9.1 UML Use Cases

- Open bank account
- Close bank account
- Apply for Credit
- Make money-transfer online
- Withdraw money from ATM
- Check balance

Roles:
- potential customer
- customer
- bank employee
- website
- account-keeping system
- ATM
Use Case: **Withdraw money from ATM**

**Actors:** ATM, Customer, account-keeping system

**Description:**

After the **ATM** has finished the transaction for the previous **customer**, the **ATM** will show a “Welcome” message and ask the next **customer** to insert his/her card. If the card has been inserted, the card is read and the consistency of the card data is checked. Then, the customer is asked to enter the PIN. The **ATM** then checks if the entered PIN is correct by comparing it with the data read from the card. If the PIN was correct, then the **customer** can enter the amount of money (s)he wishes to withdraw from his/her account. If the amount has been entered and the customer has confirmed the amount, the **ATM** checks the balance of the account (**check balance**) by asking the **account-keeping system** of the bank. If the balance of the account is higher than the requested amount, then operation can continue. The **ATM** checks its money tray if enough money is still available. If this ok, the **ATM** asks the **customer** to take the card. If the card has been taken, the money can be issued to the **customer**.

**Error Situations:**

- card not readable
- card contains incorrect data
- wrong PIN number entered by customer
- account balance lower than requested money
- **ATM** does not have enough money
- ...

**<<uses>>:** **check balance**
9.2 UML Structure Diagram

Separated into detailed class description and structure diagram for better presentation. Normally, all information is in one diagram.

Account
- number : string
- limit : int
- balance : int
- getBalance():int
- setLimit(int)

PrivateAccount

BusinessAccount

Person
- name : string
- idn: int
- getName(): string

Company
- name: string
- branch: string
- legalStatus: string
- getBranch(): string

Address
- street : string
- city : string
- zip : string

Branch
- category : string

ATM
- type : string

Employee
- ssn : int
- salary : int
- increaseSal(int)

BankCompany

Transaction
- amount : int
- date : Date
- time : Time
- cancel()
- redo()

MoneyTransfer

CashWithdrawal

CashDeposit

MT-Branch

MT-Online

CW-ATM

CW-Branch
Additional descriptions (e.g. role names, association names, constraints) can be attached to associations.
9.3 UML Sequence Diagram

- Screen
- Keyboard
- CardReader
- MoneyTray
- Money Output Device
- Server Interface

waitForCard() → askForPin()

waitForInput() → checkPin()

[ check = OK ] → askAmount()

waitForInput() → checkMoneyAvailable()

[check = OK ] → checkBalance()

[check = OK ] → outputCard()

goodBye() → [ cardTaken=OK] → outputMoney()
9.4 UML State Diagram

- **Card Inserted**
  - Show welcome & ask for PIN, num try = 0

- **Wait for PIN Input**
  - Read keyboard Input
  - PIN entered
    - num try++, Check if PIN is valid
    - [PIN invalid & num try < 3]
    - [OK]
    - [Timeout]
  - PIN correct
    - [PIN correct]
    - [Timeout]
    - Ask for amount
    - Check if money is available
    - [money available]
    - ... (see next slide)

- PIN not valid
  - Ask for another PIN
  - [PIN invalid & num try < 3]

- Not enough money
  - Show message
  - [money not available]

- Amount entered
  - Wait for input
  - Read keyboard input
  - Check if money is available

- Cancel
  - Eject Card
  - [PIN correct]
  - [Timeout]
  - Cancel
  - Keep Card & Show Message

- ... (see next slide)
Money available

- Check balance
  - [balance ok]
  - Account balance ok
    - Perform transaction
      - On bank server
        - Transaction performed
          - Eject Card
            - Card Taken
              - Eject Money
                - Money taken
                  - Show „GoodBye“

- [balance too low]
  - Account has not enough money
    - Show message
      - Cancel
        - Eject Card