Assignment #1
COMP 303
Well-Formed Networks of Objects
Due: October 3rd 2015

All your solutions, whether programmed or designed on paper, must follow these three important programming rules, they must be: well-formed, optimal, and energy conservative. These three rules are defined below:

Well-formed – Each program and diagram must follow proper syntax and adhere to the strict object oriented principals of encapsulation, information hiding and interfacing.

Optimal – Each solution must be efficient in execution speed and employ an economy of memory.

Energy conservative – Each solution must have a simple design, keep its lines of code to a minimum (or minimum arcs/boxes, or text), and require the least effort to code (or draw, or write). BUT, at the same time, maximize its expressiveness (i.e. being clear in its meaning).

For this assignment you will not submit compiled code. Submit your assignment as a PDF document containing answers to the following questions:

Question 1: Well-Formed Object (25 points)

A nuclear physicist wants to analyze and compare experimental data. Every experiment produces a text file containing a list of double values. This list of values can be of any length, changing from experiment to experiment. The values are measurements made during the experiment. The values are not in a particular order.

Create a class that can:

- Store the entire contents of a file in memory within the object
- Store the experiment's name
- Computes and returns the average of the values in the entire list
- Given a key, returns the number of times a value in the list was greater than the key
- It must have a constructor that initializes all the members of the object
- Given another experiment object, passed as an argument, this method compares the average and greater than count between the argument object and itself. It returns the name of the experiment having both the greater average and greater count. If one does not exist it returns "inconclusive".
- A user of this class would only want to construct objects and call the compare method.

For this question write out the enter class in Java. Provide the algorithms for the methods.

Question 2: Well-Formed Use-Case with Template (25 points)

Company ABC wants their employees to punch in and out from work using a computer. ABC builds widgets from raw material. An employee punches in when they pick up raw material to build a single widget. After they finish building a widget, they place the finished widget in the shipping room and

punch out. If they plan to build another widget from raw material, they then get more raw material and they punch in again. If they punched in and constructed more than one widget there is an optional place to enter the number of widgets created, otherwise it assumes one widget. At the end of the day the manager, using the computer, generates a report of the number of widgets created for a period of time. By default the system assumes the current date but optionally the user can specify a range. The report lists each employee and the quantity of widgets they built within the specified period.

For this question do the following:

- Provide a solution use-case diagram
- Provide a solution use-case template for the most complex activity

Question 3: Design an optimal Well-Formed Network using a Domain Model (25 points)

ABC Airlines would like to manage their planes and flight routes. They have 4 airplanes and they fly to 10 destinations. Planes are either in-flight or at a location (source or destination). Each plane has statistics they would like to track: size of flight crew, maximum passenger capacity, number of passengers, the route, and where they are in that route. A route has two locations: a beginning location and an end location. They would like to be able to create and delete airplanes, create and delete routes, assign a route to an airplane, edit the airplane statistics. The airline is required by law to have 20% more employees on staff then are needed to manage the airplanes they possess. This application tracks the employees (name, rank and position) and to which airplane they are currently assigned to. This application also tracks passengers (name and boarding pass). Only passengers possessing a valid boarding pass can be on an airplane. They would like to be able to create and delete people, assign or remove them to/from an airplane, and set the validity of the passenger's boarding pass.

For this question do the following:

- Provide a solution domain model

Question 4: Optimal State-Transition or Interaction Diagram (25 points)

Using the problem statement from question 3, decide which diagram is better to use (state diagram or interaction diagram) to describe how the menu system functions. Then, using the diagram you selected, describe the problem statement's menu system. 50% of the points are given to selecting the better diagram to use and the remaining 50% goes to the correctness of the diagram.

For this question do the following:

- Select the best diagram to use
- Using your selected diagram, describe the menu system