

Object-Oriented Language and Theory

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Lab 2: Problem Modeling

In this lab, you will practice with:

- Installing a design tool for UML diagrams: Astah
- Problem Modeling with Use-case diagram

0. Assignment Submission

For this lab class, you will have to turn in your work twice, specifically:

- **Right after the class:** for this deadline, you should include any work you have done within the lab class.
- **10 PM the day after the class:** for this deadline, you should include the final use case diagram. Note that you have to submit both the source file (.astah) and its exported image (.png) in the folder namely “Requirement”, into a directory namely “**Lab02**” and push it to your **master** branch of the valid repository.

Each student is expected to turn in his or her own work and not give or receive unpermitted aid. Otherwise, we would apply extreme methods for measurement to prevent cheating. Please write down answers for all questions into a text file named “**answers.txt**” and submit it within your repository.

1. UML & Astah

The Unified Modeling Language (UML) is a family of graphical notations, backed by a single metamodel, that help in describing and designing software systems, particularly software systems built using the object-oriented style (Fowler, 2003).

Astah is a design tool that supports UML. To get Astah UML, go to <http://astah.net/student-license-request>, fill out the form, and send the request. Then follow the 3 steps on the redirected page <http://astah.net/student/thank-you>. See the use case diagram with Astah at <http://astah.net/manual/422-usecase-diagram>.

Try to draw some UML diagrams in the Astah UML, such as class diagram, activity diagram, and sequence diagram.

2. Problem Statement of AIMS Project

Given the below problem statement of AIMS Project. Please read carefully the statement to ensure that you understand clearly the software that you will design and implement from this lab. If you have any problems, please do not hesitate to ask the professor or TAs.

There might be a future where Tiki and Sendo are in talks over a potential merger to contend with other e-commerce platforms and especially those that have foreign backers. The merger of these two firms would

create a Ti-do company, where “Ti” is from Tiki, and “do” is from Sendo, which means a billion-dollar company in Vietnamese. That firm, Ti-do company, would like you to help them create a brand-new system for the AIMS project (AIMS stands for An Internet Media Store). Currently, there is only one type of media: Digital Video Disc (DVD).

Customers can browse the list of DVDs available in the store, the display order is based on their added date, from latest to oldest. When a customer wants to search for DVDs to add to the cart, he or she can choose one of three searching options. The software will display a list of all matches (latest DVDs first) with all their information. He or she can also choose to play a specific DVD. The software will play a DVD (a demo part). If a DVD has a length of 0 or less, the system must notify the customer that the DVD cannot be played.

- When a customer searches for DVDs by title, he or she provides a string of keywords. If any DVD has the title containing any word in the string of keywords, it is counted as a match. Note that the comparison of words here is case-insensitive.
- When a customer searches for DVDs by category, he or she provides the category name. If any DVD has the matching category (case-insensitive), it is counted as a match.
- When a customer searches for DVDs by price, he or she provides either the minimum and maximum cost, or just the maximum cost.

Customers can view detailed information about a DVD from the list of DVDs. He/she can add a DVD to a cart from a list of DVDs or the detail screen.

When a customer wants to see the current cart, the system displays all the information about the DVDs, along with the total cost. Customers may listen to a DVD (a demo part) in the cart before confirming to place an order. Customers can sort all DVDs in the cart by title or by cost:

- Sort by title: the system displays all the DVDs in the alphabet sequence by title. In case they have the same title, the DVDs having the higher cost will be displayed first.
- Sort by cost: the system displays all the DVDs in decreasing cost order. In case they have the same cost, the DVDs will be ordered by increasing the title.

Customers can update the quantity of a DVD in a cart or remove a DVD from a cart. To increase consumer demand for the product and grow sales, customers are allowed to have an item for free which is randomly picked out in the cart by the system. Customers can filter DVDs in the cart by providing either their ID or title. If the item is found, display information of the found item in the cart. Or else, notify the customer that the item is not found in the current cart.

The customer can request to place an order when they are seeing the current cart. For simplification, he/she does not need to log in to place an order. The application will prompt the customer to enter the delivery information and delivery instructions. The software will then calculate the delivery fee based on the total mass of the order & the delivery location. Then, it will display to the customer the invoice including the DVD list, total cost before VAT, total cost after VAT, and the delivery fee. The customer can then proceed to pay for the order. Currently, only one payment method – i.e. credit card – is allowed by connecting to a card association system for checking the validity of the card or performing the payment transaction. After the transaction, the AIMS software will display all the detailed information such as transaction ID, card owner, transaction amount, transaction message, balance, and transaction date to the customer. The order will be in a pending state and the information about the order & the transaction will be sent to the customer's email.

The store manager needs to log in to the system to navigate to the management mode. He/she can see the list of pending orders, then can pick any order to see its details to approve or reject the order. The store manager can add new DVDs to the store. He or she must provide all information about the new DVD,

including its ID, title, category, director, length, and cost. Additionally, the manager can also **remove** DVDs from the store.

3. Use case diagram

Based on the problem statement in section 2, please draw the use case diagram using Astah UML for the AIMS project.

A use case diagram is one of the UML diagrams to capture dynamic behaviors, i.e., the *pattern of state change over time* (https://www.cs.uct.ac.za/mit_notes/software/htmls/ch05s08.html). The use case diagram illustrates the relations among use cases. A **use-case model** describes a software's functional requirements in terms of use cases. The use-case diagram is a model of the software's intended functions and its environment and serves as a contract between the customer and the developers. Because it is a very powerful planning instrument, the use-case diagram is generally used in all phases of the development cycle. For a better understanding, see <https://www.uml-diagrams.org/use-case-diagrams.html>.

To draw the use case diagram, you must identify the actors and use cases. A sample use case diagram is illustrated in Figure 1 with one use case: place an order. *You have to identify more use cases to update the use case diagram for the final submission.*

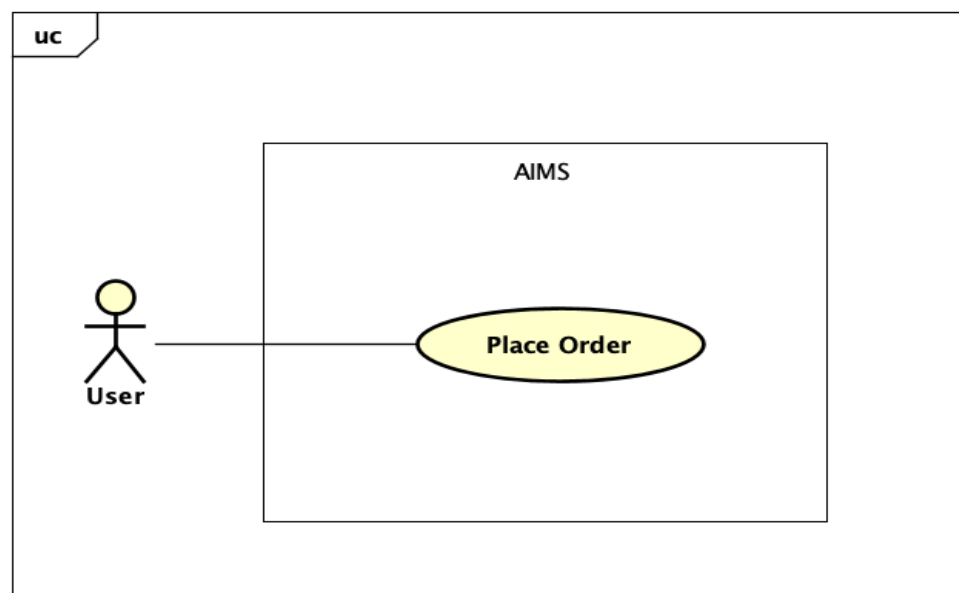


Figure 1. Sample of use case diagram for AIMS Project

4. References

James Rumbaugh, Ivar Jacobson, and Grady Booch (2004). *Unified Modeling Language Reference Manual, The (2nd Edition)*. Pearson Higher Education.