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**LAB FILE
OF
OBJECT ORIENTED ANALYSIS and DESIGN
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PRACTICAL NO. 1

Aim: To understand the problem statement and prepare a detailed statement by exploring different aspects of the problem.

The ATM System is the project which is used to access their bank access accounts in order to make cash withdrawals. Whenever the user needs to make cash withdrawals, they can enter their PIN number and it will display the amount to be withdrawn in the form of 50's, 100's, 200's 500's and 2000's. Once their withdrawal was successful the amount will be debited in their account.

The ATM will service one customer at a time. A customer will be required to enter an ATM Card and PIN - both of which will be verified by the ATM Machine for each transaction. The customer will then only be able to perform any transaction. Also customers must be able to make a balance inquiry of any account linked to the card.

The ATM will communicate each transaction to the database and obtain verification that it was allowed by the database. In the case of a cash withdrawal, a second message will be sent after the transaction has been physically completed (cash dispensed). If the database determines that the customer's PIN is invalid, the customer will be required to re-enter the PIN before a transaction can proceed.

If a transaction fails for any reason other than an invalid PIN, the ATM will display an explanation of the problem and will ask the customer whether he/she wants to do another transaction.

The ATM will provide the customer multiple options to operate. Firstly, a first time user must be able to set a new PIN for the card. Secondly, users must be able to withdraw an amount from both kinds of accounts - savings as well as current. Besides these, other options are details of the last five transactions, balance enquiry and nearby bank branch details.

The ATM will provide the user a printed receipt for each successful transaction, showing the date, time, machine location, type of transaction, account, amount and ending and available balance of the affected account.

PRACTICAL NO. 2

Aim: To prepare a Software Requirement Specification (SRS) Document.

1. INTRODUCTION

1.1 PURPOSE

The overall purpose of this project is to evaluate and analyse the requirement of the customer, design and implement the system, testing the functionality and maintain the software of an ATM component of a larger ATM network project, consistent with the requirement specification.

1.2 INTENDED AUDIENCE AND READING SUGGESTIONS

The intended audience of this document is a developer's group or system administrators who would use the library to control the ATM system.

1.3 PRODUCT SCOPE

The scope of the ATM is to support a computerized banking network. All activities directly related to the purpose are considered to be in scope. The other activities not directly related to the purposes are considered to be out of scope, such ATM hardware and concern issues.

The network enables customers to complete simple bank account services via automated teller machines (ATMs) that may be located off premise and that need not be owned and operated by the customer's bank. The ATM identifies a customer by a cash card and password. It collects information about a simple account transaction (e.g., deposit, withdrawal, transfer, bill payment), communicates the transaction information to the customer's bank, and dispenses cash to the customer. The bank provides their own software for their own computers.

1.4 DEFINITIONS, ACRONYMS AND THE ABBREVIATIONS

- **Account**

A single account at a bank against which transactions can be applied. Accounts may be of various types with at least checking and savings.

- **MaxDailyWD**

The maximum amount of cash that a customer can withdraw from an account in a day (from 00:00 AM to 23:59 PM) via ATMs.

- **PIN**

It refers to a Personal Identification Number. Used to identify and validate the login of an ATM user.

2. GENERAL DESCRIPTION

2.1 PROJECT PERSPECTIVE

- The ATM is a single functional unit consisting of various sub components.
- This software allows the user to access their bank accounts remotely through an ATM without any aid from a human bank teller.
- This software also allows to perform various other functions apart from just accessing his bank account such as mobile bill clearings etc.
- Some of its hardware components are cassettes, memory, drives, dispensers i.e. for receipts and cash, a card reader, printer, switches, a console, a telephone dialer port, a networking port and disks.
- The ATM communicates with the bank's central server through a dial-up communication link.
- The Memory of the system shall be 20MB.
- The Cassette capacity shall be at least 2000 notes

2.2 PRODUCT FUNCTION

The major functions that ATM performs are described as follows:-

- **Language Selection:**

After the user has logged in, the display provides him with a list of languages from which he can select any one in order to interact with the machine throughout that session. Users also have the freedom to switch to a different language mentioned in the list in between that session.

- **Account Maintenance:**

The various functions that a user can perform with his account are as follows:-

1. **Account Type:-**The user has the freedom to select his account type to which all the transactions are made, i.e. he can select whether the account is a current account or savings account etc.
2. **Withdrawal/Deposit:** The software allows the user to select the kind of operation to be performed i.e. whether he wants to withdraw or deposit the money.
3. **Amount:-** The amount to be withdrawn or deposited is then mentioned by the user.
4. **Denominations:-** The user is also provided with the facility to mention the required denominations. Once he enters his requirements the machine goes through its calculations

on the basis of current resources to check whether it is possible or not. If yes, the amount is given to the user otherwise other possible alternatives are displayed.

5. **Money Deposition:-** Money deposition shall be done with an envelope. After typing the amount to be deposited and verification of the same, the customer must insert the envelope in the depositary.
6. **Balance Transfer:-** Balance transfer shall be facilitated between any two accounts linked to the card for example saving and checking account.
7. **Balance Enquiry:-** Balance enquiry for any account linked to the card shall be facilitated.

- **Cancelling:**

The customer shall abort a transaction with the press of a Cancel key. For example on entering a wrong depositing amount. In addition the user can also cancel the entire session by pressing the abort key and can start a fresh session all over again.

- **Map locating other machines:**

The machine also has a facility of displaying the map that marks the locations of other ATM machines of the same bank in the entire city

2.3 User Classes and Characteristics

There are different kinds of users that will be interacting with the system. The intended users of the software are as follows:-

User A:

A novice ATM customer. This user has little or no experience with electronic means of account management and is not a frequent user of the product. User A will find the product easy to use due to simple explanatory screens for each ATM function. He is also assisted by an interactive teaching mechanism at every step of the transaction, both with the help of visual and audio help sessions.

User B:

An experienced customer. This user has used an ATM on several occasions before and does most of his account management through the ATM. There is only a little help session that too at the beginning of the session thus making the transaction procedure faster.

Maintenance Personnel:

A bank employee. This user is familiar with the functioning of the ATM. This user is in charge of storing cash into the ATM vault and repairing the ATM in case of malfunction. This user is presented with a different display when he logs in with the administrator's password and is provided with options different from that of normal user. He has the authority to change or restrict various features provided by the software in situations of repairing.

2.4 Operating Environment

The project is a Java application. So, it can be run on any operating System like Windows, Linux, Solaris etc.

2.5 Design and implementation constraints

The major constraints that the project has are as follows:-

- The ATM must service at most one person at a time.
- The number of invalid pin entries attempted must not exceed three. After three unsuccessful login attempts, the card is seized/blocked and needs to be unlocked by the bank.
- The simultaneous access to an account through both, the ATM and the bank is not supported.
- The minimum amount of money a user can withdraw is Rs 50/- and the maximum amount of money a user can withdraw in a session is Rs.10,000/- and the maximum amount he can withdraw in a day is Rs 20,000/-
- Before the transaction is carried out, a check is performed by the machine to ensure that a minimum amount of Rs 1000/- is left in the user's account after the withdrawal failing which the withdrawal is denied.
- A user can select only that cellular operator for mobile bill clearings that is supported by the bank.
- The software requires a minimum memory of 20GB.
- There shall be a printer installed with the machine to provide the user with the printed statement of the transaction.

2.6 User Documentation

A user guide will be provided to the user in which all the working of the system to be described in understandable language.

2.7 Assumptions and Dependency

The requirements stated in the SRS could be affected by the following factors:

- One major dependency that the project might face is the changes that need to be incorporated with the changes in the bank policies regarding different services. As the

policies change the system needs to be updated with the same immediately. A delay in doing the same will result in tremendous loss to the bank. So this should be changed as and when required by the developer.

- Another constraint relating to the operating environment is that we are specific to Oracle Database.
- The project could be largely affected if some amount is withdrawn from the user's account from the bank at the same time when someone is accessing that account through the ATM machine. Such a condition shall be taken care of.
- At this stage no quantitative measures are imposed on the software in terms of speed and memory although it is implied that all functions will be optimized with respect to speed and memory.

3. External Interface Requirement

3.1 User Interfaces

The interface provided to the user should be a very user-friendly one and it should provide an optional interactive help for each of the services listed. The interface provided is a menu driven one and the following screens will be provided:-

- A login screen is provided in the beginning for entering the required username/pin no. and account number.
- An unsuccessful login leads to a reattempt (maximum three) screen for again entering the same information. The successful login leads to a screen displaying a list of supported languages from which a user can select any one.
- In case of administrator, a screen will be shown having options to reboot system, shut down system, block system, disable any service.
- In case of reboot/ shut down, a screen is displayed to confirm the user's will to reboot and also allow the user to take any backup if needed.
- In case of a blocking system, a screen is provided asking for the card no. By entering the card no of a particular user, system access can be blocked for him.
- Administrator is also provided with a screen that enables him to block any service provided to the user by entering the name of the service or by selecting it from the list displayed.
- After the login, a screen with a number of options is then shown to the user. It contains all the options along with their brief description to enable the user to understand their functioning and select the proper option.
- A screen will be provided for the user to check his account balance.

- A screen will be provided that displays the location of all other ATMs of the same bank elsewhere in the city.
- A screen will be provided for the user to perform various transactions in his account.

The following reports will be generated after each session dealt with in the machine:-

- The login time and logout time along with the user's pin no and account number is registered in the bank's database.
- The ATM's branch ID through which the session is established is also noted down in the bank's database.
- Various changes in the user's account after the transactions, if any, are reported in the database.
- A printed statement is generated for the user displaying all the transactions he performed.

3.2 Hardware Interface

There are various hardware components with which the machine is required to interact. Various hardware interface requirements that need to be fulfilled for successful functioning of the software are as follows:-

- The ATM power supply shall have a 10/220 V AC manual switch.
- The card reader shall be a magnetic stripe reader The card reader shall have Smart card option.
- Screen resolution of at least 800X600-required for proper and complete viewing of screens. Higher resolution would not be a problem.
- 1GHz or High processor

3.3 Software Interface

- The transaction management software used to manage the transaction and keep track of resources shall be BMS version 2.0.
- The card management software used to verify pin no and login shall be CMS version 3.0.
- The database used to keep records of user accounts shall be Oracle version 7.0.

3.4 Communication Interface

- The communication protocol used shall be TCP/IP.
- Protocol used for data transfer shall be File Transfer Protocol.(FTP)

4. SYSTEM FEATURES

4.1 Remote Banking and Account Management

4.1.1 Description

The system is designed to provide the user with the facility of remote banking and perform various other functions at an interface without any aid of human bank teller. The functioning of the system shall be as follows:- At the start, the user is provided with a login screen and he is required to enter his PIN NO. and Account details which are then verified by the machine. In case of an unsuccessful attempt a user is asked again for his credentials but the maximum number of attempts given to the user is limited to 3 only, failing which his card is blocked and need to be unblocked by the bank for any future use.

After a successful log in, the user is presented with a list of languages. The user can select any one in the list for interaction with the machine for the entire session. After the language selection the user is also asked whether he wants to fix that language for future use also so that he is never asked for language in future. In addition there is also a facility for the user to switch to any other language during that session.

After the language selection, the user is directed towards a main page that displays a set of options/services along with their brief description, enabling the user to understand their functioning. The user can select any of the listed options and can continue with the transaction.

The machine also provides the user with a number of miscellaneous services such as:

The machine also has the facility to display a map that marks the location of other ATMs of the same bank in the city. This may help the user to look for the ATM nearest to his destination.

At any moment if the user wants to abort the transaction, he is provided with an option to cancel it. Just by pressing the abort button he can cancel all the changes made so far and can begin with a new transaction.

After the user is finished with his work, for security purposes, he is required to log out and then take his card out of the slot.

4.1.2 Functional Requirements

- Type of transaction to be performed.
- Correct States/Screen display
- Timeout parameters based on requirement.
- Proper flow based on us-on-us and them-on-us cards.
- Different Hardware error simulations
- Reversing the last transaction
- Administration Transactions

4.2 Receipt Generation

4.2.1 Description

After each transaction user has performed, a receipt is generated that contains all the information about the transaction.

5. OTHER NON-FUNCTIONAL REQUIREMENTS

5.1 Performance Requirements

The following list provides a brief summary of the performance requirements for the software:

5.1.1 Capacity

The ATM shall provide customers a 24 hour service.

5.1.2 Dynamic requirements

- The card verification time must not exceed 0.8 sec. under normal server workload and 1 sec. under peak server workload.
- The pin number verification time must not exceed 0.3 sec. under normal server workload and 0.5 sec. under peak server workload.
- Account balance display time must not exceed 2 sec. under normal server workload and 3 sec. under peak server workload.
- Account balance transfer time must not exceed 3 sec. under normal server workload and 4 sec. under peak server workload.
- Cash withdrawal transaction time must not exceed 4 sec. under normal server workload and 5 sec. under peak server workload.
- Deposit transaction time after insertion of the deposit envelope must not exceed 5 sec. under normal server workload and 6 sec. under peak server workload.
- Receipt printing time after must not exceed 3 sec. under normal server and peak server workload.
- Touch screen and button response time must not exceed 5000ms.
- Credit card advance time must not exceed 6 sec. under normal traffic and server and peak traffic and server workload.

5.1.3 Quality

The primary objective is to produce quality software. As the quality of a piece of software is difficult to measure quantitatively, the following guidelines will be used when judging the quality of the software:

1. Consistency – All code will be consistent with respect to the style. (This is implied when adhering to the standard).
2. Test cases – All functionality will be thoroughly tested.

5.2 Software System Attributes

5.2.1 Reliability

- The data communication protocol shall be such that it ensures reliability and quality of data and voice transmission in a mobile environment. For example, CDMA.
- The memory system shall be of non-volatile type.

5.2.2 Availability

- The product will have a backup power supply in case of power failures.
- Any abnormal operations shall result in the shutting down of the system.
- After abnormal shutdown of the ATM, the system shall have to be manually restarted by a maintenance personnel.
- There should be no inconsistency introduced in the account during whose transaction the system is abnormally shut down.

5.2.3 Security

- The system shall be compatible with AIMS security standards.
- The system shall have two levels of security i.e. ATM card and pin verification both authenticated by the CMS software.
- The Encryption standard used during pin transmission shall be triple DES.
- The password shall be 6-14 characters long.
- Passwords shall not contain the names of customers as they are easy to be hacked.
- Passwords can contain digit, hyphen and underscore.
- User should be provided with only three attempts for login failing which his card needs to be blocked.
- There shall be a security camera installed near the ATM.
- There shall be a secured cash vault with a combination locking system.

5.2.4 Maintainability

- The system components i.e. modem, memory, disk, drives shall be easily serviceable without requiring access to the vault.
- The system should have the mechanism of self-monitoring periodically in order to detect any fault.
- The system should inform the main branch automatically as soon as it detects any error. The kind of fault and the problem being encountered should also be mentioned by the system automatically.

6. OTHER REQUIREMENTS

None.

PRACTICAL NO. 3

Aim: To prepare a Preliminary and Detailed Use Case.

Theory:

Only static behavior is not sufficient to model a system rather dynamic behavior is more important than static behavior. In UML, there are five diagrams available to model the dynamic nature and use case diagram is one of them. Now as we have to discuss that the use case diagram is dynamic in nature, there should be some internal or external factors for making the interaction.

These internal and external agents are known as actors. Use case diagrams consist of actors, use cases and their relationships. The diagram is used to model the system/subsystem of an application. A single use case diagram captures a particular functionality of a system.

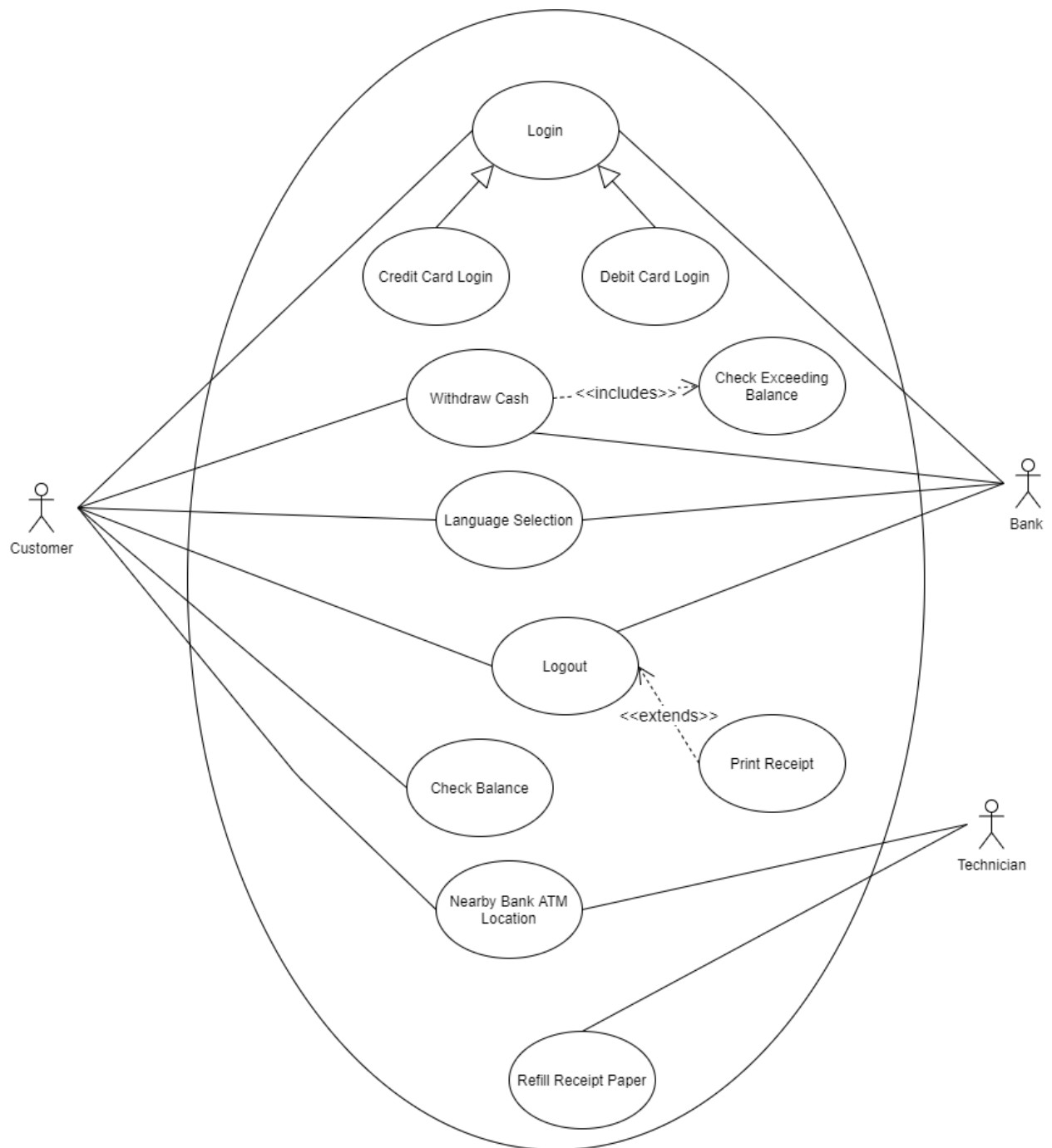
The purpose of the use case diagram is to capture the dynamic aspect of a system. However, this definition is too generic to describe the purpose, as other four diagrams (activity, sequence, collaboration, and Statechart) also have the same purpose. We will look into some specific purpose, which will distinguish it from other four diagrams.

Use case diagrams are used to gather the requirements of a system including internal and external influences. These requirements are mostly design requirements. Hence, when a system is analyzed to gather its functionalities, use cases are prepared and actors are identified.

When the initial task is complete, use case diagrams are modelled to present the outside view.

In brief, the purposes of use case diagrams can be said to be as follows –

- Used to gather the requirements of a system.
- Used to get an outside view of a system.
- Identify the external and internal factors influencing the system.
- Show the interaction among the requirements of the actors.



PRACTICAL NO. 4

Aim: To prepare a Class Diagram for the Bank ATM System.

Theory:

Class diagram is a static diagram. It represents the static view of an application. Class diagram is not only used for visualizing, describing, and documenting different aspects of a system but also for constructing executable code of the software application.

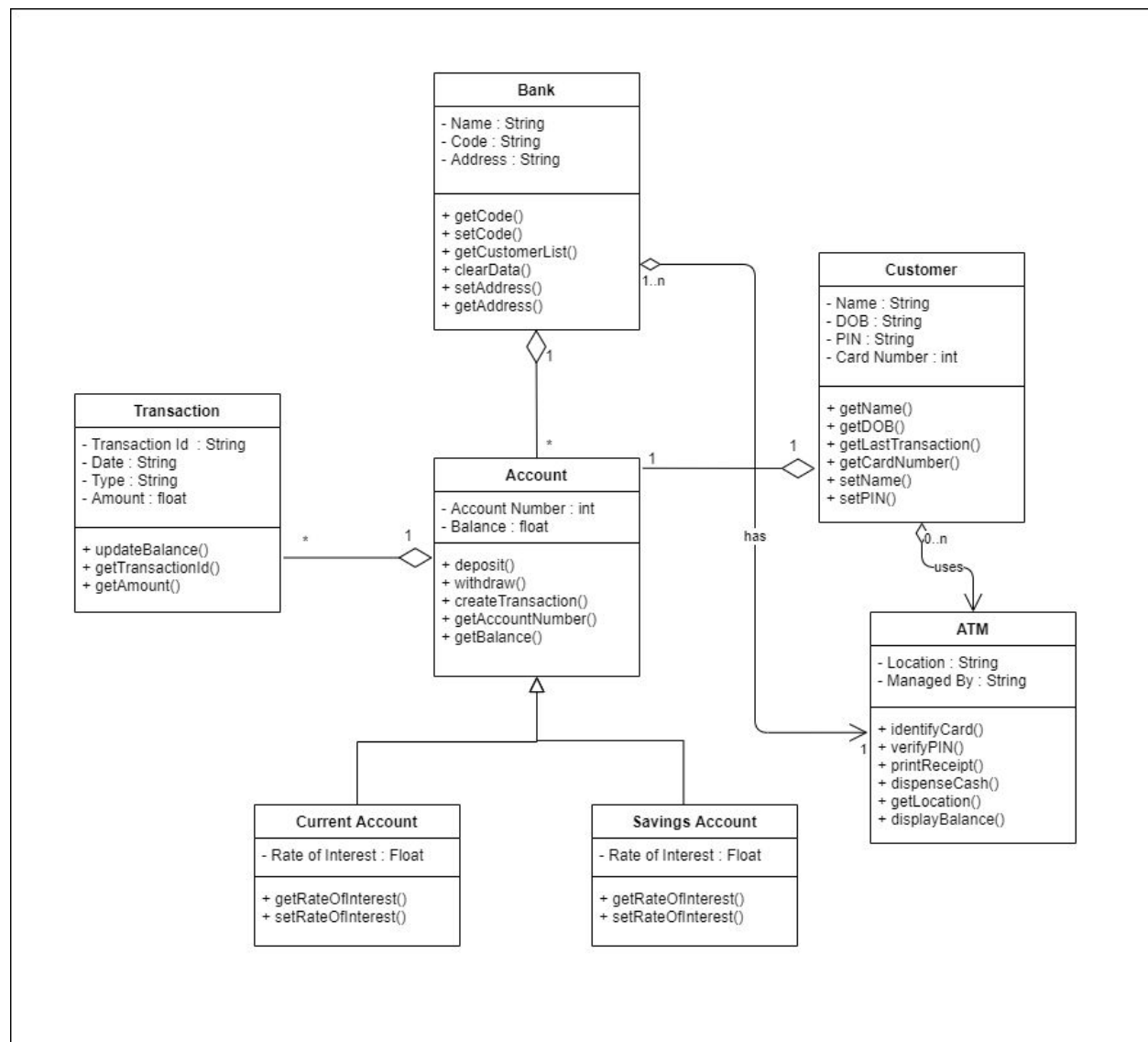
Class diagram describes the attributes and operations of a class and also the constraints imposed on the system. The class diagrams are widely used in the modeling of object oriented systems because they are the only UML diagrams, which can be mapped directly with object-oriented languages.

Class diagram shows a collection of classes, interfaces, associations, collaborations, and constraints. It is also known as a structural diagram.

The purpose of class diagrams is to model the static view of an application. Class diagrams are the only diagrams which can be directly mapped with object-oriented languages and thus widely used at the time of construction.

The purpose of the class diagram can be summarized as –

- Analysis and design of the static view of an application.
- Describe responsibilities of a system.
- Base for component and deployment diagrams.
- Forward and reverse engineering.



PRACTICAL NO. 5

Aim: To prepare an Activity Diagram for the Bank ATM System.

Theory:

Activity Diagrams describe how activities are coordinated to provide a service which can be at different levels of abstraction. Typically, an event needs to be achieved by some operations, particularly where the operation is intended to achieve a number of different things that require coordination, or how the events in a single use case relate to one another, in particular, use cases where activities may overlap and require coordination. It is also suitable for modelling how a collection of use cases coordinates to represent business workflows.

- Identify candidate use cases, through the examination of business workflows
- Identify pre- and post-conditions (the context) for use cases
- Model workflows between/within use cases
- Model complex workflows in operations on objects
- Model in detail complex activities in a high level activity Diagram

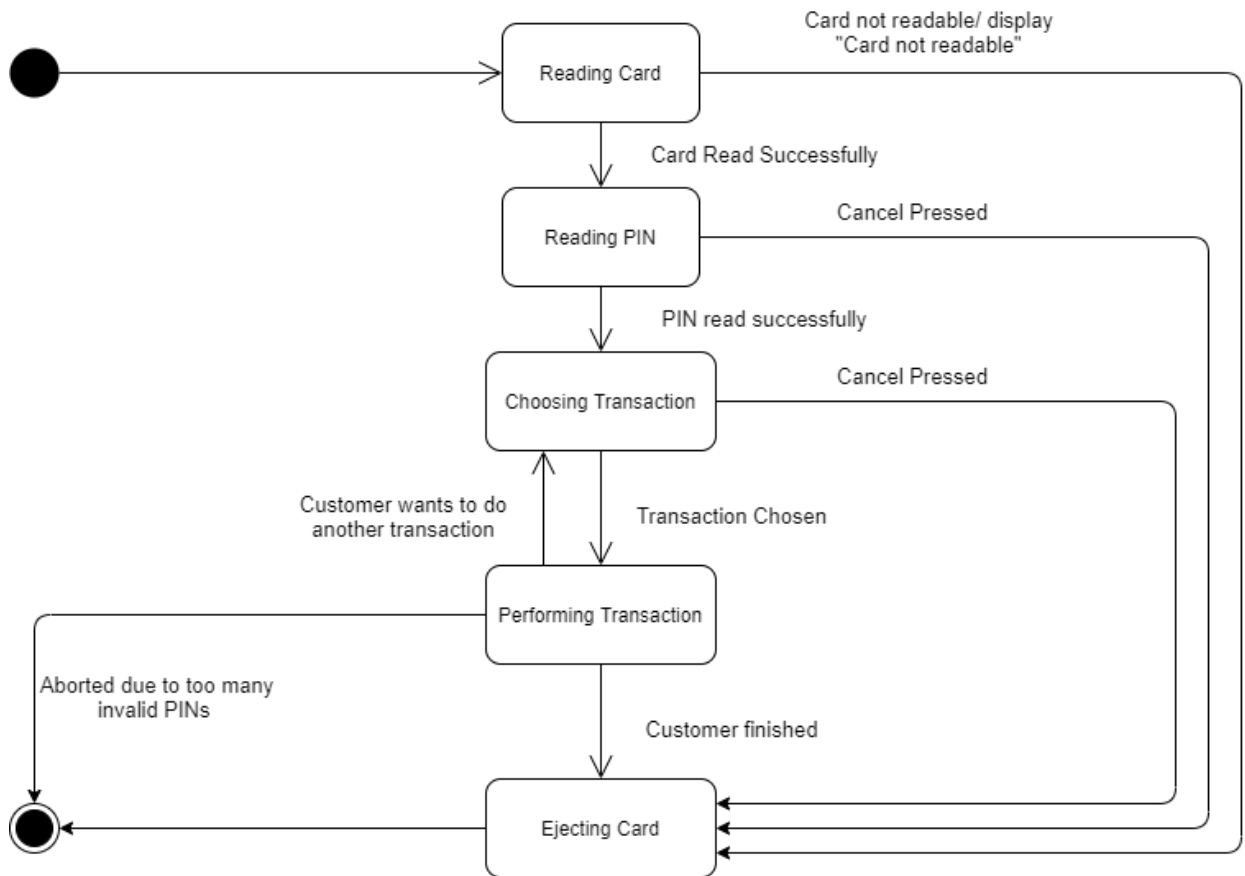
The basic purpose of activity diagrams is similar to the other four diagrams. It captures the dynamic behavior of the system. Other four diagrams are used to show the message flow from one object to another but activity diagram is used to show message flow from one activity to another.

Activity is a particular operation of the system. Activity diagrams are not only used for visualizing the dynamic nature of a system, but they are also used to construct the executable system by using forward and reverse engineering techniques. The only missing thing in the activity diagram is the message part.

It does not show any message flow from one activity to another. Activity diagram is sometimes considered as the flowchart. Although the diagrams look like a flowchart, they are not. It shows different flows such as parallel, branched, concurrent, and single.

The purpose of an activity diagram can be described as –

- Draw the activity flow of a system.
- Describe the sequence from one activity to another.
- Describe the parallel, branched and concurrent flow of the system.



PRACTICAL NO. 6

Aim: To prepare a Sequence Diagram for the Bank ATM System.

Theory:

Sequence diagram emphasizes on time sequence of messages and collaboration diagram emphasizes on the structural organization of the objects that send and receive messages.

The purpose of Sequence diagrams is to visualize the interactive behavior of the system. Visualizing the interaction is a difficult task. Hence, the solution is to use different types of models to capture the different aspects of the interaction.

Sequence and collaboration diagrams are used to capture the dynamic nature but from a different angle.

The purpose of interaction diagram is –

- To capture the dynamic behaviour of a system.
- To describe the message flow in the system.
- To describe the structural organization of the objects.
- To describe the interaction among objects.

