

TD2: Use Cases and State Machines

1 ATM Specifications

ATM = Automatic Teller Machine

ATM offers the following services:

1. Distribution of money to every holder of a smartcard via a card reader and a cash dispenser.
2. Report of account balance, cash and checks deposit facilities for bank customers who hold a smartcard from their bank.
3. All transactions are made sure.
4. The dispenser has to be refilled from time to time.

Abbreviations used in this text:

- CardHolder = Visa Card holder
- BankCustomer = Bank customer who holds a smartcard from his/her bank
- VisaAS = Visa Authorization System
- BankIS = Bank Information System

2 Example of Use Case Specification

2.1 *Withdraw money using a Visa card*

Summary: This use case allows a Visa card holder, who is not a customer of the bank to withdraw money if his/her daily limit allows it.

1. The Visa CardHolder inserts his/her smart card in the ATM's card reader.
2. The ATM verifies that the card that has been inserted is a smartcard.
3. The ATM asks the Visa CardHolder to enter his/her pin number.
4. The Visa CardHolder enters his/her pin number.
5. The ATM compares the pin number with the one that is encoded on the chip of the smartcard.
6. The ATM requests an authorization from the Visa authorization system
7. The Visa authorization system confirms its agreement and indicates the daily withdrawal limit.
8. The ATM asks the Visa CardHolder to enter the desired withdrawal amount.
9. The Visa CardHolder enters the desired withdrawal amount.
10. The ATM checks the amount against the daily withdrawal limit.
11. The ATM asks the Visa CardHolder if he/she would like a receipt.
12. The Visa CardHolder requests a receipt.
13. The ATM returns the card to the Visa CardHolder.
14. The Visa CardHolder takes his/her card.
15. The ATM issues the banknotes and a receipt.
16. The Visa CardHolder takes the banknotes and the receipt.

Variations: Temporarily incorrect pin number

- At step 5, the Visa CardHolder fails to enter a correct pin number
- 6. The ATM informs the CardHolder that the pin is incorrect for the first or second time.
- 7. The ATM records the failure on the smartcard.
- The scenario goes back to step 3.

Variations: The amount requested is greater than the daily withdrawal limit

...

Variations: The Visa CardHolder does not want a receipt

...

2.2 Withdraw money using a Bank card

Similar to Withdrawal using a Visa card

1. The Bank customer inserts his/her smart card in the ATM's card reader.
2. The ATM verifies that the card that has been inserted is a smartcard.
3. The ATM asks the Bank customer to enter his/her pin number.
4. The Bank customer enters his/her pin number.
5. The ATM compares the pin number with the one that is encoded on the chip of the smartcard.
6. The ATM requests an authorization from the Bank information system
7. The BankIS confirms its agreement and indicates the daily withdrawal limit.
8. The ATM asks the Bank customer to enter the desired withdrawal amount. **Extension point:** verify amount.
9. The Bank customer enters the desired withdrawal amount.
10. The ATM checks the amount against the daily withdrawal limit.
11. The ATM asks the Bank customer if he/she would like a receipt.
12. The Bank customer requests a receipt.
13. The ATM returns the card to the Bank customer.
14. The Bank customer takes his/her card.
15. The ATM issues the banknotes and a receipt.
16. The Bank customer takes the banknotes and the receipt.

3 Use Case Diagram

3.1 Relationships

Complete the Use Case diagram Figure 1. Justify your choice for the best relationship (associations, generalization, include, extend).

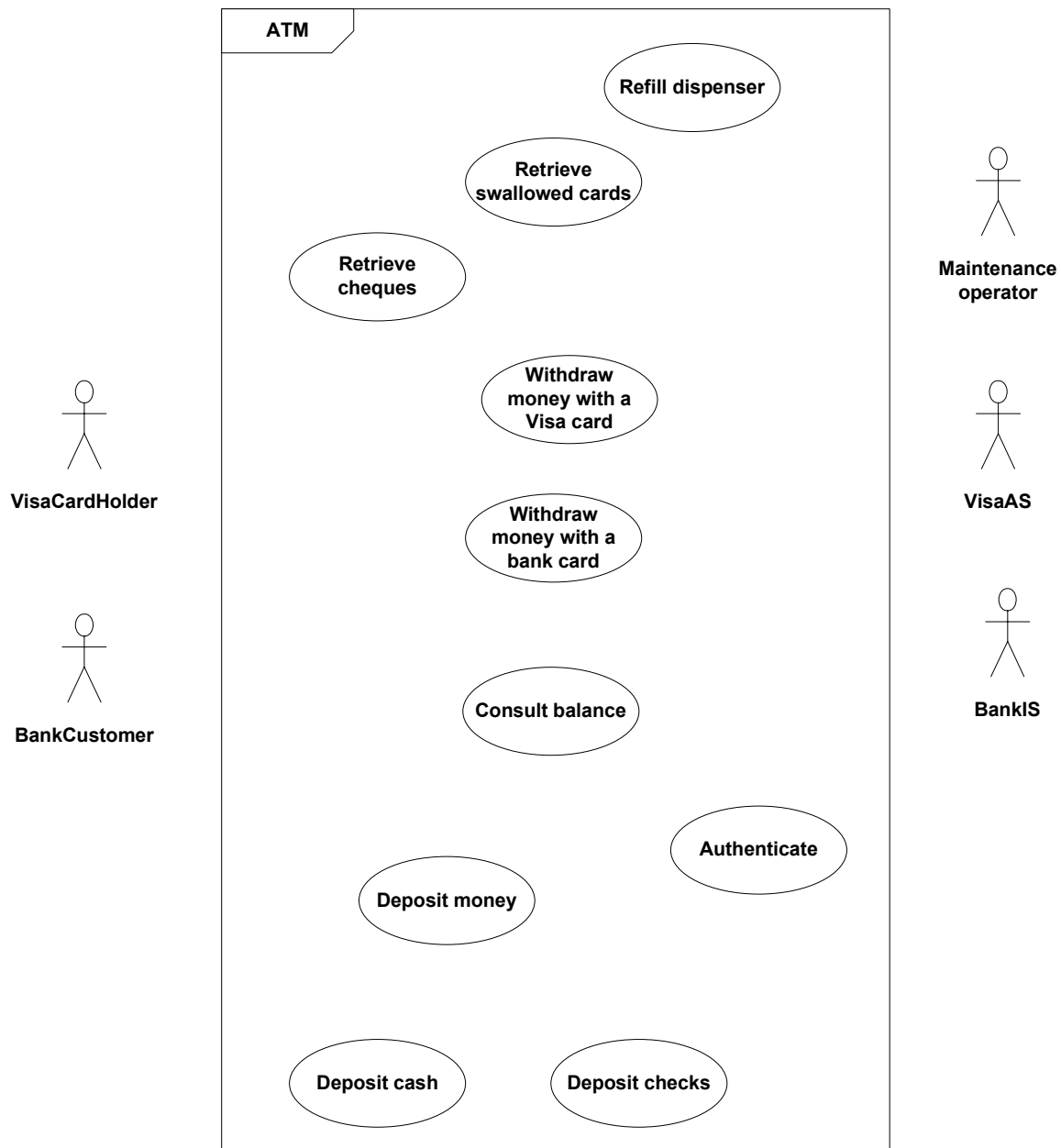


Figure 1: ATM Use Case Diagram

3.2 Use Case Specification

Give a textual specification for each use case.

3.3 Papyrus modeling

Use Papyrus to model ATM.

4 Class Diagram

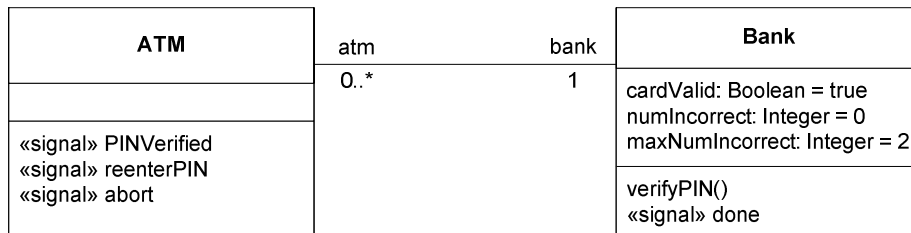


Figure 2: Class diagram of the ATM

Signals are specified by a signal object, whose type represents the kind of message transmitted between objects, and can be dynamically created. The receipt of signals may be bound to activities, state machine transitions, or other behaviors.

5 State machines

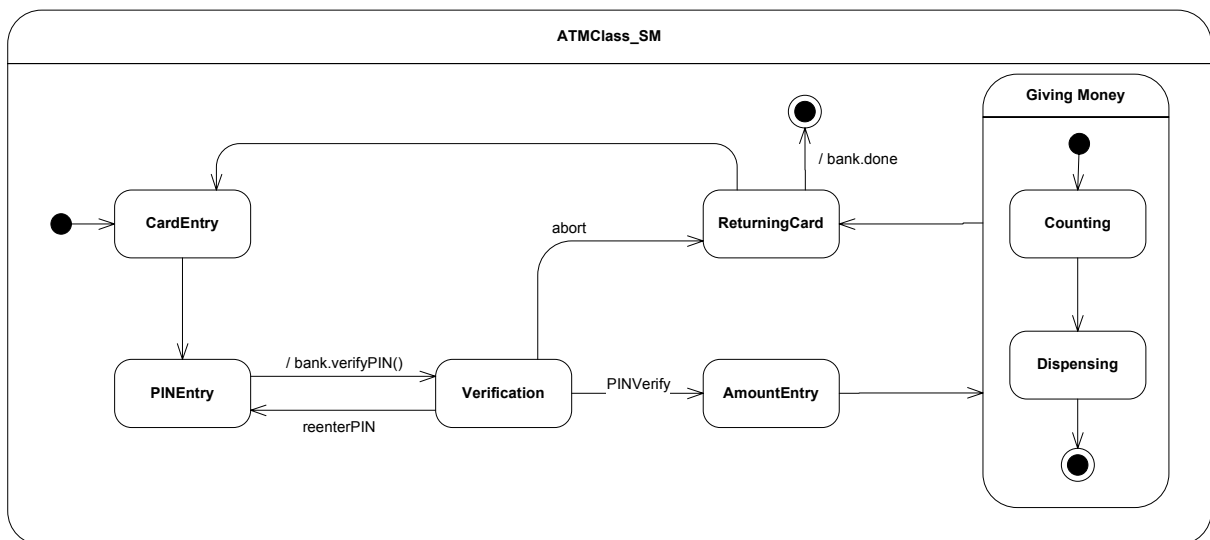


Figure 3: State machine for class ATM

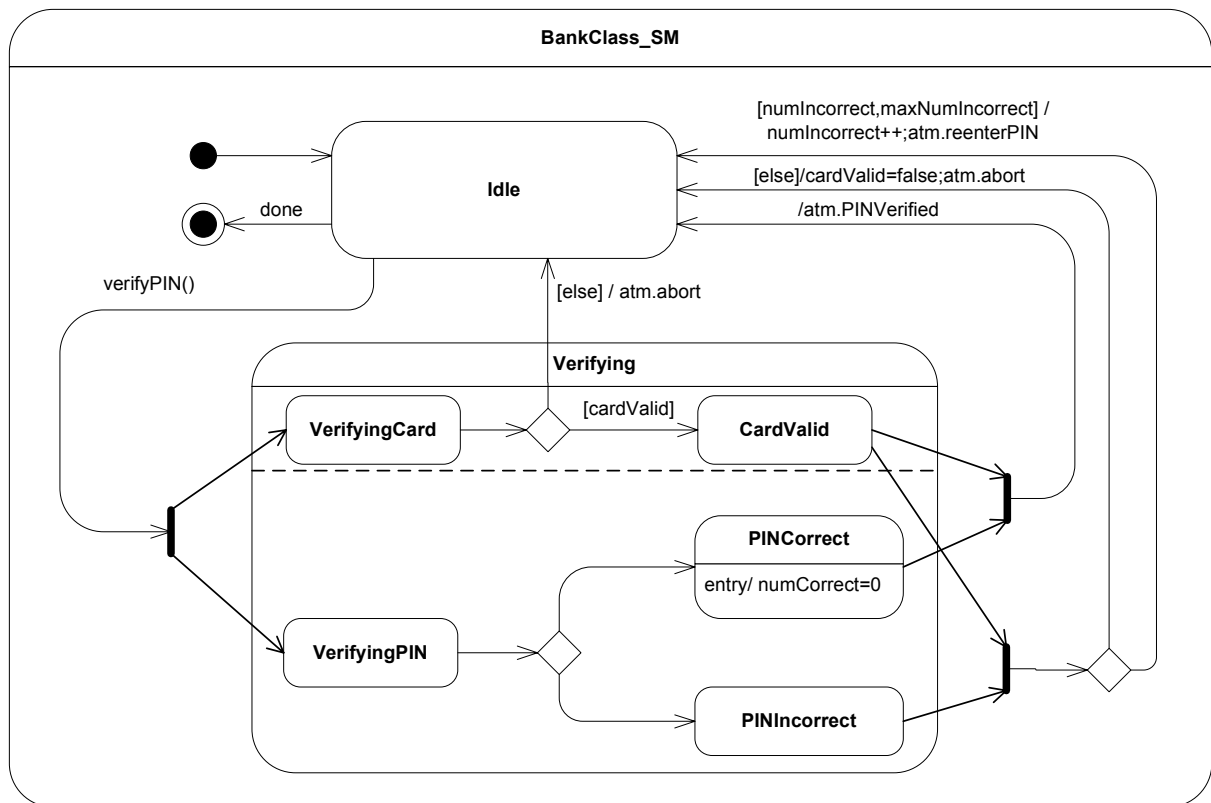


Figure 4: State machine for class Bank

5.1 Behavior

Justify the state machines in Figure 3 and Figure 4.

Analyze interactions.

Represent some possible interactions with Communication diagrams

Represent some possible interactions with Sequence diagrams.

5.2 Modifications

The specification is modified:

- The transaction can be canceled at each instant by depressing a Cancel button.
- After three incorrect PIN code, the card is swallowed by the ATM

Modify the class diagram (add signals), the interaction diagrams, and the state machines to respect the new specification.

5.3 Experimentation

Model the ATM using Papyrus.