Text of exercise #1

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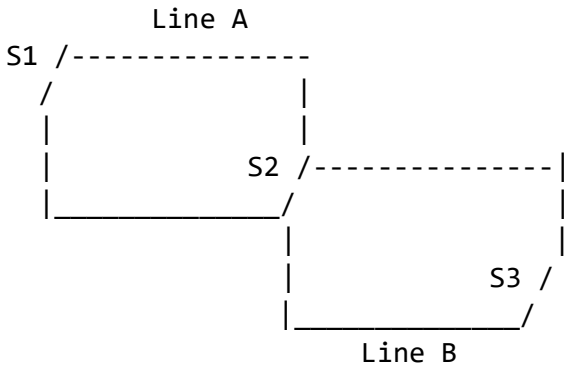
Laboratory #13 – System and device programming – A.Y. 2018-19

A small underground network has the following schematic representation:



Where Line A and Line B indicate the two underground lines (each one with two directions, clockwise and anti-clockwise), and S1, S2, and S3 are the three stations. Notice that in station S2 tracks are common, in both directions, for Line A and Line B.

To control the underground network, write a Windows-32 application with the following specifications:

- At the start-up the application has to create:
  - One thread named `commuters` in charge of the commuters entering all underground stations. This thread, every `time1` seconds decides the number of commuters (in the range [0, 100]) entering each station in each direction.
  - One thread for each station, named `station`. Stations are initially empty, but a random number of commuters enter each station as specified by the thread `commuters`.
- When:
  - The number of commuters has been larger than 75 for a direction for 3 times at a time distance equal to `time1` (i.e., at T, (`T + time1`) and (`T + 2 x time2`) for any time T) the station must generate a new train in that direction.
  - The number of commuters has been less than 30 for a direction for 3 times at a time distance equal to `time1` (i.e., at T, (`T + time1`) and (`T + 2 x time1`) for any time T) the station must suppress the first train it has created.
- Each train is represented by a thread (named train) and it has a capacity of 100 passengers. Each train needs `time2` seconds to move from one station to the following one, and it enters a station only if the tracks are empty in its direction. Each train stays in the station `time3` seconds. Every time a train enters a station, a random number of passengers (at most equal to the current number of commuters in the train at that moment) leave the train, and a random number of passengers (at most equal to the capacity of the train) get on board of the train. When a train is killed (by one station) it is supposed to end its run in a secondary station (not taken in charge by the system) where all commuters on-board get out.

The application has to simulate the entire underground network, printing all main actions performed by the commuters, all station and all train threads.