

LAB 4

Spring 2011, BESE 15

Domain Model and Sequence Diagrams

Objective

The aim of this lab is to introduce students to the concept of UML domain models and sequence diagrams. Scenarios shall be provided to students for which they need to make the required diagrams.

Submission Requirements

You are expected to complete the assigned tasks within the lab session and show them to the lab engineer/instructor. Your labs will not be graded unless shown to the lab instructor in time (at least 10 min before end of lab session).

Domain Model:

A UML domain model will relate objects in the system domain to each other. It will define concepts and terms. Objects in the domain model can be:

- * Physical objects
- * Abstract concepts

List Objects (Concepts)

To help the development of a domain model, it is important to identify nouns and noun phrases. Concepts that may not ultimately become objects may be listed for completeness and for discussion. The following types of concepts should be listed:

- * Actor roles
- * Events
- * Transactions
 - o Transaction line items
- * Objects (physical)
 - o Containers
 - + Items (in container)
 - o Other systems
 - o Organizations

Nouns can be taken from the requirements definitions and use case drawings. This means at this point all your use case drawings should be done. Actors should not be emphasized in the domain model.

Domain Model Syntax

After the list of concepts is complete a domain model should be made. Consider which simple items should be attributes of objects. The domain model is a static model. Time flow, with

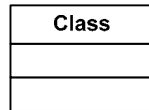
sequence of events or information flow is not shown in the domain model. The objects in the domain model are candidates for programming objects.

TASK 1:

Create a domain model for a scenario given at the end of the document.

Domain Models are created using Class Diagram notations.

1. Start MS Visio. Select Softwares and Databases category. Select UML Model Diagrams.
2. Select Static Structure.



Class Structure:

Note: To modify this structure to suit needs of a domain model, right click it, select shape display Options, Uncheck Operation Parameters from General group and Check Operations in Suppress group.

SEQUENCE DIAGRAMS:

UML sequence diagrams model the flow of logic within your system in a visual manner, enabling you both to document and validate your logic, and are commonly used for both analysis and design purposes.

Sequence diagrams are typically used to model:

1. Usage scenarios. A usage scenario is a description of a potential way your system is used. The logic of a usage scenario may be part of a use case, perhaps an alternate course. It may also be one entire pass through a use case, such as the logic described by the basic course of action or a portion of the basic course of action, plus one or more alternate scenarios. The logic of a usage scenario may also be a pass through the logic contained in several use cases. For example, a student enrolls in the university, and then immediately enrolls in three seminars.
2. The logic of methods. Sequence diagrams can be used to explore the logic of a complex operation, function, or procedure. One way to think of sequence diagrams, particularly highly detailed diagrams, is as visual object code.
3. The logic of services. A service is effectively a high-level method, often one that can be invoked by a wide variety of clients. This includes web-services as well as business transactions implemented by a variety of technologies such as CICS/COBOL or CORBA-compliant object request brokers (ORBs).

TASK 2:

Create a sequence diagram for use case scenario given at the end of the document.

1. Start MS Visio. Select Softwares and Databases category. Select UML Model Diagrams.
2. Select Sequence Diagrams.
3. An actor notation can be added from the use-case diagram section and 'Life Line' object can be used with it instead of an 'Object Life Line'.

Scenario 1: (Domain Model)

The Bank Accounts and Transactions System (BATS) is to be built for the Prime Bank Corporation. It must handle clients' bank accounts and the services on these accounts, i.e., deposit, withdraw, transfer, get balance, etc.

The transactions are recorded, because at the end of each month, the system sends out account statements to all clients showing all transactions performed for their accounts during the last period. The system sends the statements to the printer from where a junior clerk posts them.

The system is accessed by the bank's clients only indirectly, i.e., either via a teller, or an ATM, or the Internet. All transactions and queries are possible via a teller; all transactions and queries are possible except deposits via an ATM; and all except deposits and withdrawals via the Internet.

Opening an account can be performed only via a teller and the Internet; however, if a client opens an account via the Internet they must identify themselves with a teller to have their account activated (this is government policy to avoid money laundering, e.g.).

Closing an account can only be performed by a teller, and it requires a final statement to be sent out to the client. The Bank offers various account types, which fall into two categories: savings and checking. Savings accounts cannot be overdrawn. There can be a credit limit, subject to agreement by the bank, on checking accounts; a checking account cannot be overdrawn beyond this limit.

Scenario 2: (Sequence Diagram)

1 Brief Description

This use case describes how the Bank Customer uses the ATM to withdraw money to his/her bank account.

2 Actors

Bank Customer
Bank

3 Preconditions

There is an active network connection to the Bank.
The ATM has cash available.

4 Basic Flow of Events

1. The use case begins when Bank Customer inserts their Bank Card.
2. Use Case: Validate User is performed.
3. The ATM displays the different alternatives that are available on this unit. In this case the Bank Customer always selects "Withdraw Cash".
4. The ATM prompts for an account.
5. The Bank Customer selects an account.
6. The ATM prompts for an amount.
7. The Bank Customer enters an amount.
8. Card ID, PIN, amount and account is sent to Bank as a transaction. The Bank Consortium replies with a go/no go reply telling if the transaction is ok.
9. Then money is dispensed.
10. The Bank Card is returned.
11. The receipt is printed.
12. The use case ends successfully.

5 Alternative Flows

5.1 Invalid User

If in step 2 of the basic flow Bank Customer the use case: Validate User does not complete successfully, then

1. The use case ends with a failure condition

5.2 Wrong account

If in step 8 of the basic flow the account selected by the Bank Customer is not associated with this bank card, then

1. The ATM shall display the message “Invalid Account – please try again”.
2. The use case resumes at step 4.

5.3 Wrong amount

If in step 7 in the basic flow, the Bank Customer enters an amount that can't be 'created' with the kind of in the ATM, then

1. The ATM shall display the message indicating that the amount must be a multiple of the bills on hand, and ask the Bank Customer to reenter the amount.
2. The use case resumes at step 7.

5.4 Amount Exceeds Withdrawal Limit

If in step 7 in the basic flow, the Bank Customer enters an amount that exceeds the withdrawal limit (See Special Requirement WC-2 for maximum amount), then

1. the ATM shall display a warning message, and ask the Bank Customer to reenter the amount
2. The use case resumes at step 7

5.5 Amount Exceeds Daily Withdrawal Limit

If in step 8 in the basic flow, the Bank response indicates the daily withdrawal limit has been exceeded (this is determined by the Bank and depends upon the specific account), then

1. The ATM shall display a warning message, and ask the Bank Customer to reenter the amount.
2. The use case resumes at step 7.

5.6 Insufficient Cash

If in step 7 in the basic flow, the Bank Customer enters an amount that exceeds the amount of cash available in the ATM, then

1. The ATM will display a warning message, and ask the Bank Customer to reenter the amount.
2. The use case resumes at step 7.

5.7 No Response from Bank

If in step 8 of the basic there is no response from the Bank within 3 seconds, then

1. The ATM will re-try, up to three times.
2. If there is still no response from the Bank, the ATM shall display the message “Network unavailable – try again later”.
3. The ATM shall return the card.
4. The ATM shall indicate that it is “Closed”.
5. The use case ends with a failure condition.

5.8 Money Not Removed

If in step 9 of the basic flow the money is not removed from the machine within 15 seconds, then

1. The ATM shall issue a warning sound and display the message “Please remove cash”.
2. If there is still no response from the Bank Customer within 15 seconds the ATM will re-tract the money and note the failure in the log.
3. The use case end with a failure condition.

5.9 Quit

If at point prior to step 8 in the basic flow the Bank Customer selects Quit, then

1. The ATM shall print a receipt indicating the transaction was cancelled.
2. The ATM shall return the card.
3. The use case ends.

6 Key Scenarios

6.1 No Response from Bank

7 Post-conditions

7.1 Successful Completion

The user has received their cash and the internal logs have been updated.

7.2 Failure Condition

The logs have been updated accordingly.

8 Special Requirements

The ATM shall dispense cash in multiples of \$20.

The maximum individual withdrawal is \$500.

[SpReq:WC-1] The ATM shall keep a log, including date and time, of all complete and incomplete transactions with the Bank.