Dear Bernie

As you may know, our company has been commissioned to write software for WasTrack, which runs the boxcar repair services in this state. WasTrack is experiencing problems in its operations and has hired us to write a complete simulation of their operations, so that they can assess the improvements that could be achieved by increasing the number of workshops, changing the scheduling algorithms for the workshop, adding more storage areas, laying more track, and so on.

I need you to analyze the data structures that will be needed and provide me with a written report. You are welcome to join forces with up to two other data structuralists.

The simulation must simulate the movement of boxcars through their system. At present, the arriving boxcars are placed in some waiting-tracks which have limited capacity (seem to be FIFO discipline, though potentially one could reverse a boxcar out of a waiting-track). There are also several (single-track) sidings where boxcars can be stored. These are strictly LIFO discipline, but provide virtually unlimited storage. There are three identical workshops, which each work on one boxcar at a time. (Due to the weight of a boxcar, it remains on a track throughout the process.) Interconnecting the waiting-tracks, the sidings and the workshops is a tangle of crisscrossing tracks.

Currently, each boxcar is assessed on arrival. It is given an identity-number, the time-needed-for-repair is determined and it is assigned a priority. It is then added to the schedule for one of the workshops. Until the workshop is ready for it, the boxcar stays on the waiting-track or is moved to a siding so that it is out of the way of the boxcars behind it. After the boxcar is repaired, it is immediately moved to the exit.

The simulation would also have to simulate the sappy database that maintains the information about the boxcars and workshops etc. The simulation will need to display the relevant data for each boxcar, and compute appropriate statistics. WasTrack would also like to use the simulation to compare certain operational strategies with that which they currently use. For example, at present all low-priority boxcars are immediately moved to one of the sidings.

I need within a few days a report analyzing the appropriate data structures to be used. For ease of reading, apart from some general opening remarks, I just want to see a list of possible classes one might define, and for each class a statement of what data structure (and implementation) would be appropriate, and how the class would be used. Please include reasons for your choices. Please underline each and every data structure mentioned.

Please bring one hard copy for the group on Thursday 2 November at 9:30am.

– Nikki