

Homework #3

Due March 12, 2007, in class

Please answer the following questions using lucid, concise English language; use the electronic word processing system and graphics tools of your choice to produce high-quality output. **At the due date, please turn in stapled hardcopies of your work, as well as an electronic copy via email.** Scores for late assignments will be multiplied by 0.8 for each day late. Please remember that this is an individual assignment; refer to the class web pages for the definition of "individual".

Please find a short list of open source tools for creating graphs etc. at <http://java-source.net/open-source/uml-modeling>; others are easy to locate via Google and other search engines.

The general context for this assignment is the analysis of architectural aspects for an extended version of our online video rental system (OVRs) started in HW #1. The business is expanding to become a full-feature online rental store. In particular, the new online store will (a) provide multiple categories of merchandise (books, CDs, DVDs and other media, apparel, devices, etc), (b) allow "sub-stores" that enable presentation of products according to certain "themes" (such as a "surfers' store", showing literature, media, and devices etc. specifically geared towards surfers' interests), (c) has a simple online chat system (OCS) as a sub-component, facilitating communication among logged-in customers (say, so as to discuss an item that is for sale), and (d) allows customers to rate products and fellow customers. The goal is to model key architectural aspects for this extended online store using elements from the UML notation. In your modeling effort, start from the model we have built in class for the OVRs (see solution provided for HW #2).

1. Use Cases and Activities

1. Identify seven (7) key use cases (other than "log in" and "log out") for this extended online rental store. Identify the key actors involved, and indicate "includes" and "extends" relationships between the use cases where appropriate. The use cases shall, in particular, cover the extensions (a)-(d) mentioned above.
2. For one of these use cases provide a sequence of actions/activities required to execute the use case (in prose), including alternative paths and exceptions. For another one of the use cases provide an activity diagram featuring concurrency between activities.

2. Domain Models

Address the following problems based on your use case analysis. To find your solution it will help to revisit the use cases, and to determine the entities (actors, data elements,

messages ...) required for their execution; if in need for inspiration take into account also the grouping of information and its presentation to online users.

1. Name **at least** 15 classes representing entities of the *extended* online store, again covering the extensions (a) through (d), and describe their purpose in short prose.
2. Identify relationships between these entities, and express them using a UML class diagram; use aggregation/composition and inheritance where appropriate. Label associations with multiplicities and association names (incl. reading directions). Don't use "has_a", or "is_a" as labels, because these are expressed already graphically.
3. Identify, in prose, two (2) constraints at the domain model ("healthiness conditions") that are not captured in graphical notation in the class diagram.

3. Behavior: Interaction- and State Models

1. Select two use cases and provide sequence diagrams indicating the flow of messages/information between the domain-model-entities required for executing the use case.
2. Provide a statechart modeling key states of a purchase for a used item and the transitions between these states.
3. On a high level of abstraction, buyers can be considered "logged in" or "logged out" of the online store. Refine their "logged in" state hierarchically by identifying sub-states and corresponding transitions; these could, for instance, reflect the participation of the buyer in corresponding use cases.

4. Components and Interfaces

The extended online store can be divided into several sub-components; one example is the chat sub-system, which can be sold as a separate item (or service) to other online stores. Another example where flexibility might be required is the user interface.

1. Organize your domain model into at least three (3) components and give your rationale for this organization. Use design patterns for decoupling where appropriate.
2. Use a UML2 component diagram to describe the relationships between your components. Provide at least two component interfaces, i.e. ports with corresponding protocols; list incoming/outgoing signals/messages and show related message sequences using a sequence diagram.