RHEINISCH-WESTFÄLISCHE TECHNISCHE HOCHSCHULE AACHEN

LEHRSTUHL FÜR INFORMATIK 2
RWTH Aachen · D-52056 Aachen
http://moves.rwth-aachen.de

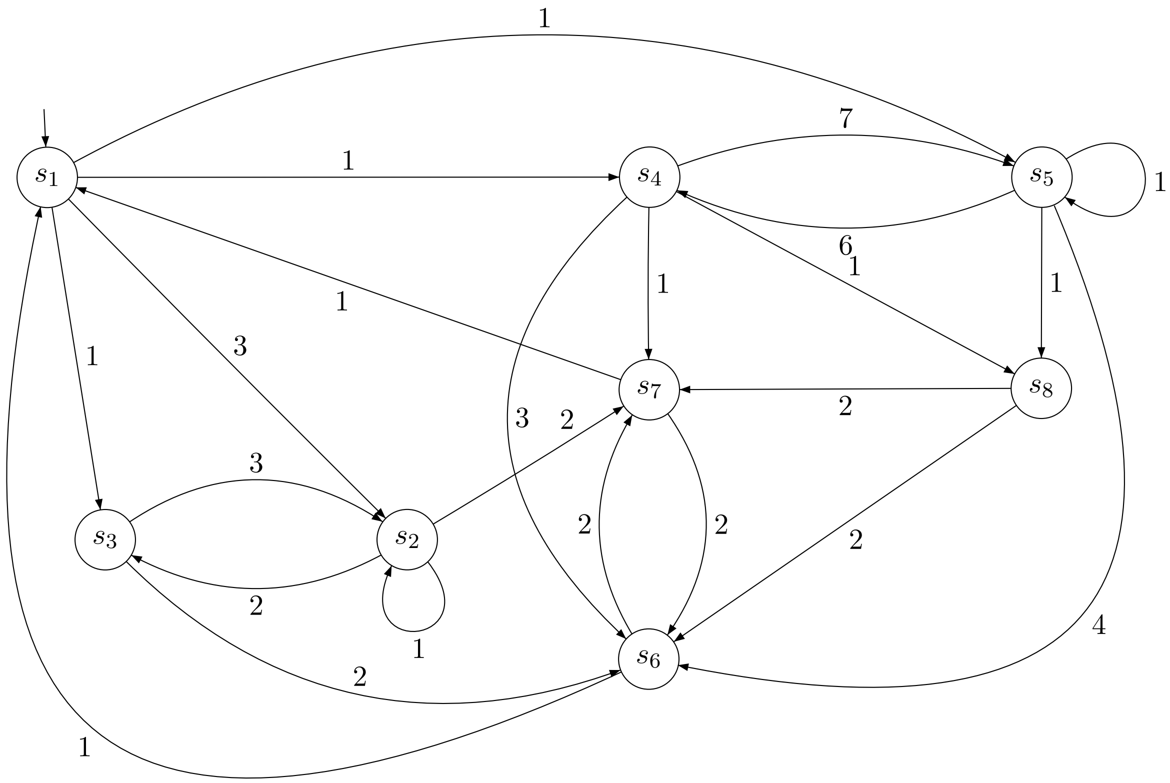
Prof. Dr. Ir. J.-P. Katoen
N. Jansen & B. Kaminiski

Modeling and Verification of Probabilistic Systems
Summer term 2014

– Series 9 –

Hand in on July 10 before the exercise class.

Exercise 1 (3 points)



Consider the CTMC C given above. Let $G = \{s_6, s_7, s_8\}$ be the set of goal states. Find out $Sat(\Diamond^{\leq 2} G)$ by the following steps:

- Determine $C/\sim_m$.
- Make all equivalence classes in $C/\sim_m$ that contain goal states absorbing.
- Uniformize the CTMC obtained in the previous step.
- Find out the transient probability for $t = 2$ of the uniformized CTMC.

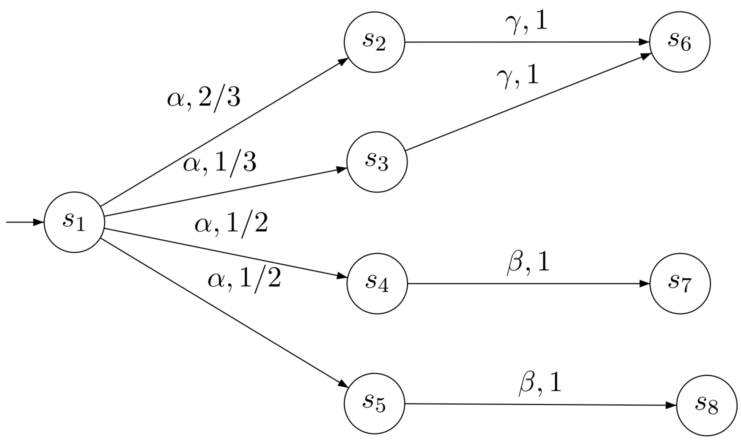
Exercise 2 (2 points)

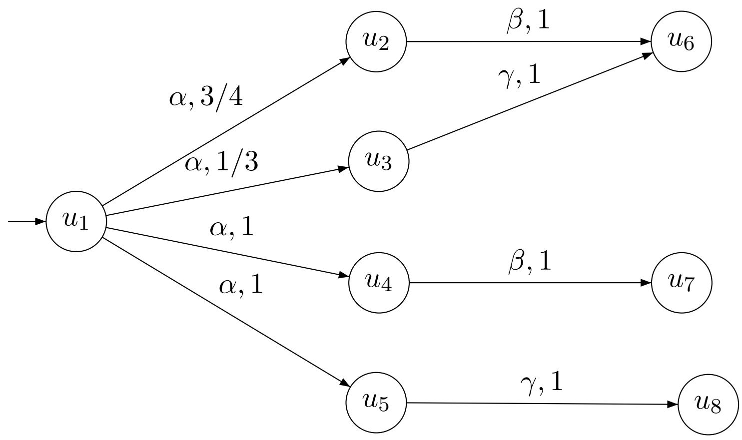
Let C be a CTMC with state space S, states $s, u \in S$, $t \in \mathbb{R}_{\geq 0}$ and let $G \subseteq S$ be closed under $\sim_m$. Prove the following statement:

$$s \sim_m u \text{ implies } \Pr(s \models \Diamond^{\leq t} G) = \Pr(u \models \Diamond^{\leq t} G)$$

Indicate in your proof where the fact that G is closed under $\sim_m$ is used.

Exercise 3 **(2 points)**





Consider the two probabilistic automata P_1 and P_2 given above. Prove or disprove the following statements:

- $s_1 \sim_p u_1$
- $s_1 \sim_{cp} u_1$

Exercise 4 **(3 points)**

For any CSL path formula φ and state s of CTMC C, prove that the set $\{\pi \in Paths(s) \mid \pi \models \varphi\}$ is measurable.