



December 20, 2022

These exercise sets cover some aspects you will find useful for the final exam software development. This exercises can be part of the material for the final exam questions. You are strongly encouraged to find yourself a solution to the presented problems.

## Exercises

The aim of this lab is to build a Monte Carlo emulator to estimate the performance of a given network in terms of traffic allocation.

As in lab 9, assume a uniform distribution for the traffic matrix: all node pairs request always the same bit rate of  $100 * M$  Gbps, where  $M$  is an increasing integer number (1, 2, 3, ...). Furthermore, assume that the probability density function associated to the extraction of a pair of source-destination nodes with a non-zero request is uniform for all the possible pairs.

A single Monte Carlo run is represented by the task executed by the script written to satisfy the point 6 of lab 9. The most relevant metrics for network performance evaluation are: **the total capacity, the per-link average capacity and GSNR, the per-link minimum/maximum capacity and GSNR, blocking event count**.

In the following, two possible Monte Carlo-based approaches of network performance evaluation are presented. In the exam, other types of evaluation may be presented.

1. **[Single Traffic Matrix Scenario]** For a given value of  $M$ , fix the number of Monte Carlo runs for which the distributions of the metrics are stable (executing other Monte Carlo runs, the distribution does not change). For each run, collect the metrics of interest. For the current value of  $M$ , calculate **the final average metrics and plot the distributions**.
2. **[Network Congestion]** Plot the evolution of the metrics of interest given the increment of the  $M$  value.

