ATM Simulation System

**1. Requirements & Scope Definition**

**Actors/Roles:**

* **Customer** – withdraws, deposits, checks balance, etc.
* **Bank/ATM System** – verifies identity, processes transactions.
* **Admin (optional)** – loads cash, checks ATM status.

**Functional Requirements:**

* Authenticate user via card and PIN
* Check balance
* Withdraw money
* Deposit money
* Mini-statement (optional)

**Non-Functional Requirements:**

* Secure login
* Modular and scalable design
* Error handling (e.g., insufficient funds)
* Simulation only (no real hardware)

**2. UML Diagrams**

**✅ Use-Case Diagram**

Use cases:

* Authenticate
* Withdraw
* Deposit
* View Balance
* View Mini-statement

Actors:

* Customer
* ATM Machine (system)

**✅ Class Diagram**

Classes:

* ATM
* Bank
* Account
* Customer
* Card
* Transaction (abstract)
  + Withdrawal
  + Deposit
  + BalanceInquiry
* ATMState (Strategy/State pattern)

Design Patterns:

* **State** (ATMState)
* **Strategy** (Transaction handling)
* **Singleton** (ATM as a singleton instance)
* **Factory Method** (Transaction factory)

**✅ Sequence Diagram (Withdraw)**

Actors: Customer → ATM → Bank → Account → ATM

Steps:

1. Authenticate
2. Request withdrawal
3. Check balance
4. Dispense cash
5. Print receipt

**3. Design Patterns Used**

* **Strategy Pattern** – for transaction behavior (withdraw, deposit)
* **Factory Pattern** – for creating transactions
* **Singleton Pattern** – to ensure one instance of ATM
* **State Pattern** – to manage ATM states like idle, active, processing

**UML Diagrams for the ATM Simulation System**

To visualize the system's structure and interactions, here are the key UML diagrams:

**1. Use Case Diagram**

This diagram illustrates the interactions between users (actors) and the system's functionalities (use cases).[DAV University+1GeeksforGeeks+1](https://davuniversity.org/images/files/study-material/UML-ATM.pdf?utm_source=chatgpt.com)

* **Actors**:
  + **Customer**: Initiates transactions like withdrawal, deposit, and balance inquiry.
  + **ATM Technician**: Performs maintenance and repairs.[UML Diagrams](https://www.uml-diagrams.org/bank-atm-uml-use-case-diagram-example.html?utm_source=chatgpt.com)
* **Use Cases**:
  + **Authenticate User**: Customer inserts card and enters PIN.
  + **Withdraw Cash**: Customer requests cash withdrawal.
  + **Deposit Funds**: Customer deposits money.
  + **Check Balance**: Customer views account balance.
  + **Print Receipt**: System prints transaction receipt.
  + **Maintain ATM**: Technician performs maintenance tasks.[UML Diagrams+2Reddit+2GeeksforGeeks+2](https://www.reddit.com/r/businessanalysis/comments/1eesrtq/create_uml_diagrams_with_chat_gpt_use_case_class/?utm_source=chatgpt.com)

The diagram showcases how each actor interacts with the system's functionalities.[DAV University](https://davuniversity.org/images/files/study-material/UML-ATM.pdf?utm_source=chatgpt.com)

**2. Class Diagram**

This diagram depicts the system's classes, their attributes, methods, and relationships:

* **Classes**:
  + **ATM**: Manages transactions and interacts with accounts.
  + **Account**: Represents a bank account with balance and PIN.
  + **Transaction**: Abstract class for transactions.
    - **Withdrawal**: Handles cash withdrawal.
    - **Deposit**: Handles fund deposits.
    - **BalanceInquiry**: Handles balance checks.
  + **TransactionFactory**: Creates transaction instances.[Gleek+1GitHub+1](https://www.gleek.io/blog/atm-system-class?utm_source=chatgpt.com)

The diagram illustrates inheritance (e.g., Withdrawal inherits from Transaction) and associations (e.g., ATM uses TransactionFactory).

**3. Sequence Diagram**

This diagram shows the sequence of interactions during a withdrawal transaction:

1. **Customer** initiates withdrawal.
2. **ATM** authenticates the customer.
3. **ATM** uses TransactionFactory to create a Withdrawal transaction.
4. **Withdrawal** executes, updating the Account balance.
5. **ATM** dispenses cash and prints a receipt.

This visualizes the dynamic flow of messages between objects during the process.

Use the link for resource:

**https://www.uml-diagrams.org/bank-atm-uml-use-case-diagram-example.html?**