Venice PhD course: Lab 2

April 11th 2013

1 Modelling airport security with PEPA

In this practical you are asked to construct a PEPA model representing an airport security check-point. Passengers `arrive`, at rate λ, at the check-point and place their bags on a conveyor belt for screening. 75% of passengers have just a single item of hand-baggage and 25% have a laptop within the bag which must be taken out for separate scanning . Depositing a bag on the conveyor belt takes approximately $1/d$ seconds (action `deposit`) but this time doubles if a laptop has to be deposited separately. Passengers then `walk`, at rate ω through the metal detector. Approximately 1 in 10 passengers are additionally searched, taking $1/s$ seconds on average (action `search`). Finally the passenger must `collect` her bag, and possibly a laptop: picking up just a bag takes approximately $1/c$ seconds, but again this time doubles if a laptop must also be retrieved. The conveyor belt accepts items and then screens them, taking $1/sc$ seconds on average.

I suggest that you start with the following parameter assumptions, although you may want to play around with changing some of these rates and observing the impact on the performance measures.

parameters	λ	d	ω	c	s	sc
value	3.0	10.0	10.0	10.0	1.0	10.0

a) Construct a PEPA representation of a passenger, using the action types indicated in the description and suitable rates.

b) Construct a PEPA representation of the conveyor belt, using appropriate action types and suitable rates.

c) Write a PEPA expression to represent a model of the checkpoint when there are up to three passengers present at a time.

d) Using the PEPA Eclipse Plug-in calculate the size of the state space for this model.

e) Using the PEPA Eclipse Plug-in calculate:

   – The utilisation of the conveyor belt;

   – The throughput of passengers through the check point;

   – The average number of passengers waiting to be searched.