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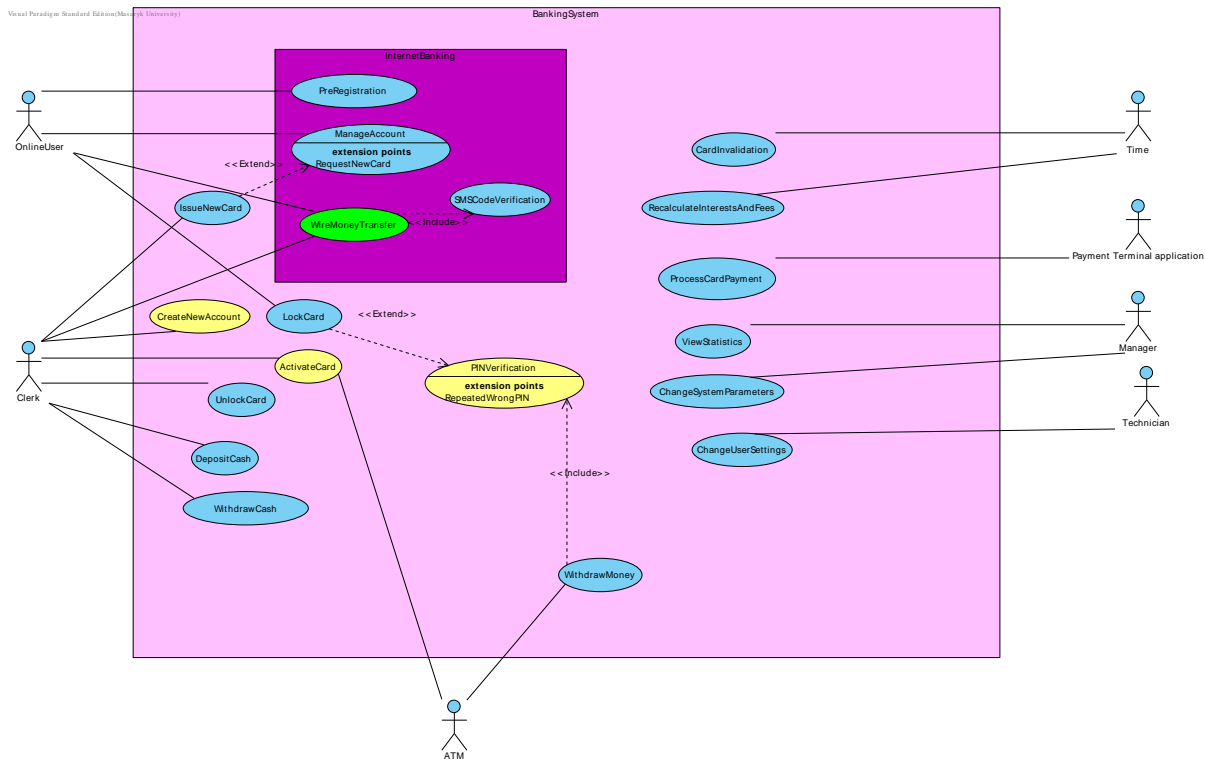
Stereotypes

UseCase		
Tagged Value Definitions	Level	
	Type	Enumeration
	Enumeration Values	Summary, User, Subfunction
	Complexity	
	Type	Enumeration
	Enumeration Values	Low, Medium, High
	Use Case Status	
	Type	Enumeration
	Enumeration Values	Name Only, Initial, Base, Complete, Deferred
	Implementation Status	
	Type	Enumeration
	Enumeration Values	Scheduled, Started, Partially Complete, Complete, Partially Deferred
	Preconditions	
	Type	Multi-line Text
	Post-conditions	
	Type	Multi-line Text
	Author	
	Type	Text
	Assumptions	
	Type	Multi-line Text

requirement		
Tagged Value Definitions	Text	
	Type	HTML
	ID	
	Type	Text
	source	
	Type	Text
	kind	
	Type	Enumeration
	Enumeration Values	Functional, Performance, Interface
	verifyMethod	
	Type	Enumeration
	Enumeration Values	Analysis, Demonstration, Inspection, Test
	risk	
	Type	Enumeration
	Enumeration Values	High, Medium, Low
	status	
	Type	Enumeration
	Enumeration Values	Proposed, Approved, Rejected, Deferred, Implemented, Mandatory, Obsolete
Include		
Extend		
use		







Use Case Diagram

Banking System



Summary

Name		Documentation	
OnlineUser			
Clerk			
ATM			
Time			
Payment Terminal application			
Manager			
Technician			
DepositCash			
UnlockCard			
LockCard			
PINVerification			
		Use Case ID	1
		Brief Description	UC1 verifies the PIN number of card
		Primary Actors	ATM
		Secondary Actors	Customer

	Preconditions	Card is activated and unlocked
	Main Flow of Events	<ol style="list-style-type: none"> 1. UC is evoked when card is inserted into ATM 2. WHILE number of attempts ≤ 3 AND access is not allowed <ol style="list-style-type: none"> 2.1. System prompts the user to enter PIN code 2.2. User enters PIN code into ATM 2.3. System compares PIN code to database entry 2.4. IF PIN matches database entry <ol style="list-style-type: none"> 2.4.1. Allow ATM to access user data 3. IF access is not allowed <ol style="list-style-type: none"> 3.1. extension point(LockCard)
	Alternative Flows	
	Post-conditions	ATM has access to user data or the card is locked
 IssueNewCard		
 CardInvalidation		
 ActivateCard		
	Use Case ID	2
	Brief Description	UC2 activates the card
	Primary Actors	Clerk, ATM
	Secondary Actors	Customer
	Preconditions	Card is not activated
	Main Flow of Events	<ol style="list-style-type: none"> 1. UC is evoked when card activation is requested 2. Actor enters card information 3. Specified card is marked as active in database
	Alternative Flows	Card does not exists or is not valid
	Post-conditions	Card is activated
 WithdrawMoney		
 WithdrawCash		
 SMSCodeVerification		

● ManageAccount	Includes transfer history and card requests	
● WireMoneyTransfer		
● CreateNewAccount	Use Case ID	3
	Brief Description	UC3 creates new account
	Primary Actors	Clerk
	Secondary Actors	Customer
	Preconditions	
	Main Flow of Events	<ol style="list-style-type: none"> 1. UC is evoked when customer requests opening an account 2. Customer presents his/her personal ID 3. IF customer didn't pre-register online <ol style="list-style-type: none"> 3.1. Clerk fills in customer's personal data 3.2. Clerk fills in requested account type 3.3. Clerk fills in requested currency 4. Customer signs the documents 5. IF customer is not registered in the bank yet <ol style="list-style-type: none"> 5.1. Clerk creates new user account for the customer 5.2. System saves the new user account 6. System saves the newly created bank account in database 7. Bank account is assigned to customer's user account 8. Account login information is given to customer
	Alternative Flows	
	Post-conditions	Account is created
● PreRegistration		
● ChangeUserSettings		
● ChangeSystemParameters		
● ViewStatistics		
● ProcessCardPayment		
● RecalculateInterestsAndFees		
📖 InternetBanking		
📖 BankingSystem		

Documentation

Functional Requirements

- FR001 A clerk will be able to create an account for a customer using customer's ID.
- FR002 A customer will be able to pre-fill a registration form online and then, visiting a bank, a clerk will be able to finish the account creation using the form.
- FR003 Only when creating an account a customer will be able to choose a type of the account (current or saving account), account currency (CZK or EUR).
- FR004 A timer will be periodically (at the end of the month) computing fees and interests for the past month.
- FR005 A clerk will be able to set a money transfer after a customer's request.
- FR006 A customer can set a money transfer using a online interface (internet banking).
- FR007 Every online money transfer must be authorized by a code which will be sent to the user's cell phone via SMS
- FR008 Every transaction code is valid for 5 minutes
- FR009 Transaction is canceled if wrong code is submitted 3 times
- FR010 A client can view his/her transfer history using the internet banking.
- FR011 Card payments at shops or online will be processed by the external system.
- FR012 Money in cash can be deposited or withdrawn in person at the bank's cash desk, served by bank cashier.
- FR013 Money in cash can be withdrawn from an ATM using a card.
- FR014 Card can be delivered to a customer by post (including authorization PIN sent separately) or he/she can pick it up at the bank.
- FR015 The card can be only activated by a clerk or through an ATM.
- FR016 Card has a validity date. After the date the card will be invalidated.
- FR017 Card can be blocked by a customer through online banking.
- FR018 A clerk can unblock a card that is blocked.
- FR019 Bank managers can view system statistics.
- FR020 Bank managers can change system parameters.
- FR021 Technicians can maintain the system and change user settings.

Non-Functional Requirements

- NFR001 Every ATM has a working connection to the bank server.
- NFR002 SMS authorization code will be sent in less than 30s after request.
- NFR003 Card activation and lock/unlock has to take effect in less than a minute after request.
- NFR004 A transaction details must be available for up to 10 years after transaction.
- NFR005 There must be a redundant copy of every server and connection element.
- NFR006 In case of hardware failure, system must switch to the redundant copy in less than 30s.
- NFR007 Every bank employee is authenticated using a USB token and a password.
- NFR008 Creating a new account can take up to 24h.
- NFR009 All system preferences and user data changes has to be saved as separate revisions in case of rollback.
- NFR010 An internal money transfer has to be completed in less than a day. A money transfer to any other bank has to be completed in less than a week.










Details



OnlineUser










Clerk

-  **ATM**
-  **Time**
-  **Payment Terminal application**
-  **Manager**
-  **Technician**
-  **DepositCash**
-  **UnlockCard**
-  **LockCard**
-  **PINVerification**


Extension Points

RepeatedWrongPIN

-  **IssueNewCard**
-  **CardInvalidation**
-  **ActivateCard**
-  **WithdrawMoney**
-  **WithdrawCash**
-  **SMSCodeVerification**
-  **ManageAccount**

Extension Points

RequestNewCard

-  **WireMoneyTransfer**
-  **CreateNewAccount**
-  **PreRegistration**
-  **ChangeUserSettings**
-  **ChangeSystemParameters**

- ViewStatistics
- ProcessCardPayment
- RecalculateInterestsAndFees
- 📄 InternetBanking







Children




Name	Documentation
● ManageAccount	Includes transfer history and card requests
● PreRegistration	
● WireMoneyTransfer	
● SMSCodeVerification	

📄 BankingSystem

Children

Name	Documentation												
● RecalculateInterestsAndFees													
● ProcessCardPayment													
● ViewStatistics													
● ChangeSystemParameters													
● ChangeUserSettings													
● CreateNewAccount													
	<table> <tr> <td>Use Case ID</td><td>3</td></tr> <tr> <td>Brief Description</td><td>UC3 creates new account</td></tr> <tr> <td>Primary Actors</td><td>Clerk</td></tr> <tr> <td>Secondary Actors</td><td>Customer</td></tr> <tr> <td>Preconditions</td><td></td></tr> <tr> <td>Main Flow of Events</td><td> <ol style="list-style-type: none"> 1. UC is evoked when customer requests opening an account 2. Customer presents his/her personal ID 3. IF customer didn't pre-register online <ol style="list-style-type: none"> 3.1. Clerk fills in customer's personal data 3.2. Clerk fills in requested account type 3.3. Clerk fills in requested currency 4. Customer signs the documents 5. IF customer is not registered in the bank yet <ol style="list-style-type: none"> 5.1. Clerk creates new user account for the customer </td></tr> </table>	Use Case ID	3	Brief Description	UC3 creates new account	Primary Actors	Clerk	Secondary Actors	Customer	Preconditions		Main Flow of Events	<ol style="list-style-type: none"> 1. UC is evoked when customer requests opening an account 2. Customer presents his/her personal ID 3. IF customer didn't pre-register online <ol style="list-style-type: none"> 3.1. Clerk fills in customer's personal data 3.2. Clerk fills in requested account type 3.3. Clerk fills in requested currency 4. Customer signs the documents 5. IF customer is not registered in the bank yet <ol style="list-style-type: none"> 5.1. Clerk creates new user account for the customer
Use Case ID	3												
Brief Description	UC3 creates new account												
Primary Actors	Clerk												
Secondary Actors	Customer												
Preconditions													
Main Flow of Events	<ol style="list-style-type: none"> 1. UC is evoked when customer requests opening an account 2. Customer presents his/her personal ID 3. IF customer didn't pre-register online <ol style="list-style-type: none"> 3.1. Clerk fills in customer's personal data 3.2. Clerk fills in requested account type 3.3. Clerk fills in requested currency 4. Customer signs the documents 5. IF customer is not registered in the bank yet <ol style="list-style-type: none"> 5.1. Clerk creates new user account for the customer 												

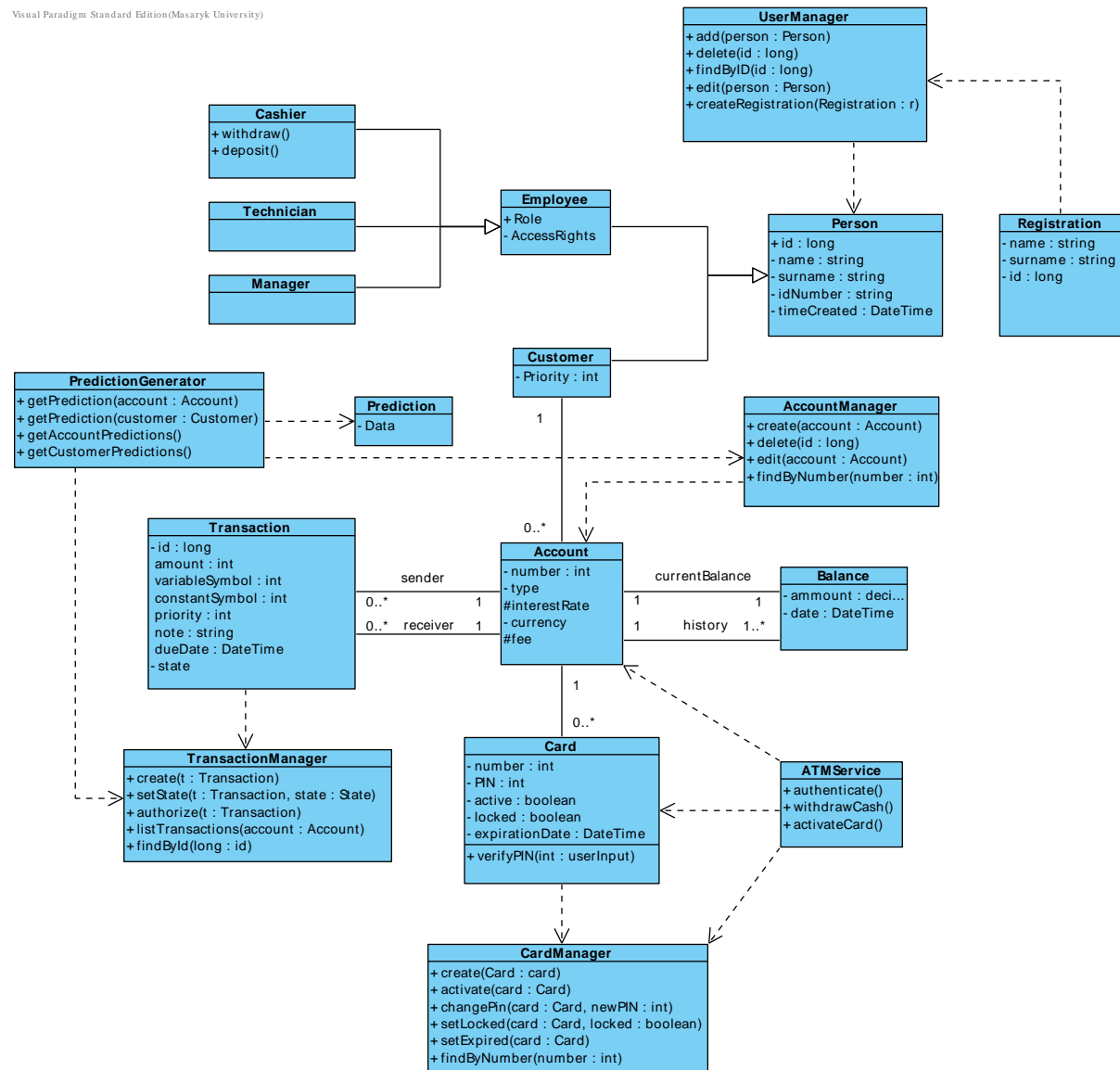
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	Alternative Flows	
	Post-conditions	Account is created
 WithdrawCash		
 WithdrawMoney		
 ActivateCard		
	Use Case ID	2
	Brief Description	UC2 activates the card
	Primary Actors	Clerk, ATM
	Secondary Actors	Customer
	Preconditions	Card is not activated
	Main Flow of Events	1. UC is evoked when card activation is requested 2. Actor enters card information 3. Specified card is marked as active in database
	Alternative Flows	Card does not exists or is not valid
	Post-conditions	Card is activated
 CardInvalidation		
 IssueNewCard		
 PINVerification		
	Use Case ID	1
	Brief Description	UC1 verifies the PIN number of card
	Primary Actors	ATM
	Secondary Actors	Customer

	Preconditions	Card is activated and unlocked
	Main Flow of Events	<ol style="list-style-type: none"> 1. UC is evoked when card is inserted into ATM 2. WHILE number of attempts ≤ 3 AND access is not allowed <ol style="list-style-type: none"> 2.1. System prompts the user to enter PIN code 2.2. User enters PIN code into ATM 2.3. System compares PIN code to database entry 2.4. IF PIN matches database entry <ol style="list-style-type: none"> 2.4.1. Allow ATM to access user data 3. IF access is not allowed <ol style="list-style-type: none"> 3.1. extension point(LockCard)
	Alternative Flows	
	Post-conditions	ATM has access to user data or the card is locked
 LockCard		
 UnlockCard		
 DepositCash		

Class Diagram



Class Diagram

Visual Paradigm Standard Edition(Masaryk University)



Summary

Name	Documentation
UserManager	
Cashier	
Employee	
Technician	
Person	
Registration	
Manager	
Customer	
PredictionGenerator	

 Prediction	
 AccountManager	
 Transaction	
 Account	
 Balance	
 Card	
 TransactionManager	
 ATMService	
 CardManager	

Details

 **UserManager**

 **Cashier**

 **Employee**

 **Technician**

 **Person**

 **Registration**

 **Manager**

 **Customer**

 **PredictionGenerator**

 **Prediction**

 **AccountManager**

 **Transaction**

 **Account**

 **Balance**

 **Card**

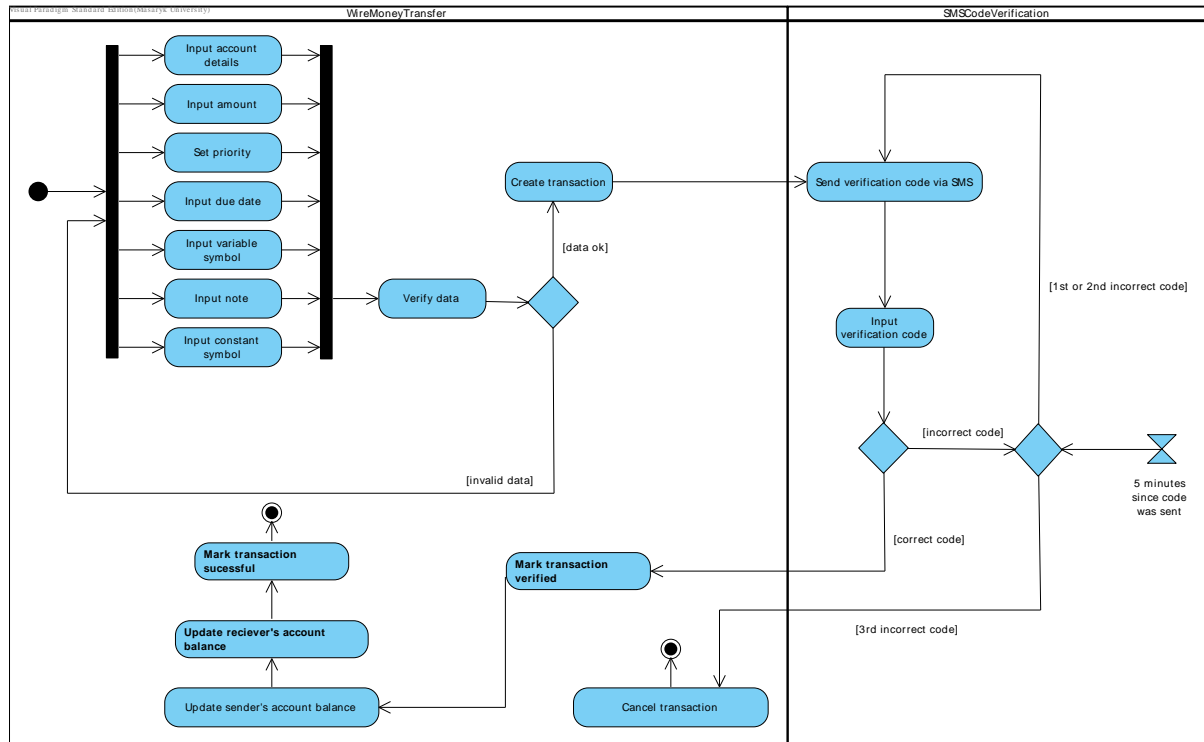
 **TransactionManager**

 **ATMService**

 **CardManager**

Activity Diagram

WireMoneyTransfer



Summary

Name	Documentation
Swimlane	
WireMoneyTransfer	
SMSCodeVerification	
Input account details	
Input amount	
Set priority	
Input due date	
Input variable symbol	
Input note	
Input constant symbol	
Verify data	
Create transaction	
Send verification code via SMS	
Input verification code	
Cancel transaction	
Mark transaction verified	
Update sender's account balance	
Update reciever's account balance	
Mark transaction sucessful	



5 minutes since code was sent

Details



Swimlane

Activity Partitions

WireMoneyTransfer		
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Contained Elements	Name	Documentation
	N/A	
	N/A	
	Input account details	
	Input amount	
	Set priority	
	Input due date	
	Input variable symbol	
	Input note	
	N/A	
	Create transaction	
	Input constant symbol	
	Cancel transaction	
	Update sender's account balance	
	N/A	
	N/A	
	Verify data	
	N/A	
	Update reciever's account balance	
	Mark transaction sucessful	
	Mark transaction verified	

SMSCodeVerification		
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Contained Elements	Name	Documentation
	[-] Input verification code	
	↔ N/A	
	↔ N/A	
	[-] Send verification code via SMS	
	⏰ 5 minutes since code was sent	

● N/A

↔ N/A

[-] Input account details

[-] Input amount

[-] Set priority

[-] Input due date

[-] Input variable symbol

[-] Input note

[-] Input constant symbol

↔ N/A

[-] Verify data

↔ N/A

[-] Create transaction

[-] Send verification code via SMS

[-] Input verification code

↔ N/A

↔ N/A

[-] Cancel transaction

 **N/A**

 **Mark transaction verified**

 **Update sender's account balance**

 **Update reciever's account balance**

 **Mark transaction sucessful**

 **N/A**

 **5 minutes since code was sent**

Textual Analysis

Textual Analysis¹

Registration and new **account**: Both the **registration** of a new **customer** and opening of a new **account** can follow two scenarios. First, a **customer** can register/open an **account** in person at the bank with the help of a **bank assistant**. Second, the **registration/account** opening can consist of an online pre-**registration** and **registration** finalization in person at the bank (again with the help of a **bank assistant**), where he/she signs the documents and presents his **personal ID**. For simplicity, let each **account** be assigned to exactly one person.

Account types: The bank offers "checking" accounts and "savings" accounts, which have different **interest rates** and withdrawal conditions. Both **types** of accounts can have either CZK or EUR **currency**. The **account** type cannot be changed after **account** opening.

Fees: At the beginning of each month the system is periodically computing the fees for **account** management and **interest rates** for the past month. 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.

Non-cash money transfer: Money transfer can be done in the bank with the help of a **bank assistant** or through Internet banking (from a browser), where the **customer** can also see the **transaction** history on his/her accounts. To start a transfer, the **customer** first needs to enter necessary information (**bank account** of the **receiver**, **amount**, etc.) and then the **customer** needs to authorize the **transaction** by entering an **authorization code** sent to his/her mobile phone. 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.

Non-cash payments: **Card** payments in shops or online and their evidence are realized by means of the integration of the banking system with an **external application** that is responsible for these activities.


Cash: Money in cash can be deposited or withdrawn in person at the bank's cash desk, served by bank **cashiers**. Money from checking accounts can be withdrawn also from **ATM** with a **card**. Each "checking" **account** is assigned one **card**, there is no **card** for a "savings" **account**.


Card: An interesting object in the system is the **card**, which goes through the following life cycle. The **card** can be delivered to the bank **customer** either by post (with authorization **PIN** number sent separately) or in person at the bank (based on his/her preference). At the beginning, the **card** is **inactive**. The **card** can be activated by the **customer** either at the bank with the help of a **bank assistant**, or through an **ATM**. Then the **card** is **valid** till the **validity date**, when it is discarded. When **valid**, the **card** can be **blocked** to protect the **account** against attack if the **card** is lost or stolen - and then again unblocked at the bank. The **card** is **blocked** also in an **ATM** if the authorization **PIN** code is entered unsuccessfully three times.

Users: Besides bank assistants, **cashiers** and bank customers, the banking system is accessed also by bank managers (each bank branch has its own **manager**, one of which is the **manager** of the whole bank), who can access various statistics about money flows, including future predictions, and can set various system parameters (**interest rates** of savings accounts, fees, etc.). The last type of users are the **technicians**, who take care of the system and when


asked by the managers, they change the **access rights** of other users (e.g. when a cashier is promoted to a **manager** position).


Candidate Classes


Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Class	
Candidate Item Text	Registration	
Create Model	 Registration	
Highlight Color	#ffff00	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Class	
Candidate Item Text	account	
Create Model	 Account	
Highlight Color	#ffff00	
Ignore	false	


Name	Value	
Quality Score	Good	
Candidate Item Type	Class	
Candidate Item Text	bank assistant	
Highlight Color	#ffff00	
Ignore	false	


Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Class	
Candidate Item Text	transaction	
Create Model	 Transaction	
Highlight Color	#ffff00	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Class	
Candidate Item Text	Card	
Create Model	 Card	
Highlight Color	#ffff00	
Ignore	false	


Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Class	
Candidate Item Text	ATM	
Create Model	 ATMService	
Highlight Color	#ffff00	
Ignore	false	


Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Class	
Candidate Item Text	external application	
Highlight Color	#ffff00	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Class	
Candidate Item Text	cashiers	
Create Model	 Cashier	
Highlight Color	#ffff00	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Class	
Candidate Item Text	manager	
Create Model	 Manager	
Highlight Color	#ffff00	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	personal ID	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Class	
Candidate Item Text	customer	
Create Model	 Customer	
Highlight Color	#ffff00	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Class	
Candidate Item Text	technicians	
Create Model	 Technician	
Highlight Color	#ffff00	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	types	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	interest rates	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	currency	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	priority	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	bank account	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	receiver	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	amount	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	balance	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	authorization code	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	inactive	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	valid	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	validity date	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	blocked	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	PIN	
Highlight Color	#90cb48	
Ignore	false	

Name	Value	
Quality Score	Fair	
Quality Reason	Problem	Suggestion
	Name does not contain glossary terms	Define name as term in glossary
Candidate Item Type	Unspecified	
Candidate Item Text	access rights	
Highlight Color	#90cb48	
Ignore	false	