

PB007: Banking system

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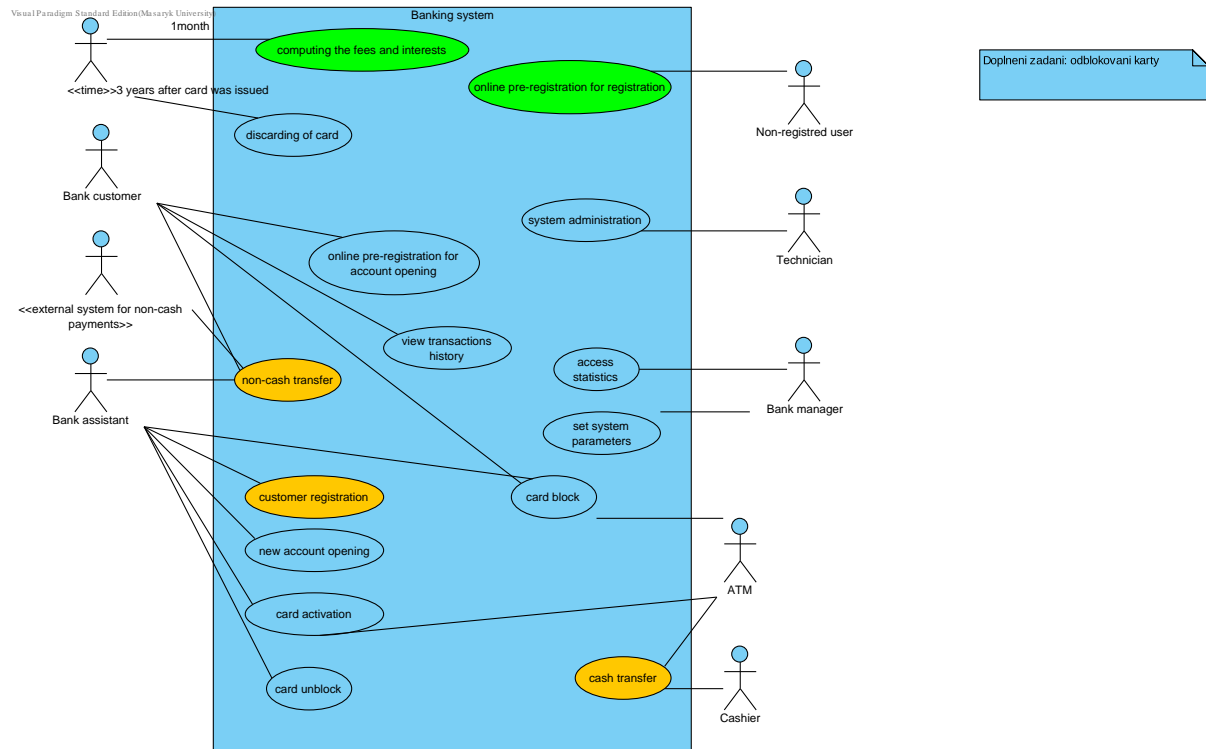
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
Use Case Diagram

Use Case Diagram



Summary

| Name | Documentation |
|---|------------------------------------|
| <<time>> | |
| Bank assistant | |
| Bank customer | |
| <<external system for non-cash payments>> | |
| ATM | |
| Cashier | |
| Non-registered user | |
| Technician | |
| Bank manager | |
| card unblock | |
| system administration | |
| N/A | Doplňeni zadání: odblokování karty |
| cash transfer | |
| view transactions history | |
| set system parameters | |
| access statistics | |

| | |
|---|--|
|  discarding 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 | |

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-registered 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 | <ol style="list-style-type: none"> 1. UC begins when cashier or ATM requests new cash transfer. 2. IF (actor is ATM): <ol style="list-style-type: none"> 2.1. Actor inputs authentication details (card number and PIN) |

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

discarding 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 | <ol style="list-style-type: none"> 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"): <ol style="list-style-type: none"> 3.1 Bank assistant fills email address 3.2 IF (pre-registration form with this email address does not exists): <ol style="list-style-type: none"> 3.2.1 Dismiss registration 3.3 Retrieve filled personal details from the form 4. ELSE: <ol style="list-style-type: none"> 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 | <ol style="list-style-type: none"> UC begins when Bank customer or assistant selects "Non-cash payment" or external system requests non-cash payment. Actor inputs non-cash transfer details (amount, receiver's account number) <ol style="list-style-type: none"> IF (actor is bank customer): <ol style="list-style-type: none"> System shows prompt to input SMS verification code. System sends SMS verification code and starts time countdown (5 minutes). Bank customer inputs the code and clicks "Submit the transfer" button. IF (the inputted code is not valid OR timeout expired): <ol style="list-style-type: none"> Dismiss the transfer. IF (actor is external system): <ol style="list-style-type: none"> Actor inputs authentication details (card number and PIN) IF (authentication details are not valid): <ol style="list-style-type: none"> Dismiss the transfer. IF (required amount can not be allocated): <ol style="list-style-type: none"> Dismiss the transfer 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

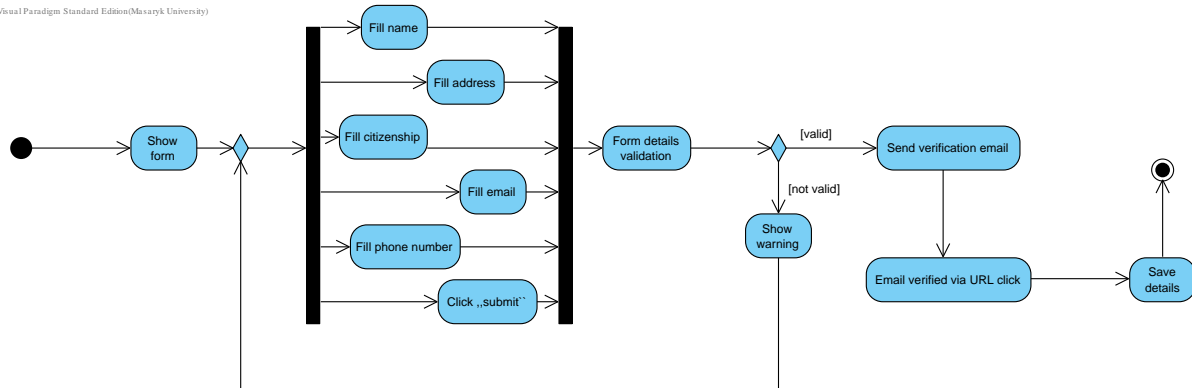
Children

| 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 | |
|  discarding of card | |
|  access statistics | |
|  set system parameters | |
|  view transactions history | |
|  cash transfer | |
|  system administration | |
|  card unblock | |

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**

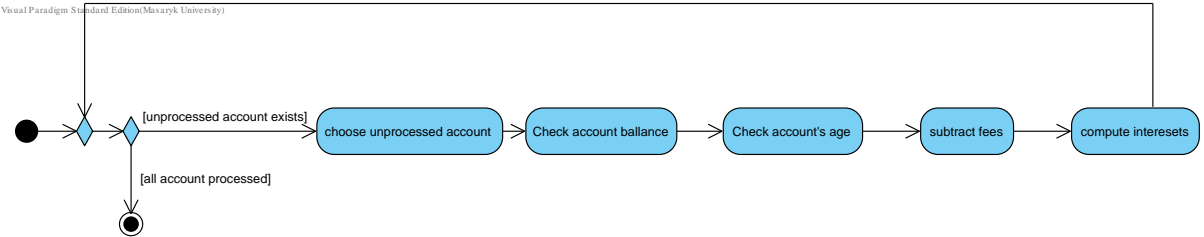
 **Save details**

 **N/A**

 **Show warning**

Activity Diagram

Computing interest rates and fees



Summary

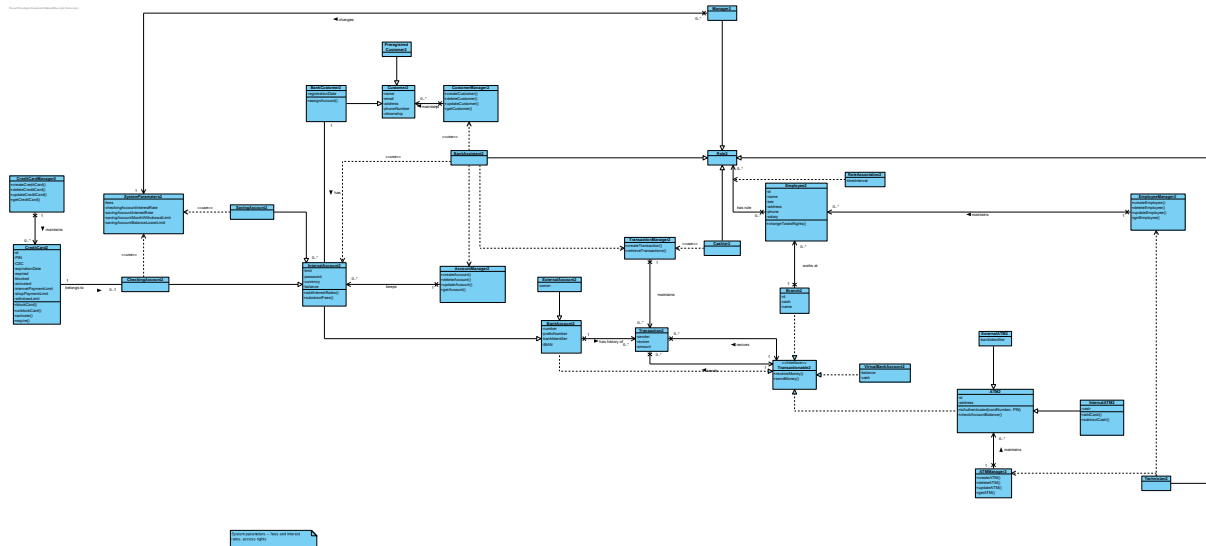
| Name | Documentation |
|----------------------------|---------------|
| choose unprocessed account | |
| Check account ballance | |
| Check account's age | |
| subtract fees | |
| compute interesets | |

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**

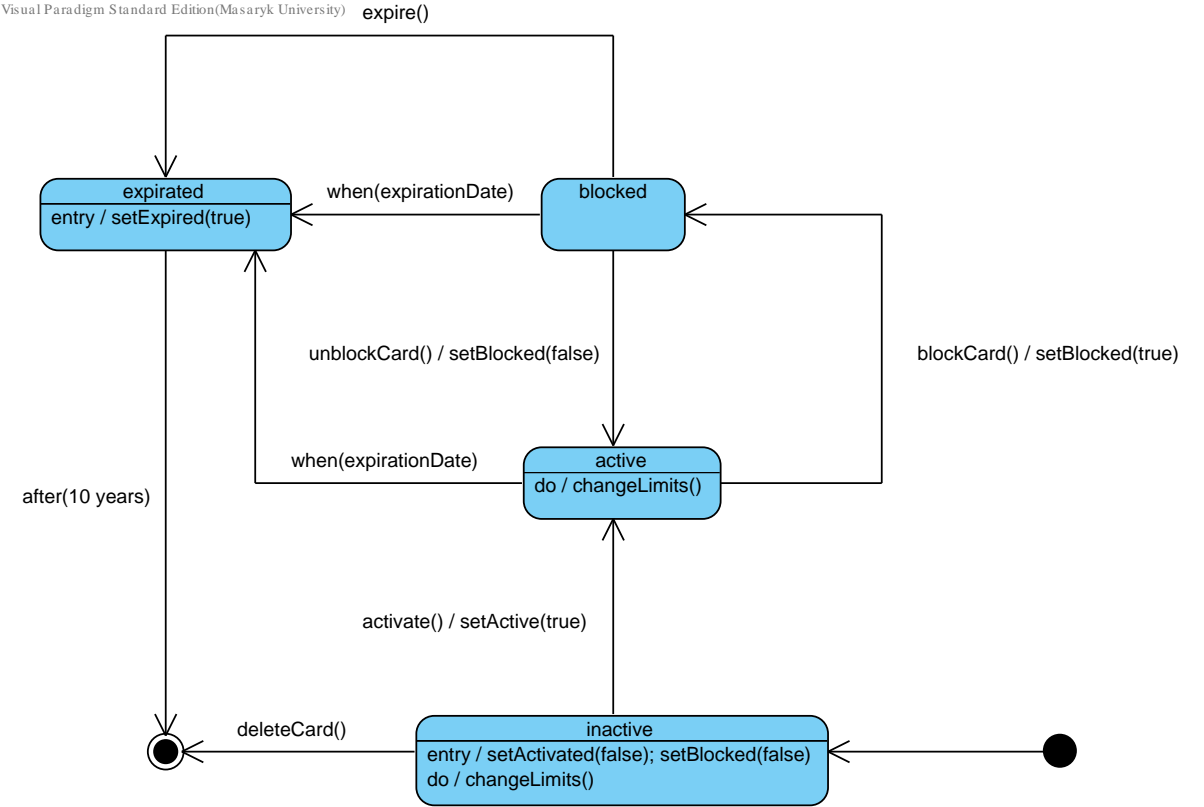
 **ATMManager2**

 **Technician2**

 **N/A**

State Machine Diagram

Card State Machine Diagram







Summary

| Name | Documentation |
|----------|---------------|
| inactive | |
| active | |
| blocked | |
| expired | |

Details

- N/A
- inactive

Regions

| Name | Documentation |
|---|---------------|
|  setActivated(false) | |
|  setBlocked(false) | |
|  setActivated(false); setBlocked(false) | |
|  changeLimits() | |

active

Regions

| Name | Documentation |
|--|---------------|
|  changeLimits() | |

blocked

expired

Regions

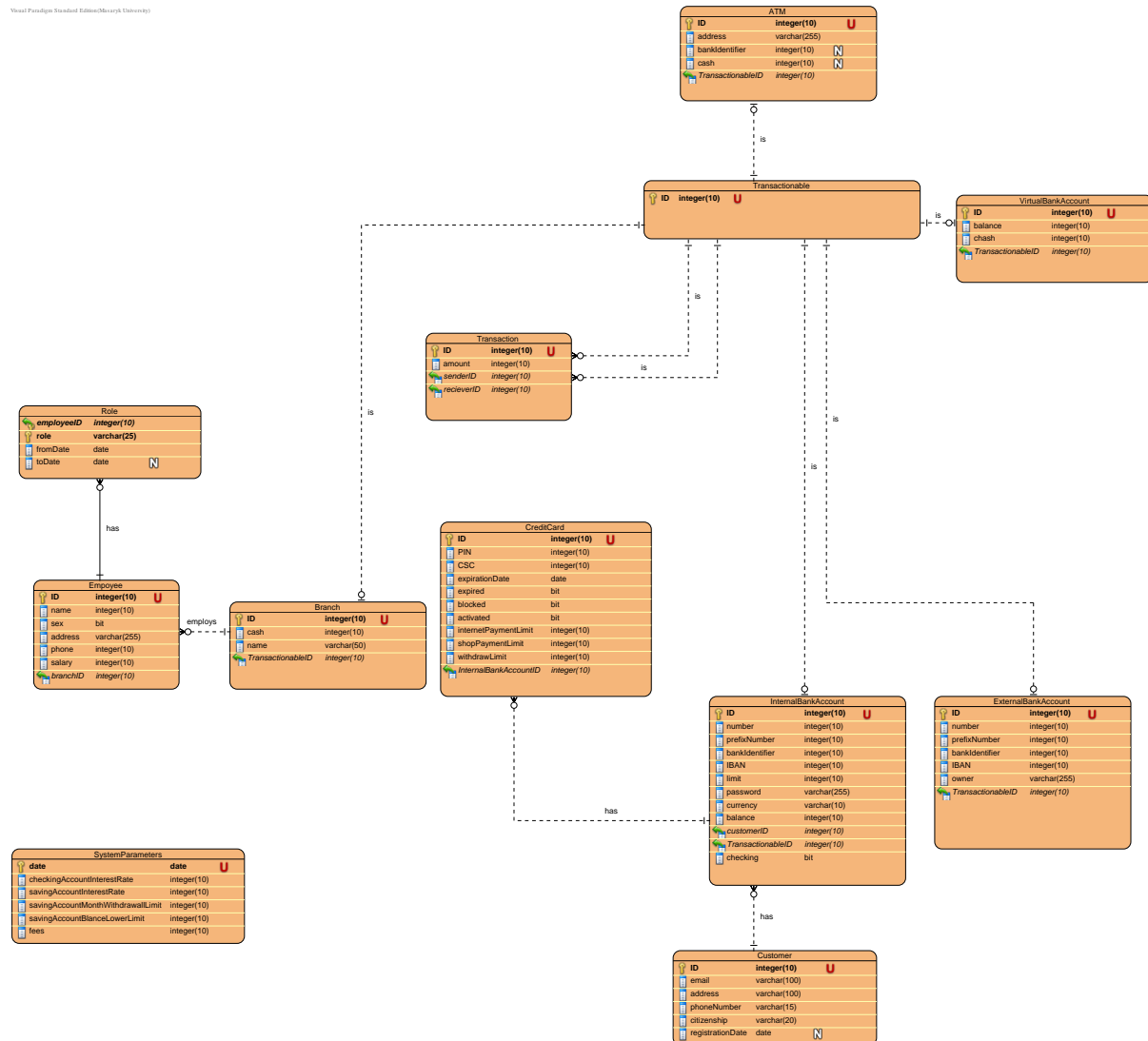
| Name | Documentation |
|--|---------------|
|  setExpired(true) | |

N/A

Entity Relationship Diagram


ERD

Visual Paradigm Standard Edition (Microsoft University)















Summary

| Name | Documentation |
|--------------------|---------------|
| ATM | |
| Transactionable | |
| VirtualBankAccount | |
| Transaction | |
| Role | |
| CreditCard | |
| Employee | |
| Branch | |

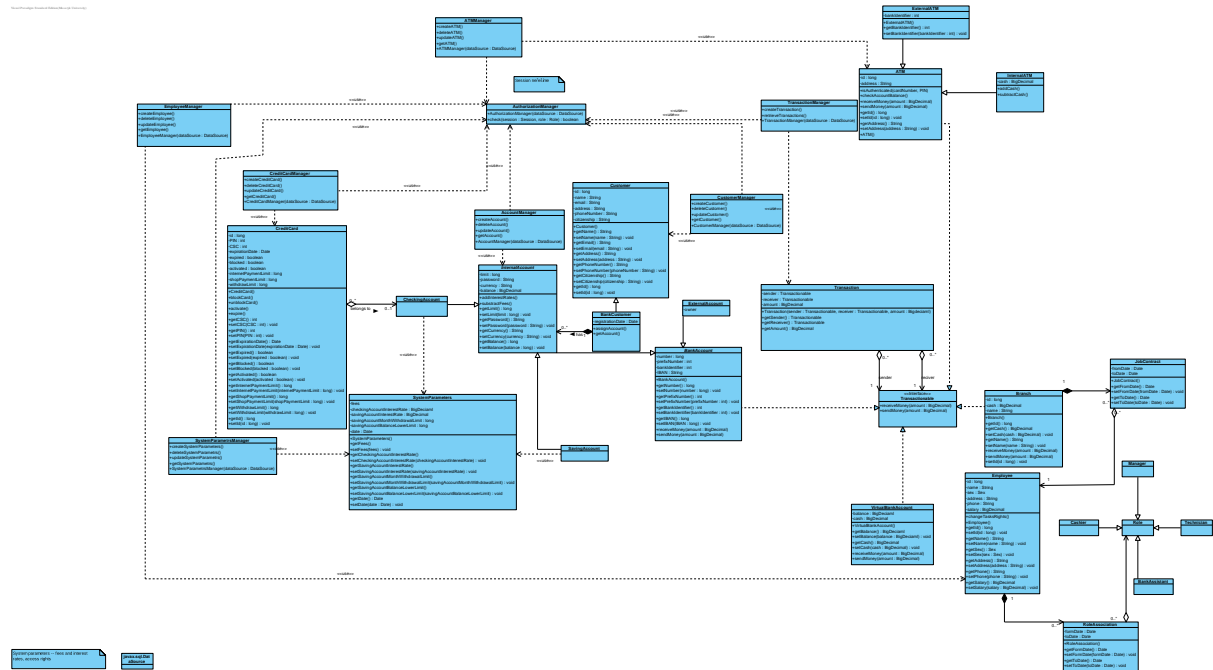
| | |
|---|--|
|  InternalBankAccount | |
|  ExternalBankAccount | |
|  SystemParameters | |
|  Customer | |

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 | |
| CreditCardManager | |
| Customer | |
| CustomerManager | |
| AccountManager | |
| CreditCard | |
| InternalAccount | |
| Transaction | |
| CheckingAccount | |
| ExternalAccount | |
| BankCustomer | |
| BankAccount | |

| | |
|---|---|
|  JobContract | |
|  Transactionable | |
|  Branch | |
|  SystemParameters | |
|  SystemParametersManager | |
|  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**
-  **CreditCardManager**
-  **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**

