PB007: Banking system

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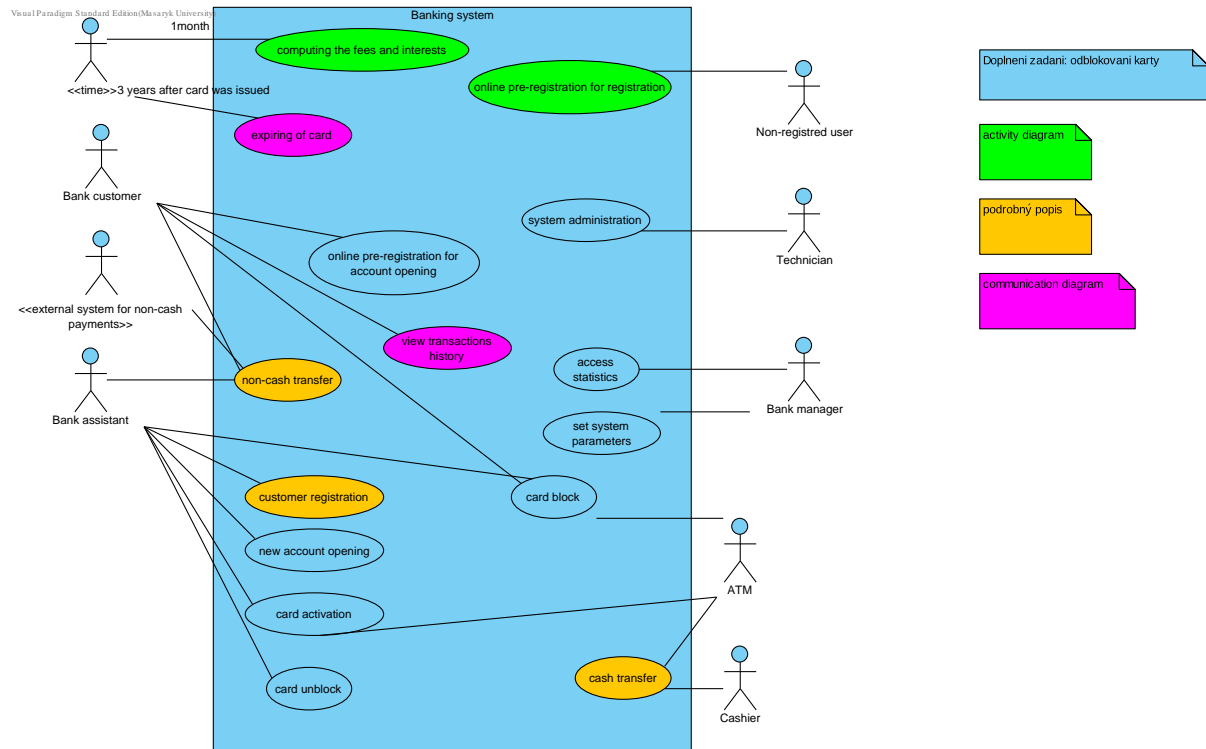# Table of Figures

Use Case Diagram
Use Case Diagram

Summary

Name	Documentation
👤 <<time>>	
👤 Bank assistant	
👤 Bank customer	
👤 <<external system for non-cash payments>>	
👤 ATM	
👤 Cashier	
👤 Non-registred user	
👤 Technician	
👤 Bank manager	
🔵 card unblock	
🔵 system administration	
📄 N/A	Doplneni zadani: odblokovani karty
🔵 cash transfer	
🔵 view transactions history	
🔵 set system parameters	
🔵 access statistics	

🔵 expiring of card	
🔵 computing the fees and interests	
🔵 card activation	
🔵 new account opening	
🔵 customer registration	
🔵 card block	
🔵 non-cash transfer	
🔵 online pre-registration for account opening	
🔵 online pre-registration for registration	
🔲 Banking system	
📄 N/A	activity diagram
📄 N/A	podrobný popis
📄 N/A	communication diagram

Documentation

Functional Requirements (F)
1. Bank customer
    1.1. Online pre-registration for account opening
    1.2. Money transfer
        1.2.1. Authorization
            • The authorization code can be entered at most three times (each time within 5 minutes from its delivery). If the code is entered three times unsuccessfully (wrong code or entered late), the whole transaction is canceled and the reserved money (for the transaction) is unblocked.
    1.3. See transactions history
    1.4. Card block
2. Bank manager
    2.1. Statistics (including future predictions)
    2.2. Set system parameters
        2.2.1. interest rates of savings accounts
        2.2.2. fees
3. Bank assistant
    3.1. Customer registration
    3.2. New account opening
        3.2.1. Checking account or savings account
        3.2.2. CZK or EUR
    3.3. Money transfer
    3.4. Card activation
    3.5. Card block
    3.6. Card unblock
4. Cashier
    4.1. Money deposit
    4.2. Money withdrawal
5. External system for non-cash payments
    5.1. Non-cash payment notification

6. Time
    6.1. Computing the fees and interests
        • The computation is based on the priority of the customer, which is derived
        from how long the customer has been with the bank, and what has been the
        balance on his/her accounts in the past year.
    6.2. Discarding of card
7. ATM
    7.1. Card activation
    7.2. Money withdrawal
    7.3. Card block
8. Technician
    8.1. system maintenance
    8.2. change the access rights of other users
9. Non-registered user
    9.1. Online pre-registration for registration

Non-functional Requirements (N)
1. Java platform
2. reliability
    2.1. backup of all actions (1 year)
    2.2. backup of all transactions (10 years)
    2.3. accessibility of online banking system 24/7 (99.5% a year)
    2.4. accessibility of ATMs 24/7 (98% a year)
3. performance of the online banking system (scalable)
4. security
    4.1. authorization via SMS
    4.2. use HTTPS for online banking

Details

<<time>>

Bank assistant

Bank customer

<<external system for non-cash payments>>

ATM

Cashier

Non-registred user

Technician

🧑 Bank manager
🔵 card unblock
Use Case Descriptions

Use Case ID	14
Brief Description	UC14 unblocks a blocked card
Primary Actors	Bank assistant
Secondary Actors	-
Preconditions	
Main Flow of Events	
Alternative Flows	
Post-conditions	

🔵 system administration
Use Case Descriptions

Use Case ID	6
Brief Description	UC6 enables to update system version, change access rights and view system logs
Primary Actors	Technician
Secondary Actors	-
Preconditions	
Main Flow of Events	
Alternative Flows	
Post-conditions	

📄 N/A
🔵 cash transfer
Use Case Descriptions

Use Case ID	14
Brief Description	UC14 enables to withdraw or deposit cash
Primary Actors	Cashier, ATM
Secondary Actors	bank customer
Preconditions	-
Main Flow of Events	1. UC begins when cashier or ATM requests new cash transfer.

	2. IF (actor is ATM): 2.1. Actor inputs authentication details (card number and PIN) 2.2. IF (authentication details are not valid): 2.2.1. System dismisses the transfer. 3. IF (actor is cashier): 3.1. System shows form for bank customer verification. 3.2. Actor verifies bank customer by card number and personal ID. 3.3. System shows form for cash transfer. 4. Actor inputs cash transfer details (amount, which can be both positive (money deposit) or negative (money withdrawal)). 5. Actor chooses optional printing of receipt. 6. IF (required amount can not be allocated or is not present in cash): 6.1. Dismiss the transfer. 7. System updates customer's account balance.
Alternative Flows	
Post-conditions	Customer's account balance is updated.

🔵 view transactions history

Use Case Descriptions

Use Case ID	4
Brief Description	UC4 Show history of transactions of the given bank customer
Primary Actors	Bank customer
Secondary Actors	-
Preconditions	
Main Flow of Events	
Alternative Flows	
Post-conditions	

🔵 set system parameters

Use Case Descriptions

Use Case ID	9
Brief Description	UC9 enables to set various parameters of the system
Primary Actors	Bank manager
Secondary Actors	-
Preconditions	
Main Flow of Events	
Alternative Flows	
Post-conditions	

🔵 access statistics
Use Case Descriptions

Use Case ID	8
Brief Description	UC8 enables to access statistics of the system for better overview of the system
Primary Actors	Bank manager
Secondary Actors	-
Preconditions	
Main Flow of Events	
Alternative Flows	
Post-conditions	

🔵 expiring of card
Use Case Descriptions

Main	
Use Case ID	5
Brief Description	UC5 disables card after expiration date
Primary Actors	<<time>>
Secondary Actors	-
Preconditions	
Main Flow of Events	
Alternative Flows	
Post-conditions	

🔵 computing the fees and interests
Use Case Descriptions

Main	
Use Case ID	1
Brief Description	UC1 Computing the fees and interest rates
Primary Actors	<<time>>
Secondary Actors	-
Preconditions	
Main Flow of Events	
Alternative Flows	
Post-conditions	

🔵 card activation

Use Case Descriptions

Use Case ID	13
Brief Description	UC13 activates new card
Primary Actors	Bank assistant, ATM
Secondary Actors	-
Preconditions	
Main Flow of Events	
Alternative Flows	
Post-conditions	

🔵 new account opening

Use Case Descriptions

Use Case ID	12
Brief Description	UC12 opens new account
Primary Actors	Bank assistant
Secondary Actors	-
Preconditions	
Main Flow of Events	
Alternative Flows	
Post-conditions	

🔵 customer registration

Use Case Descriptions

Use Case ID	11
Brief Description	UC11 registers new bank customer
Primary Actors	Bank assistant
Secondary Actors	-
Preconditions	-
Main Flow of Events	1. UC begins when bank assistant selects "Customer registration" 2. System shows two options: "with pre-registration" and "without pre-registration" 3. IF (bank assistant selects "with pre-registration"): 3.1 Bank assistant fills email address 3.2 IF (pre-registration form with this email address does not exists): 3.2.1 Dismiss registration 3.3 Retrieve filled personal details from the form 4. ELSE: 4.1 Bank assistant fills contender's personal details 5. Bank assistant fills authentication details (ID, signature pattern)

	6. Create new customer account
Alternative Flows	Interruptions of the process of customer registration because the person has already has an customer account or problem during providing details about the person.
Post-conditions	New customer account created.

🔵card block
Use Case Descriptions

Use Case ID	10
Brief Description	UC10 blocks card and notifies customer about this event
Primary Actors	Bank customer, Bank assistant, ATM
Secondary Actors	Bank customer
Preconditions	
Main Flow of Events	
Alternative Flows	
Post-conditions	

🔵non-cash transfer
Use Case Descriptions

Use Case ID	7
Brief Description	UC7 enables to execute non-cash transfer
Primary Actors	Bank customer, Bank assistant, <<external system for non-cash payments>>
Secondary Actors	-
Preconditions	-
Main Flow of Events	1. UC begins when Bank customer or assistant selects "Non-cash payment" or external system requests non-cash payment. 2. Actor inputs non-cash transfer details (amount, receiver's account number) 2. IF (actor is bank customer): 2.1. System shows prompt to input SMS verification code. 2.2. System sends SMS verification code and starts time countdown (5 minutes). 2.3. Bank customer inputs the code and clicks "Submit the transfer" button. 2.4. IF (the inputted code is not valid OR timeout expired): 2.4.1. Dismiss the transfer. 3. IF (actor is external system): 3.1. Actor inputs authentication details (card number and PIN) 3.2. IF (authentication details are not valid): 3.2.1. Dismiss the transfer. 4. IF (required amount can not be allocated): 4.1 Dismiss the transfer

	5. System executes the transfer.
Alternative Flows	Bank customer may log out of the system anytime.
Post-conditions	Sender's and receiver's account balance is updated.

🔵 online pre-registration for account opening
Use Case Descriptions

Use Case ID	3
Brief Description	UC3 Enables to fill online pre-registration form for account opening
Primary Actors	Bank customer
Secondary Actors	-
Preconditions	
Main Flow of Events	
Alternative Flows	
Post-conditions	

🔵 online pre-registration for registration
Use Case Descriptions

Main	
Use Case ID	2
Brief Description	UC2 Enables to fill online pre-registration form for registration
Primary Actors	Non-registered user
Secondary Actors	-
Preconditions	
Main Flow of Events	
Alternative Flows	
Post-conditions	

📱 Banking system

Children

Name	Documentation
online pre-registration for registration	
online pre-registration for account opening	
non-cash transfer	
card block	
customer registration	
new account opening	
card activation	
computing the fees and interests	
expiring of card	
access statistics	
set system parameters	
view transactions history	
cash transfer	
system administration	
card unblock	

N/A

N/A

N/A

Activity Diagram
Online pre-registration for registration
Visual Paradigm Standard Edition(Masaryk University)
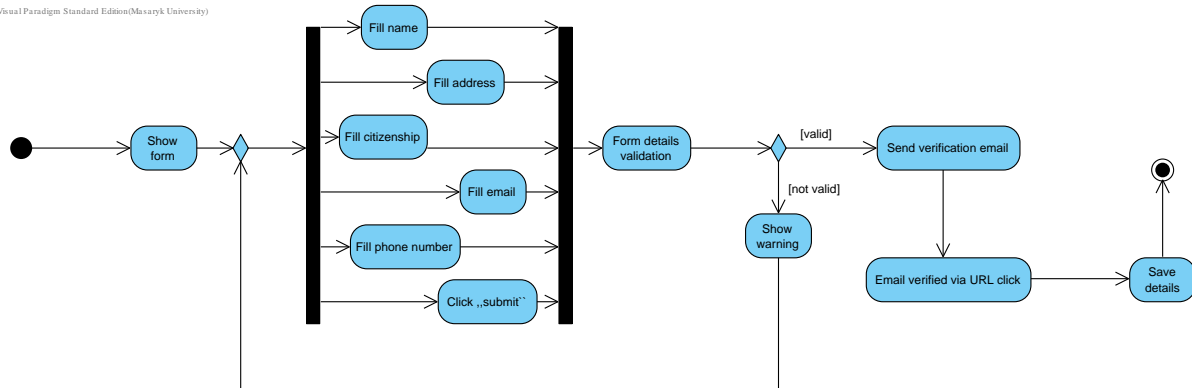
Summary

Name	Documentation
Show form	
Fill name	
Fill address	
Fill citizenship	
Fill email	
Fill phone number	
Click ,,submit``	
Form details validation	
Send verification email	
Email verified via URL click	
Save details	
Show warning	

Details

N/A

Show form

N/A

N/A

Fill name

Fill address

- **Fill citizenship**
- **Fill email**
- **Fill phone number**
- **Click „submit``**
- **N/A**
- **Form details validation**
- **N/A**
- **Send verification email**
- **Email verified via URL click**
- **Save details**
- **N/A**
- **Show warning**

Activity Diagram

Computing interest rates and fees

Visual Paradigm Standard Edition(Masaryk University)

[unprocessed account exists]

choose unprocessed account   Check account ballance   Check account's age   subtract fees   compute interesets

[all account processed]
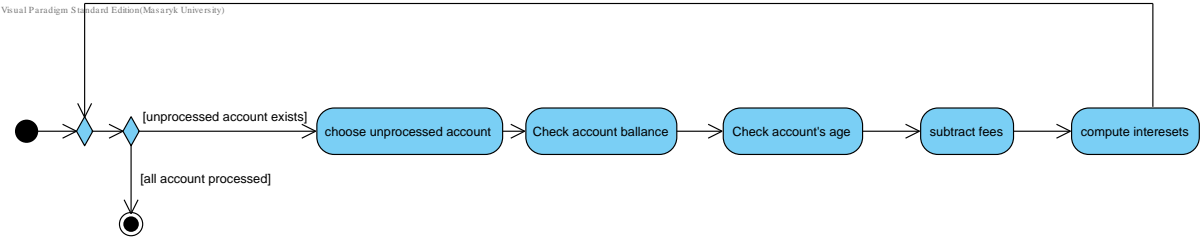
Summary

Name	Documentation
🔷 choose unprocessed account	
🔷 Check account ballance	
🔷 Check account's age	
🔷 subtract fees	
🔷 compute interesets	

Details

⬤ **N/A**

N/A

N/A

🔷 **choose unprocessed account**

🔷 **Check account ballance**

🔷 **Check account's age**

🔷 **subtract fees**

🔷 **compute interesets**

◉ **N/A**

Class Diagram
Analytic Class Diagram
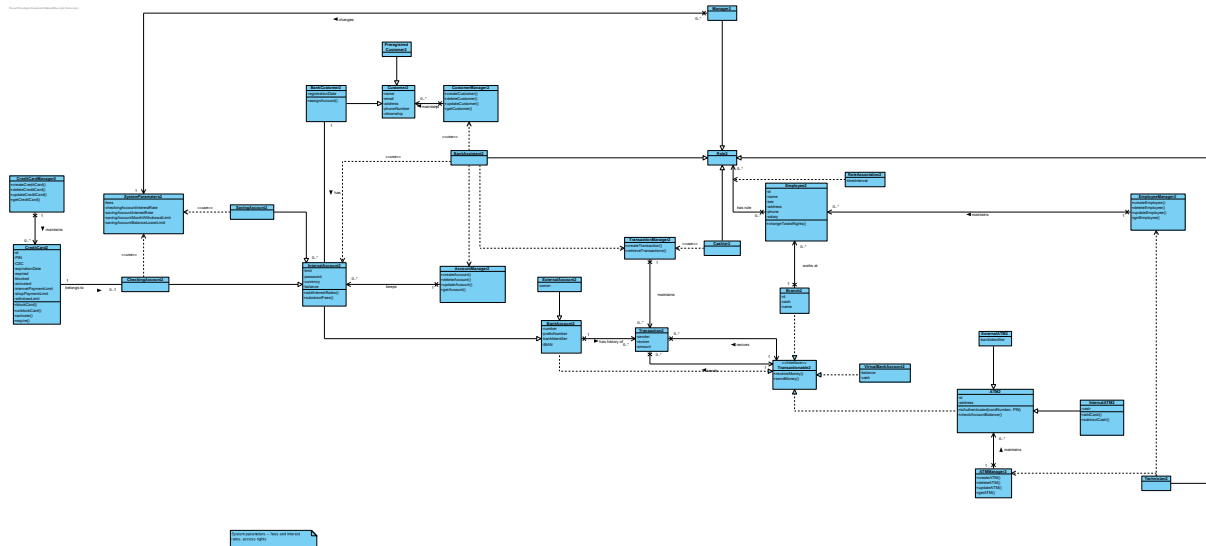
Summary

Name	Documentation
Manager2	
PreregistredCustomer2	
BankCustomer2	
Customer2	
CustomerManager2	
BankAssistant2	
Role2	
RoleAssociation2	
CreditCardManager2	
Employee2	
SystemParameters2	
EmployeeManager2	
SavingAccount2	
TransactionManager2	
Cashier2	
CreditCard2	
InternalAccount2	
AccountManager2	
CheckingAccount2	
ExternalAccount2	
Branch2	

📄 BankAccount2	
📄 Transaction2	
📄 ExternalATM2	
📄 Transactionable2	
📄 VirtualBankAccount2	
📄 ATM2	
📄 InternalATM2	
📄 ATMManager2	
📄 Technician2	
📄 N/A	System parameters -- fees and interest rates, access rights

Details

📄 Manager2

📄 PreregistredCustomer2

📄 BankCustomer2

📄 Customer2

📄 CustomerManager2

📄 BankAssistant2

📄 Role2

📄 RoleAssociation2

📄 CreditCardManager2

📄 Employee2

📄 SystemParameters2

📄 EmployeeManager2

📄 SavingAccount2

📄 TransactionManager2

📄 Cashier2

📄 CreditCard2

- **InternalAccount2**
- **AccountManager2**
- **CheckingAccount2**
- **ExternalAccount2**
- **Branch2**
- **BankAccount2**
- **Transaction2**
- **ExternalATM2**
- **Transactionable2**

VirtualBankAccount2

ATM2

InternalATM2

ATMManager2

Technician2

N/A

State Machine Diagram
Card State Machine Diagram
Visual Paradigm Standard Edition(Masaryk University)
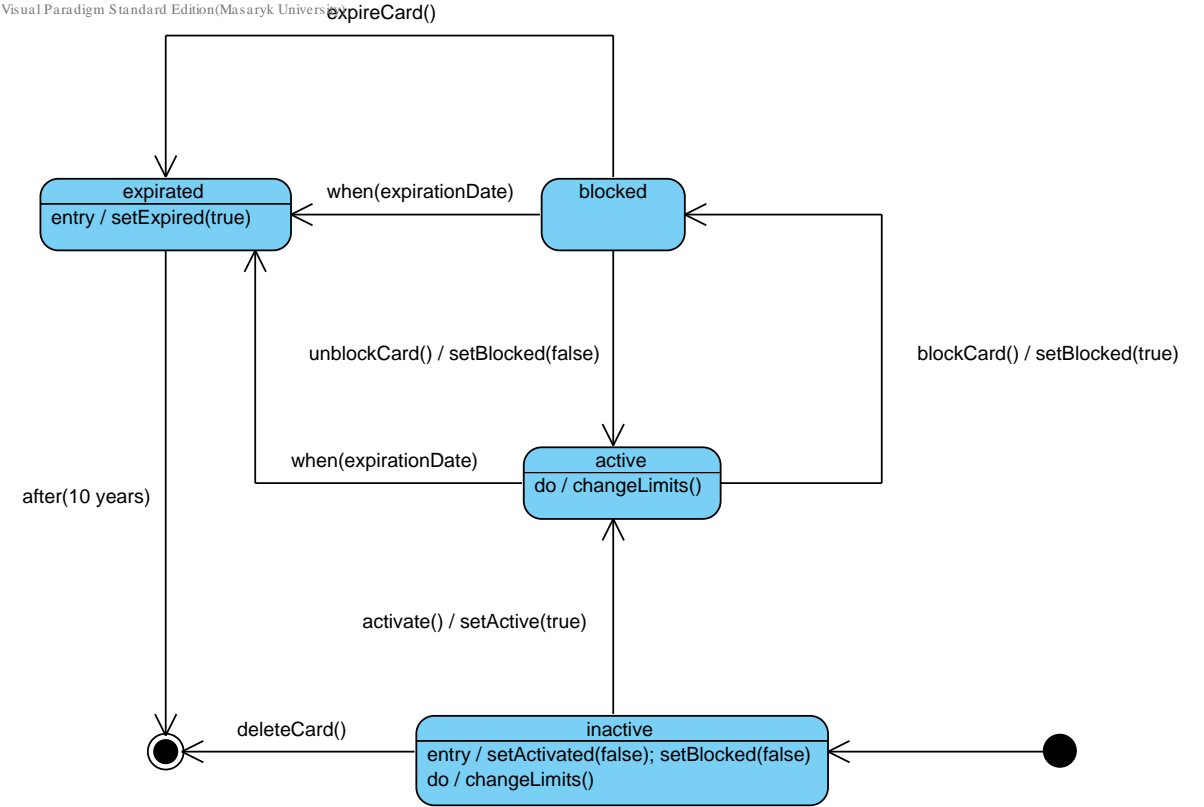
Summary

Name	Documentation
🔷 inactive	
🔷 active	
🔷 blocked	
🔷 expirated	

Details

🔴 N/A

🔷 inactive

Regions

Name	Documentation
🔲 setActivated(false)	
🔲 setBlocked(false)	
🔲 setActivated(false); setBlocked(false)	
🔲 changeLimits()	

🔲 active

Regions

Name	Documentation
🔲 changeLimits()	

🔲 blocked

🔲 expirated

Regions

Name	Documentation
🔲 setExpired(true)	

◉ N/A

Entity Relationship Diagram
ERD

Visual Paradigm Standard Edition(Masaryk University)
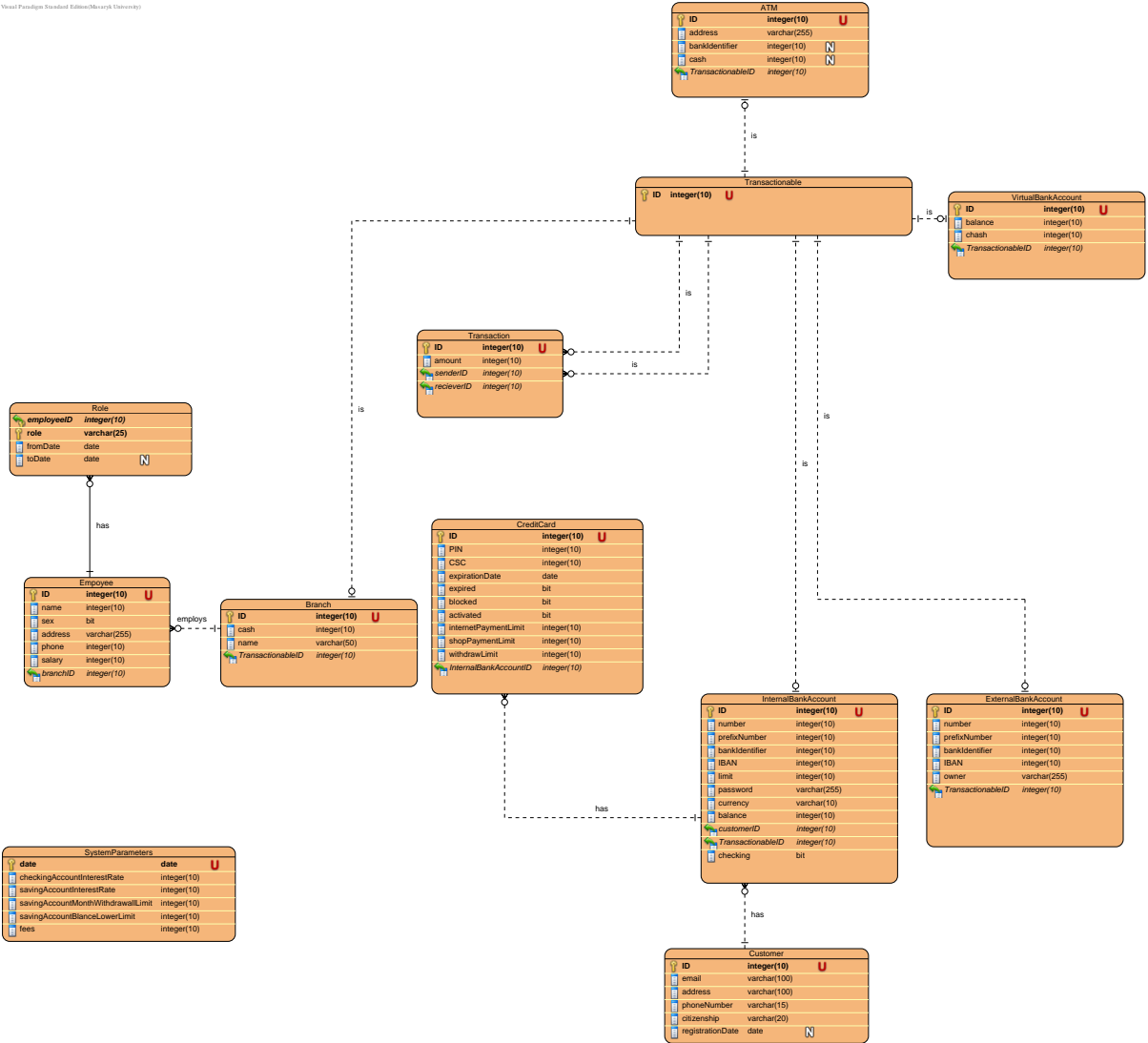
Summary

Name	Documentation
📁 ATM	
📁 Transactionable	
📁 VirtualBankAccount	
📁 Transaction	
📁 Role	
📁 CreditCard	
📁 Empoyee	
📁 Branch	

🗀 InternalBankAccount	
🗀 ExternalBankAccount	
🗀 SystemParameters	
🗀 Customer	

Details

🗀 **ATM**

🗀 **Transactionable**

🗀 **VirtualBankAccount**

🗀 **Transaction**

🗀 **Role**

🗀 **CreditCard**

🗀 **Empoyee**

🗀 **Branch**

🗀 **InternalBankAccount**

🗀 **ExternalBankAccount**

🗀 **SystemParameters**

🗀 **Customer**

Class Diagram
Design class diagram
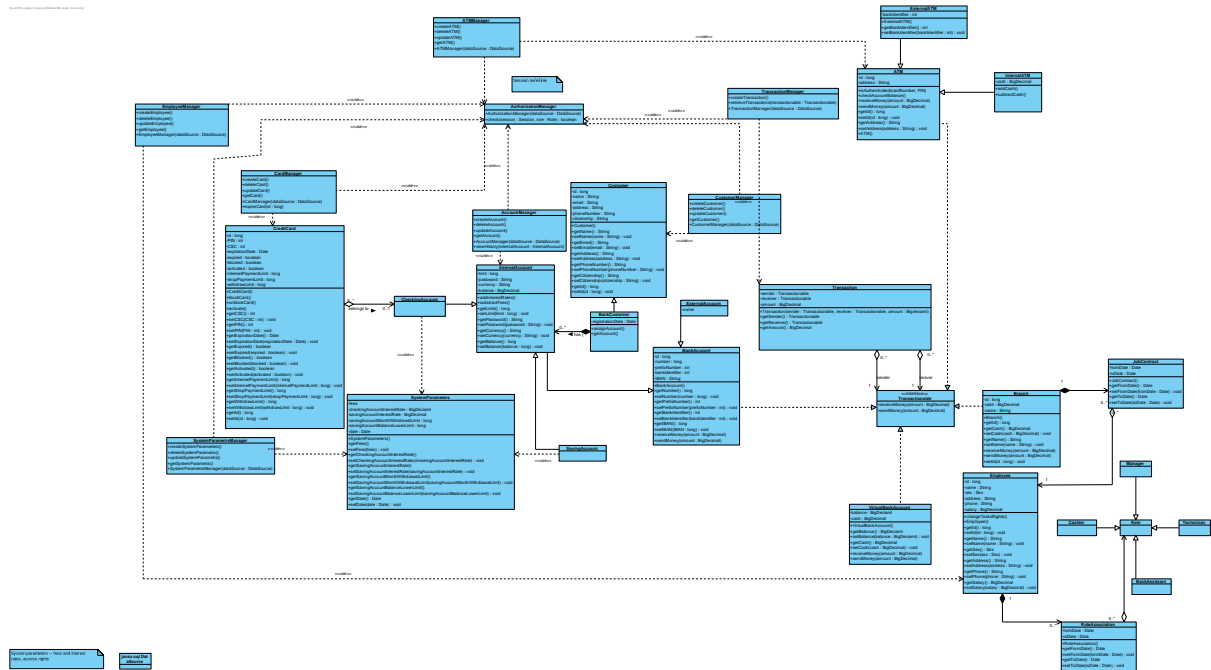
Summary

	Name	Documentation
	ExternalATM	
	ATMManager	
	ATM	
	InternalATM	
	TransactionManager	
	EmployeeManager	
	AuthorizationManager	
	CardManager	
	Customer	
	CustomerManager	
	AccountManager	
	CreditCard	
	InternalAccount	
	Transaction	
	CheckingAccount	
	ExternalAccount	
	BankCustomer	
	BankAccount	

JobContract	
Transactionable	
Branch	
SystemParameters	
SystemParametrsManager	
SavingAccount	
Manager	
Employee	
VirtualBankAccount	
Cashier	
Role	
Technician	
BankAssistant	
RoleAssociation	
javax.sql.DataSource	
N/A	Session neřešíme
N/A	System parameters -- fees and interest rates, access rights

Details

ExternalATM
ATMManager
ATM
InternalATM
TransactionManager
EmployeeManager
AuthorizationManager
CardManager
Customer
CustomerManager
AccountManager
CreditCard

InternalAccount

Transaction

CheckingAccount

ExternalAccount

BankCustomer

BankAccount

JobContract

Transactionable

Children

Name	Documentation
Class4	

Branch

SystemParameters

SystemParametrsManager

SavingAccount

Manager

Employee

VirtualBankAccount

Cashier

Role

Technician

BankAssistant

RoleAssociation

javax.sql.DataSource

N/A
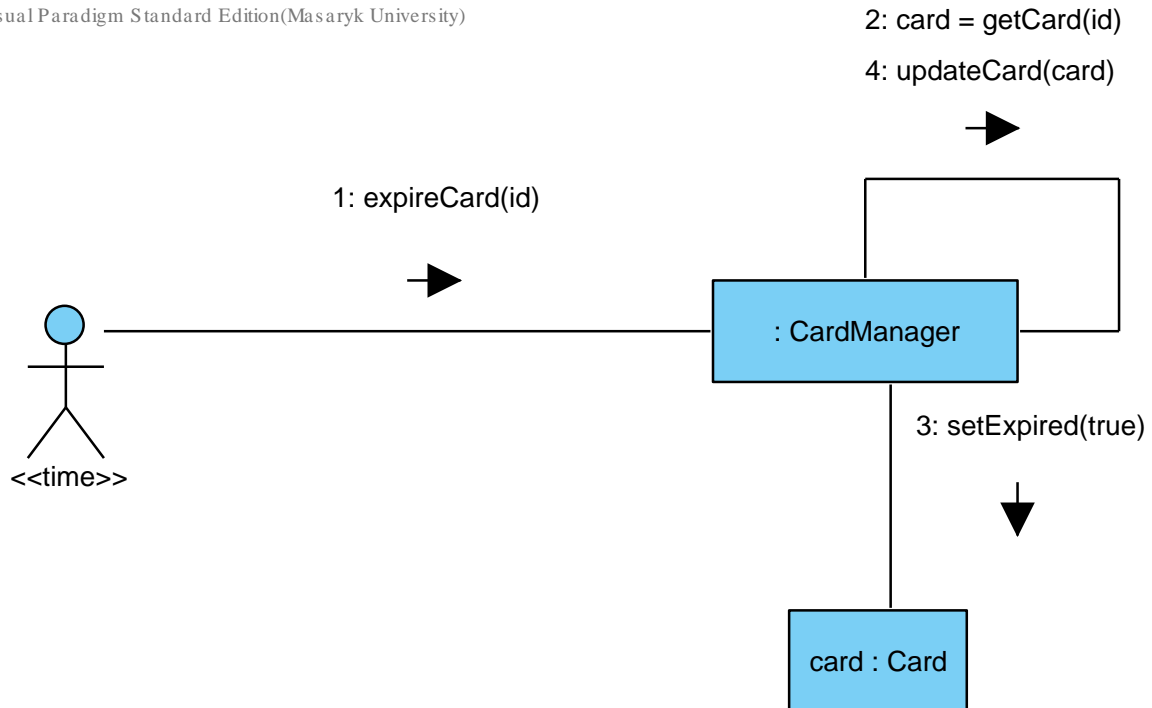
N/A

Communication Diagram
Expiration Card - communications

Visual Paradigm Standard Edition(Masaryk University)

2: card = getCard(id)

4: updateCard(card)

1: expireCard(id)

: CardManager

<<time>>

3: setExpired(true)

card : Card

Summary

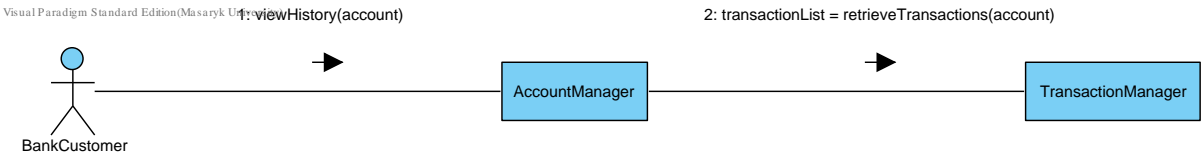| Name	Documentation
<<time>>	
expireCard(id)	
: CardManager	
card = getCard(id)	
setExpired(true)	
card : Card	
updateCard(card)	

Details

<<time>>

expireCard(id)

: CardManager

card = getCard(id)

→ **setExpired(true)**
card : Card
→ **updateCard(card)**

Communication Diagram
Transaction History - Communication

Visual Paradigm Standard Edition(Masaryk University) 1: viewHistory(account)   2: transactionList = retrieveTransactions(account)

BankCustomer   AccountManager   TransactionManager

Summary

Name	Documentation
👤 BankCustomer	
→ viewHistory(account)	
🖥 AccountManager	
→ transactionList = retrieveTransactions(account)	
🖥 TransactionManager	

Details

🖥 BankCustomer

→ viewHistory(account)

🖥 AccountManager

→ transactionList = retrieveTransactions(account)

🖥 TransactionManager