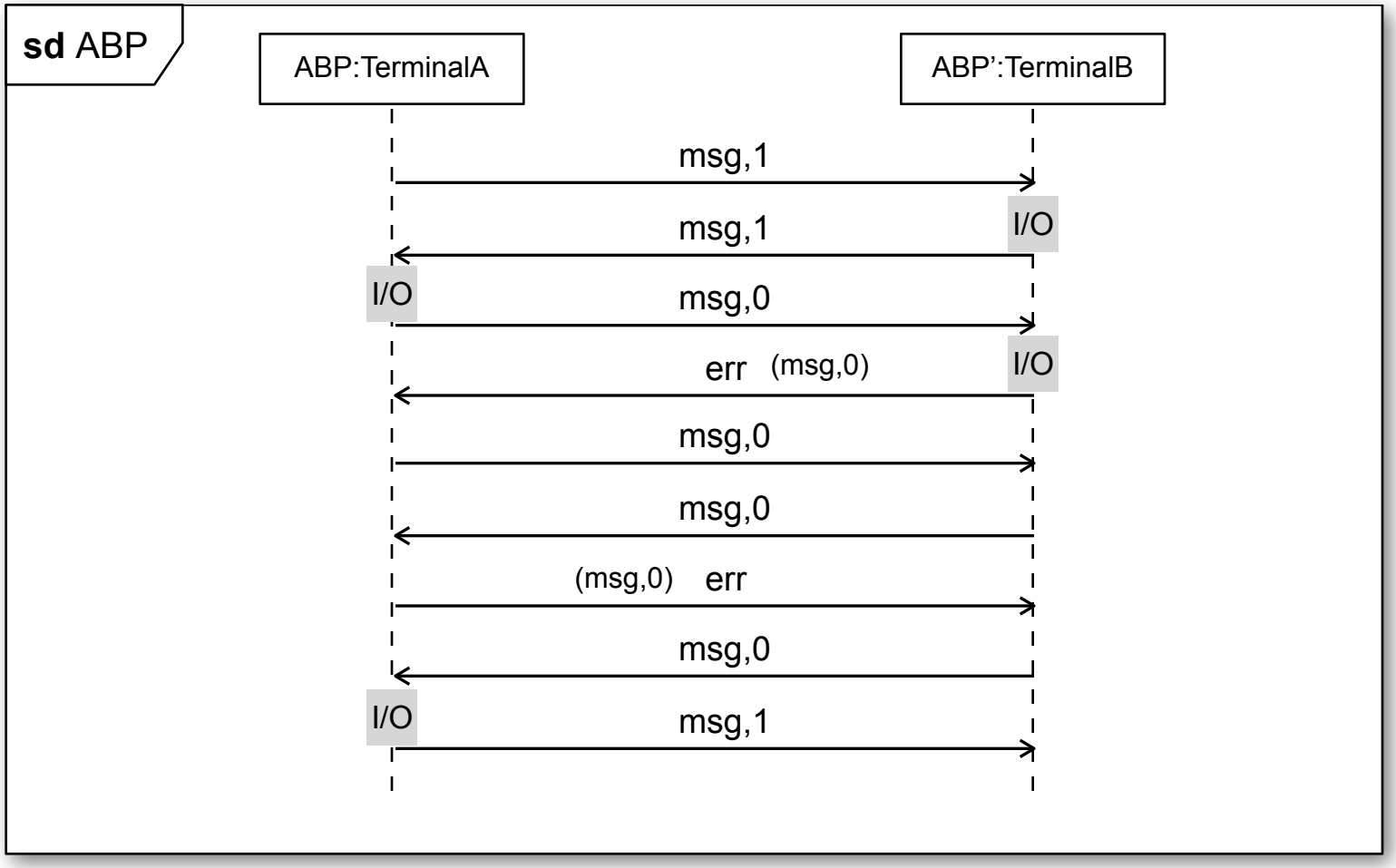
[Bartlett, Scantleburst, Wilkinson 1969]

Exercise 2, Task 1

UML state chart of the Alternating Bit Protocol. The counterpart ABP' is defined analogously.



Exercise 2, Task 1



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

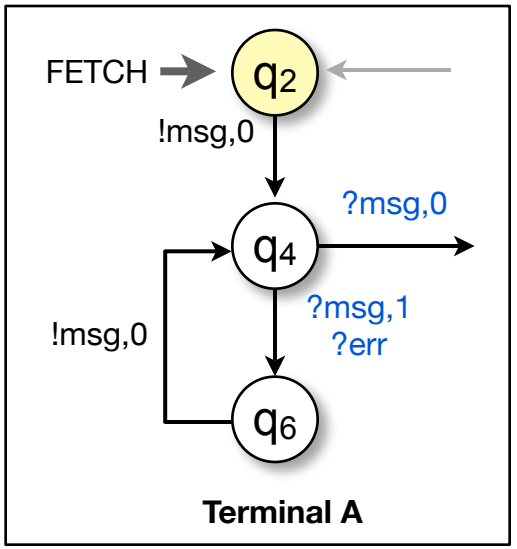
- We start in q_2,q_2 where A fetches a message and begins with alternating bit = 0. B waits for this message.

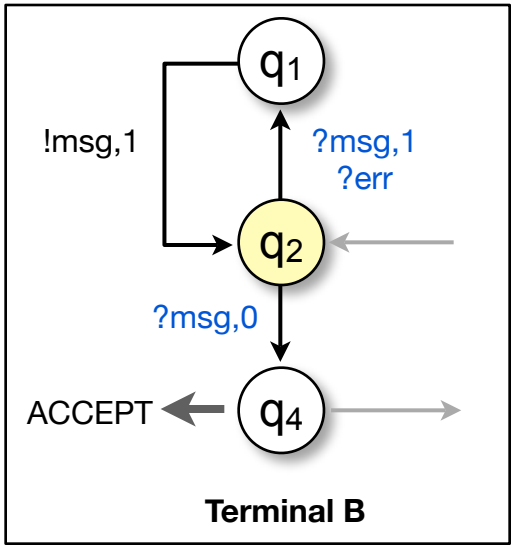
  (we do not consider initialization here)

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 q_1, 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 (q_5)
  - A receives msg,0, switches to q_5 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)