Software Modeling and Verification
Lehrstuhl für Informatik 2
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Foundations of the UML

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– Assignment 3b –

Hand in until November 18th before the exercise class.

Exercise 3 **(16 points)**

Consider the following two properties of CMSGs (**note:** $\lambda(v)$ contains at least one event for $v \in V$):

(P_1) : A CMSG $\mathcal{G} = (V, \rightarrow, v_0, F, \lambda)$ satisfies (P_1) if for every transition $(v, w) \in \rightarrow$ the communication graph of $\lambda(v)$, $\lambda(w)$ and $\lambda(v) \cdot \lambda(w)$ is weakly connected.

(P_2) : A CMSG $\mathcal{G} = (V, \rightarrow, v_0, F, \lambda)$ satisfies (P_2) if every CMSC labeling a simple loop (i.e., a loop where each edge is exactly traversed once) of the graph $(V, \rightarrow)$ has a weakly connected communication graph.

a) Show that (P_1) implies (P_2).

b) Prove that every local-choice MSG fulfills property (P_2).

c) Show that the other direction of b) does not hold in general.

Explanation: a graph is called *strongly connected* if every node can be reached by every other node. If the direction of edges is disregarded it is called *weakly connected.*