Advanced SQL - PROG3070 (W2014)

Assignment #2

**Submissions – individual or group of 2**

# Objectives

1. To develop a SQL-based simulation soution

2. To create and use triggers, stored procedures, stored functions and views to model business/production line workflow

# Assignment Background and Functionality Description

Our customer is asking us to create a database backed simulation to support and test simple electronic Kanban solution.

For an explanation of Kanban, see the following sites:

<http://en.wikipedia.org/wiki/Kanban>

<http://www.strategosinc.com/kanban_1.htm>

The customer builds a fog lamp assembly for automobiles. The assembly is made up of a harness, a reflector, a housing, a lens, a bulb and a bezel. Each of these parts is in its bin, and an employee takes one of each of these parts and puts it together. Once completed, the fog lamp is placed on a tray with separators. When full, the tray is sent to the testing department.

At present, the customer uses a manual Kanban system. Each bin has the following starting capacities:

- Harness: 75

- Reflector: 35

- Housing: 25

- Lens: 40

- Bulb: 50

- Bezel: 75

There is a Kanban card in a sleeve on the side of each of the bins. When there are only 5 parts left, the card is removed by the assembler and placed into a common tray (e.g. All stations are checked for cards every 5 minutes). A runner picks up all cards from the tray every 5 minutes. He goes to the stock room, picks up a new bin of the specific part on the card, and then replaces it with the old one. New bins have the starting quantities outlined above. Any remaining parts are placed on top of the stock in the new bin. The return time to/from the stock room fits into the 5 minute span mentioned above.

The stock room is on a separate Kanban system, but both systems should access a common stock room inventory database. The stock room can be assumed to have an infinite supply of new parts bins for our purposes here.

The assembly area dedicated to fog lamps has 3 assembly stations, though the customer projects this might need to be expanded in the near future. An experienced worker can assemble a completed fog lamp in 60 seconds, +/- 10%. New employees in this position can take about 50% longer.

Test trays can hold 60 completed units, and each tray should be assigned a test unit number that has the format FLxxxxxxyy where xxxxxx is a sequentially assigned integer. Each completed lamp in the test tray should be assigned a number (yy) according to its position in the tray (e.g. 13 or 54). FL00020334 would be the 34th lamp in the 203rd test tray. Every lamp in the test tray will be tested, and can be passed/failed. You must be able to modify various rates of failure (See questions below).

Build a database to support an electronic version of this system. Use triggers, functions, views and stored procedures as is necessary. Once the simulation is complete, you’ll need to test your solution according the following questions, showing your results in a Word or PDF file for the instructor’s review.

# Specific Requirements:

1. SQL Only – We can accomplish the goal of simulating this automation with the SQL techniques discussed in class. You’ll not need to write any application (C#, Java, etc) code for this assignment.
2. Your solution must step through time, so that we can study potential bottlenecks in the assembly line process and so on. Be sure to provide some mechanism to scale our passage of time appropriately so that we don’t have to wait a real minute for an assembly to occur (for example).
3. You’ll need to provide your well documented/commented SQL scripts to solve the questions below, along with sample output showing that your solutions meets the requirements.
4. A relational schema diagram is needed, but easy to obtain from MySQL or MSSQL. It is important that we see that you

# Checkpoint!

1. It is very important that you plan this assignment out. Go over all the details above and questions below now, make notes, and use the in-class time provided on the first day of the assignment to ask for clarifying questions.
2. On the second class (in between assigned and due dates) additional class time will be given to exploring your schema choices, and having a chance to speak about your assignment 1:1 with the instructor. Come prepared to do so, please.

# Questions and Scenarios to Be Answered

1. Provided and briefly describe the triggers, stored procedures, functions and views you implemented to support the basic operations of the simulation as described above. (10 marks)
2. Provide your schema diagram. (5 marks)
3. Assuming 3 stations are running with experienced workers, some components will be replaced at the station more often than others. (20 marks)
   1. Produce a view that displays the most ‘in demand’ components per assembly station.
   2. Run the simulation for 7 hour shift of simulated time, and then run your view to give us a report on the activity for the shift.
   3. Adjust your speed on the stations – Have one new worker, one experienced worker (normal time) and one super worker (takes 15% less time to make a lamp). Run the sim for 7 hrs and produce the same report.
4. Pick either a or b below (5 marks)
   1. What would happen if we had 2 runners instead of just one, for scenario 3c?
   2. We need a report that shows which lamps from a given test batch number are defective (failed testing), and a quick way to fail an entire tray should we locate a core defect.

# Assignment submission - in a zip file in the D2L Drop Box for A2

- Provide required answer document to cover the questions/scenarios above

- Provide all scripts to create the objects in the database

- Provide test cases scripts to exercise the database functionality