CSCE 742 - Assignment 1

Due Date: Tuesday, September 25th, 11:59 PM (in PDF format, via Dropbox)

Question 1 (16 Points)

In class and in the Garlan and Shaw paper, we considered architectural styles, including:

    a. pipe and filter
    b. event-based
    c. layered
    d. repository

Suppose that you are to design an automotive system whose subsystems (a-h) are enumerated below. For each style discussed above, describe a subsystem where the style would be an appropriate structuring mechanism - and why - or describe why this style does not apply to any of the subsystems.

    a. On-star communications: manages communications with satellite
    b. sensor management: turns noisy sensor data into useful information
    c. motion control: operates the motors and provides position and velocity
    d. Image processing system to identify highway lanes
    e. UX vehicle management involving touch screen
    f. Health/status monitoring: checks status of all other subsystems to ensure correct operation
    g. Collision avoidance system
    h. Dashboard displays

Question 2 (10 Points)

Some architectural styles subsume (contain within them) other styles. For example, all of the styles can be implemented using a theoretical object-oriented style that describes a Turing-complete programming language. You can build pipe-and-filter, event-based, and layered systems all using objects, so the object-oriented style *subsumes* the other styles.

Describe the relationships between the *event, pipe-and-filter, repository,* and *layered* styles in terms of their subsumption relationships and generality.

Question 3 (24 Points)

Consider the software for air-traffic control at an airport (say, CAE). Identify one performance, one availability, and one usability requirement that you think would be necessary for this software and develop a quality attribute scenario for each. Note that you will likely have to assume certain architectural choices in order to describe these scenarios.

Use the scenario format from Lecture 7. Requirements should be specific and testable. Scenarios should have single stimuli and specific, and measurable system responses.

Question 4 (10 Points)

What is the relationship between a use case and a quality attribute scenario? If you wanted to add quality attribute information to a use case, how would you do it?

Question 5 (15 Points)

Consider the simple ABC example in *Your "What" is My "How"*. The property is not true for floating point numbers.
1. Explain why.
2. Fix it: give one solution in which you change the input assumption and another solution where you change a component constraint.

Question 6 (15 Points)

Pipe-and-filter systems can be developed as *push* implementations and *pull* implementations. What is the difference? Explain both approaches in terms of locus-of-control (what triggers computation?). Comment on latency, memory, and computation load issues for both implementations. Give one example system where *push* is the best choice and another where *pull* is the best choice.

Question 7 (10 Points)

Proxy stakeholders are designated to act as stakeholders for groups that cannot be represented (e.g. users of an unreleased product). What are the risks with using proxy stakeholders, with respect to the effective stakeholder guidelines presented in class (from Rozanski and Woods)? Are there ways of mitigating those risks?