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LEHRSTUHL FÜR INFORMATIK 2
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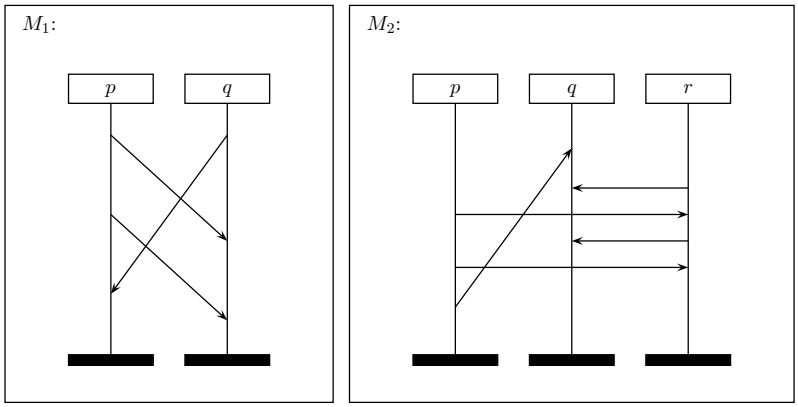
Foundations of UML
Winter term 2009
– Assignment 6b –

Hand in the solutions before the exercise class on December 16th.

Exercise 1 (4 points)



Show whether the formulas:

- $\Phi_1 = \exists \left(\langle proc \rangle^{-1} \langle proc \rangle^{-1} \langle msg \rangle q!p \wedge \langle msg \rangle^{-1} p!q \right)$ and
- $\Phi_2 = \forall \left([proc]^{-1} false \wedge (\langle msg \rangle p!q \vee \langle proc \rangle q?p) \right)$

hold for M_1 and the formulas

- $\Phi_3 = \exists \langle \{p!q\}; proc; proc; proc \rangle [proc] false\}$ and
-

$$\begin{aligned} \varphi &= [proc]^{-1} false \rightarrow \langle \alpha \rangle [proc] false \\ \alpha &= ((\{q!p \vee q!r\}; proc)^*; \{q?p \vee q?r\}; proc; \\ &\quad (\{q!p \vee q!r\}; proc)^*; \{q?p \vee q?r\}; proc; \\ &\quad (\{q!p \vee q!r\}; proc)^*; \{q?p \vee q?r\}; proc; \\ &\quad (\{q!p \vee q!r\}; proc)^*)^* \\ \Phi_4 &= \exists \varphi \end{aligned}$$

hold for M_2.

Exercise 2 (6 points)

Write down the PDL formulas according to the informal descriptions:

- The total number of messages sent and received at process 1 is odd.
- There does not exist a path from process 1 to process 2.
- If process 1 receives *req* from process 2, then process 1 will eventually send an *ack* to process 2 and in between these two events, process 1 cannot send any messages to other processes.

Exercise 3 **(10 points)**

Provide an algorithm for checking the backward path expression i.e., the function TransBack from the PDL model checking algorithm (see Lecture 12 slide 22).