



**Exercises**  
**Distributed Systemes: Part 2**  
**Summer Term 2013**  
19.7.2013

### 3. Exercise sheet: Petri Nets

#### Exercise 1

Model a traffic light by a Petri-Net.

- (1) You can use any number of places, however only multiplicity 1 is allowed.
- (2) Now only 3 places (one for each color) may be used, but there are no restrictions on the multiplicities.

#### Exercise 2

Prove or give a counterexample:  $m[q]m' \Leftarrow m' = m + \Delta q$ .

#### Exercise 3

Model the following Handshaking protocol by a Petri-Net:

Two processes P1 and P2 mutually exchange messages. P1 is the sender and P2 the receiver. P1 starts in state *Ready-to-Send*. When it has sent a message to P2, it moves into the state *Ready-to-Receive* and waits for an acknowledgement ACK sent by P2. Once the acknowledgement has been arrived, P1 can send more messages. P2 starts in state *Waiting-for-Messages*. If it receives a message, it confirms by sending an acknowledgement ACK to P1 and waits for more messages.

#### Exercise 4

Model the following *Reader-Writer* synchronization protocol with a P/T Petri Net: There are  $k$  processes that compete for a resource  $p^*$ . Only one process is allowed to write to  $p^*$  at a time, but at most  $k$  processes are allowed to read  $p^*$  in parallel.