CpSc 875
MidTerm Exam

Name_____

Answer any FOUR of the five questions. Place a large X on the page for the question you are not answering. If you answer all five, I will not count the one on which you did the best. All questions are counted the same: 25 points each. Be certain to answer ALL parts of the questions you select to answer. When a question refers to either the architecture you developed in the project or specific examples that we developed in class, be certain to answer using the correct system. You are allowed the textbook, notes you have taken and handouts but no laptops.

1. We have discussed several basic architecture styles such as pipe and filter and MVC.
    a. List two ways these fundamental styles can be combined in a single architecture.

       Composed end to end where the output of one style serves as the input to the other

       One style is subsumed within the other

    b. Identify one fundamental style used in the architecture given in Figure 1. Describe which parts of the drawing in Figure 1 correspond to which parts of the standard style.

       Client/server- where the box marked client is the client and the box marked the server is the server

    c. Layering was the first standard style we applied. What qualities did it enhance and which did it degrade in CTAS?

       Portability and maintainability are enhanced and performance is degraded

    d. We also considered three fundamental types of architectural structures: module, component/connector, and allocation. Using Figure 1, trace a portion of the architecture that illustrates a component/connector structure in this architecture.

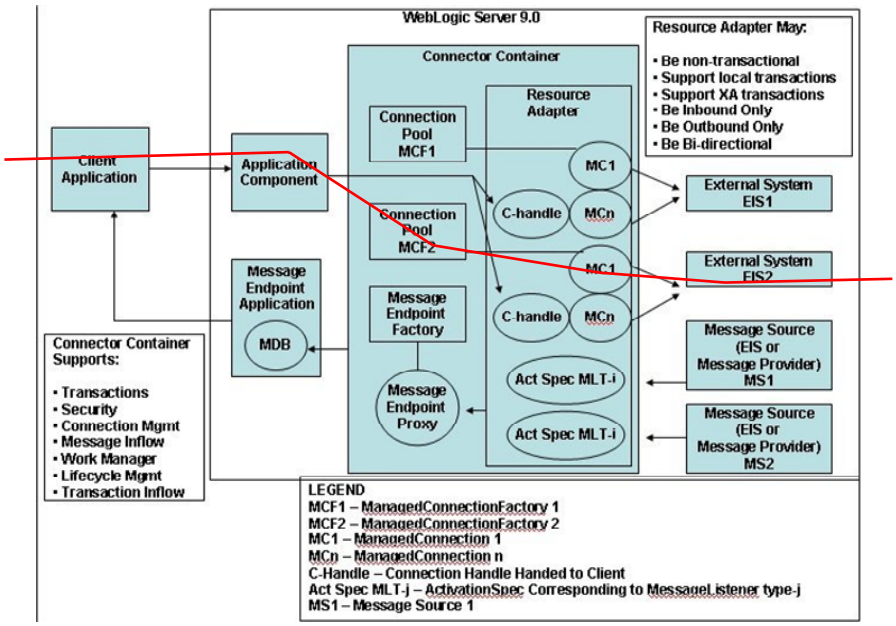

Figure 1 - A J2EE architecture

2. Scenarios play an important role in architecture development.
    a. We initially identify appropriate scenarios by identifying use cases. Why does this approach usually result in a more complete set of scenarios than simply making a bulleted list of requirements?

       It is easier to identify a complete set of actors (stimulators) on the system than it is to identify all requirements. By starting with actors and then focusing on the uses to which each actor puts the system we get a more complete set.

    b. List three scenarios for CTAS. List the stakeholder who would support each scenario. (make it three different stakeholders) Explain why each is a valid stakeholder in CTAS.
        1. *User creates a new itinerary. The user of the system would want this.*
        2. *Schedule information for a mode of transportation is updated. The service provider wants to attract business.*
        3. *A new capability is added to CTAS. The producer of the software wants the product to remain attractive to buyers.*

    c. Describe the role of scenarios in ATAM. How is it determined which are the most important scenarios?

       Scenarios are the test cases. They ensure that a thorough examination is conducted. The stakeholders in the system are given votes based on their relative importance to the success of the system.

    d. List all the tasks, in order of their use in the architecting process, in which we have used scenarios. How do the sets of scenarios used in these tasks differ from each other?

        1. *Requirements definition – a complete list of all possible situations that the system must handle*
        2. *Architecture definition – a prioritized list is used with the top few requirements being the driving requirements that are most actively tracked.*
        3. *ATAM – a subset of the prioritized list is used to focus the evaluation on risks to the success of the system*

3. We are using Attribute Driven Design as the approach to architecture design.
    a. Describe the process for determining which attributes will be used to evaluate design choices.

       The Quality Attribute Workshop or a similar meeting is held. Stakeholders are presented with a selection of qualities. They vote on which should be used.

    b. How are priorities among the attributes determined?

       By the ranking of vote totals

    c. When we decompose a module into 2 new modules, what gets divided?

       The responsibilities that each module must meet.

    d. There are several criteria for dividing a module. We first divided CTAS into three layers and then divided along the lines of Model/View/Controller. In each case we have three elements but there are fundamentally different reasons why we made these two transformations. What is the difference between the relationships among the layered elements and the relationships among the M, V, and C elements?

       The difference is the level of abstraction. The MVC elements each handle separate roles at the same level of abstraction while the layers handle the same roles but at different levels of abstraction.

4. An engineering decision is made carefully and on the basis of evidence.
    a. List the steps in the decision process we would use to decide whether to use the 3 tier or 4 tier version of the J2EE architecture style for our design of the Model module for CTAS.

        1. *Determine the differences between the two versions.*
        2. *Rate the effect of each difference on the software qualities*
        3. *Compute the aggregate effect*
        4. *Pick the one with the most positive impact*

    b. How is the quality of such a decision evaluated?

        By comparing the degree to which high priority software qualities are enhanced and degraded.

    c. List the two highest priority criteria you used in making the decision about which of the three architectures (J2EE, SOA, Grid) to use for the Model module. Justify why each is a valid high priority criteria given the goals and priorities for CTAS.

        The two criteria I would use would be upport for the user and maintainability.

    d. We begin with a standard architecture but then we modify it to tailor it to the specific problem. Justify our decision to split the View module of MVC into two modules. Use specific criteria and list both the qualities that are enhanced and those that are degraded.

        The split in the View was one of differences in level of abstraction. One resulting module was in the top layer and the other was one layer down. This enhanced portability, maintainability at the expense of performance.

5. We are using two tools for our work: The OSATE Eclipse plug-in for AADL and ArchE.
    a. How can we combine the information from the two tools to design the architecture?

       The information in ArchE supports decision making about design options. The results of those qualitative decisions are encoded in AADL so that we can perform tests on the complete architecture.

    b. How are the scenarios and responsibilities used in ArchE related to each other? (I mean logically, not how they are entered into the tool.)

       The responsibilities are behaviors that the software must exhibit in order to fulfill the scenarios.

    c. How are scenarios represented in AADL?

       Flows

    d. What does a "port" in AADL represent in an architecture? What is its value in the design?

       Ports represent interfaces which allow for the separation of specification from implementation which enhances modifiability.