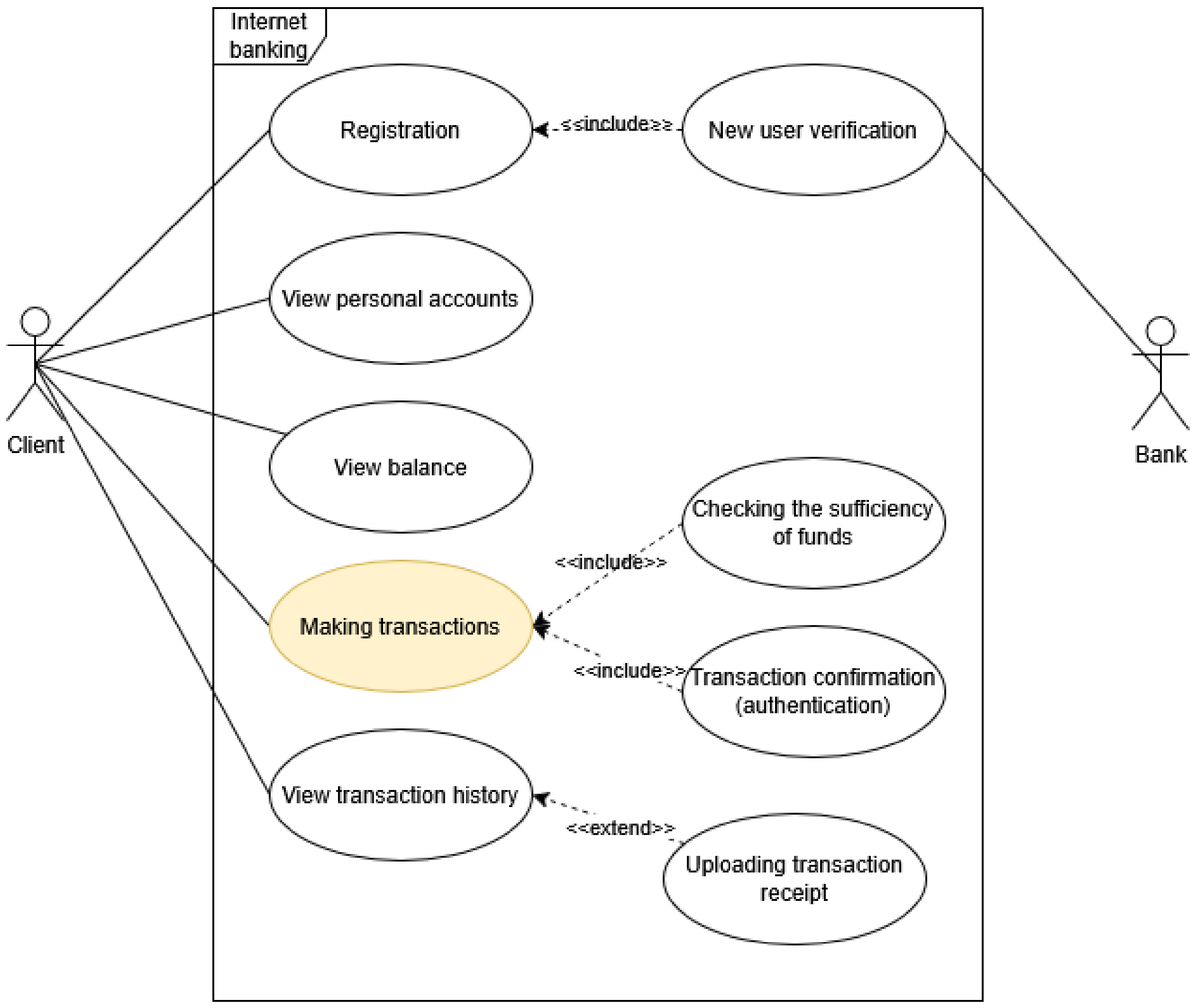
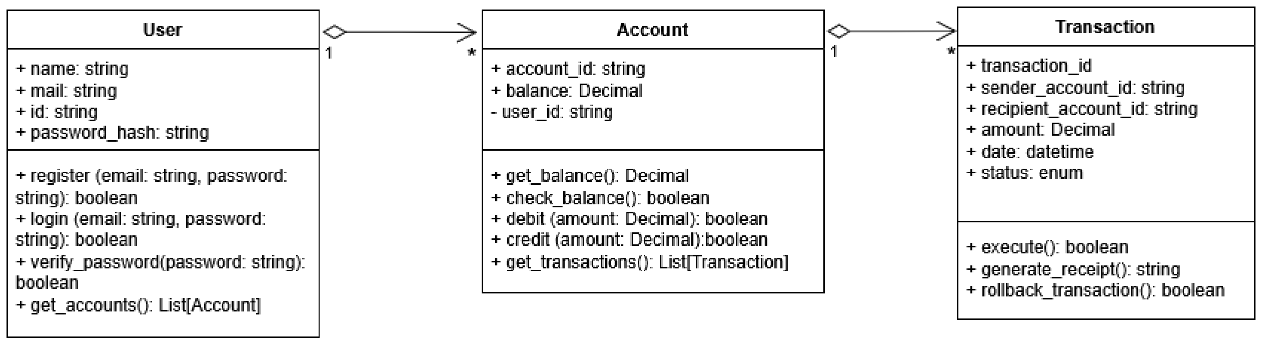
Business requirements for new functionality

This project examines the functionality of the money transfer (transaction) service. The Use-case diagram below shows how this service interacts with other services for the client



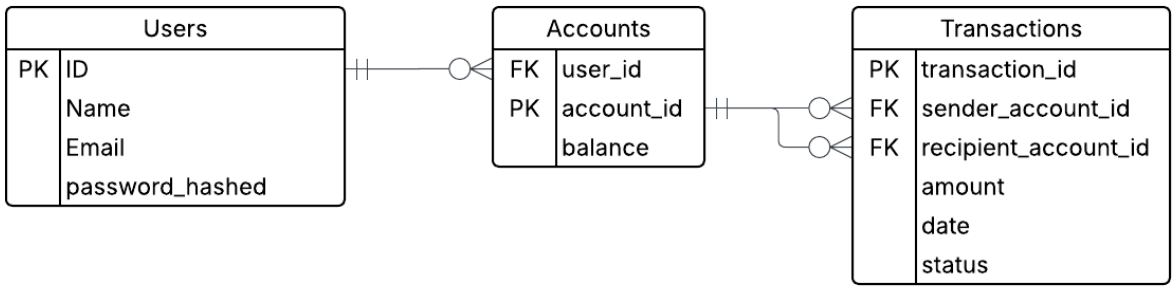
There are three main classes interacting within this service:
1. Users
2. Accounts
3. Transactions

The class diagram below shows their attributes, methods, and relationships:



User
+ name: string
+ mail: string
+ id: string
+ password_hash: string
+ register (email: string, password: string): boolean
+ login (email: string, password: string): boolean
+ verify_password(password: string): boolean
+ get_accounts(): List[Account]
1
*
Account
+ account_id: string
+ balance: Decimal
- user_id: string
+ get_balance(): Decimal
+ check_balance(): boolean
+ debit (amount: Decimal): boolean
+ credit (amount: Decimal):boolean
+ get_transactions(): List[Transaction]
1
*
Transaction
+ transaction_id
+ sender_account_id: string
+ recipient_account_id: string
+ amount: Decimal
+ date: datetime
+ status: enum
+ execute(): boolean
+ generate_receipt(): string
+ rollback_transaction(): boolean

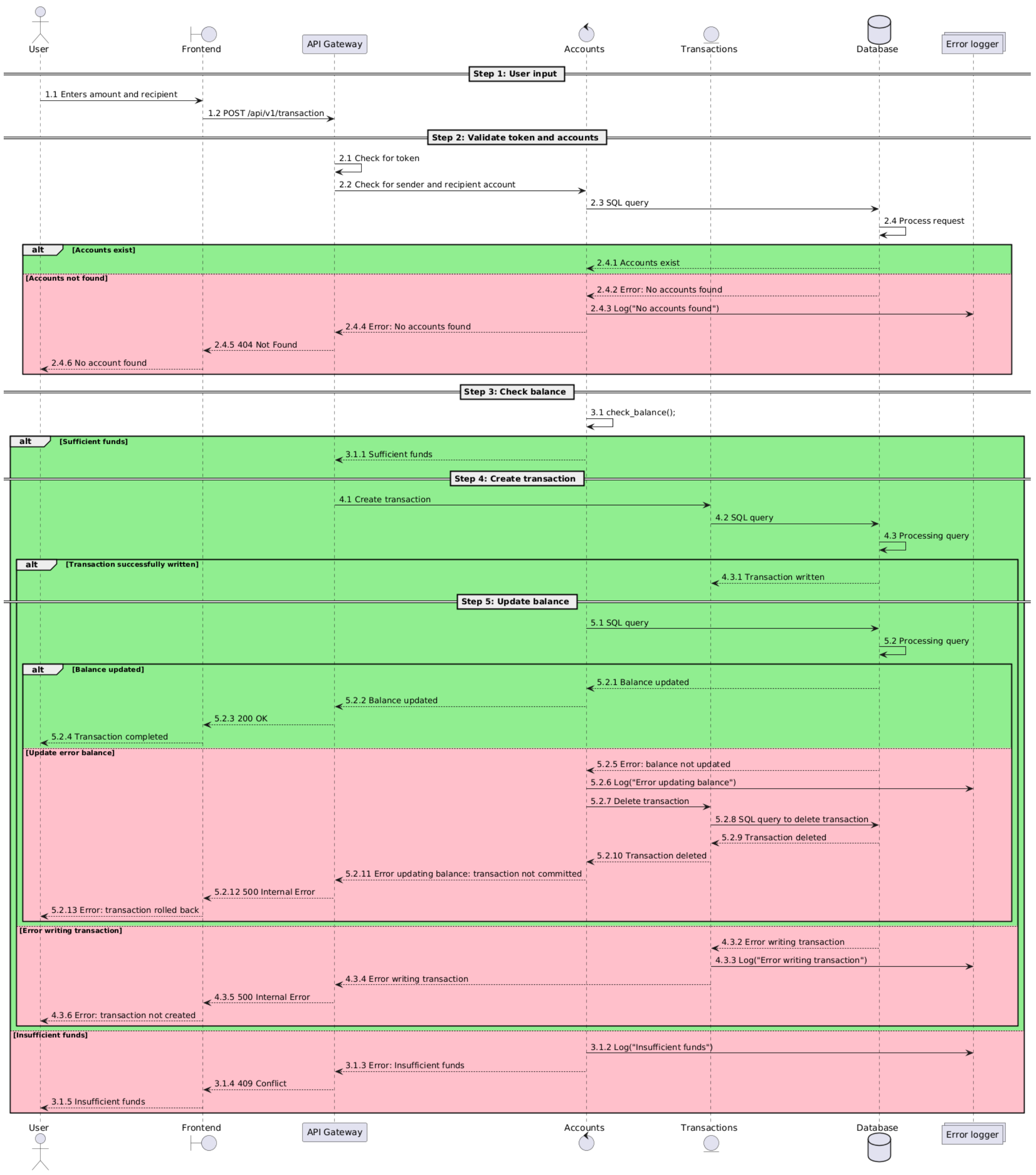
Based on this diagram an ER diagram has been built and tables have been created in the database for further interaction with the service interface.



The LucidChart toolkit allows you to immediately export an ER diagram in the format of SQL queries for generating tables. The following SQL queries are required to create the required tables:

Table	**SQL query**
USERS	CREATE TABLE users (ID INT AUTO_INCREMENT, Name VARCHAR(100), Email VARCHAR(255) UNIQUE, password_hashed VARCHAR(255), PRIMARY KEY (ID));
ACCOUNTS	CREATE TABLE accounts (account_id INT AUTO_INCREMENT, user_id INT, balance DECIMAL(15, 2) DEFAULT 0.00, PRIMARY KEY (account_id), FOREIGN KEY (user_id) REFERENCES Users(ID));
TRANSACTIONS	CREATE TABLE transactions (transaction_id INT AUTO_INCREMENT, sender_account_id INT, recipient_account_id INT, amount DECIMAL(15, 2), date DATETIME DEFAULT CURRENT_TIMESTAMP, status ENUM('PENDING', 'COMPLETED', 'FAILED'), PRIMARY KEY (transaction_id), FOREIGN KEY (sender_account_id) REFERENCES Accounts(account_id), FOREIGN KEY (recipient_account_id) REFERENCES Accounts(account_id));

After describing the classes and databases involved in the money transfer process, it is necessary to describe the interaction of these components. Below is a sequence diagram showing the main steps in the money transfer process.


User
Frontend
API Gateway
Accounts
Transactions
Database
Error logger
Step 1: User input
1.1 Enters amount and recipient
1.2 POST /api/v1/transaction
Step 2: Validate token and accounts
2.1 Check for token
2.2 Check for sender and recipient account
2.3 SQL query
2.4 Process request
alt [Accounts exist]
2.4.1 Accounts exist
[Accounts not found]
2.4.2 Error: No accounts found
2.4.3 Log("No accounts found")
2.4.4 Error: No accounts found
2.4.5 404 Not Found
2.4.6 No account found
Step 3: Check balance
3.1 check_balance();
alt [Sufficient funds]
3.1.1 Sufficient funds
Step 4: Create transaction
4.1 Create transaction
4.2 SQL query
4.3 Processing query
alt [Transaction successfully written]
4.3.1 Transaction written
Step 5: Update balance
5.1 SQL query
5.2 Processing query
alt [Balance updated]
5.2.1 Balance updated
5.2.2 Balance updated
5.2.3 200 OK
5.2.4 Transaction completed
[Update error balance]
5.2.5 Error: balance not updated
5.2.6 Log("Error updating balance")
5.2.7 Delete transaction
5.2.8 SQL query to delete transaction
5.2.9 Transaction deleted
5.2.10 Transaction deleted
5.2.11 Error updating balance: transaction not committed
5.2.12 500 Internal Error
5.2.13 Error: transaction rolled back
[Error writing transaction]
4.3.2 Error writing transaction
4.3.3 Log("Error writing transaction")
4.3.4 Error writing transaction
4.3.5 500 Internal Error
4.3.6 Error: transaction not created
[Insufficient funds]
3.1.2 Log("Insufficient funds")
3.1.3 Error: Insufficient funds
3.1.4 409 Conflict
3.1.5 Insufficient funds

Detailed description of the money transfer process:

Title	UC: Make a money transfer
Priority	Must
Scope	Mobile app
Context	Make a money transfer from one account to another
Actor	User, recipient, sender
Goal	Transfer money from one account to another
Precondition	User must be authorized
Trigger	User clicks the "Make Transfer" button

Postcondition	Funds are transferred from one selected account to another selected account
Basic behavior scenario	1.1 User enters the amount and recipient 1.2 Frontend sends API request: POST /api/v1/transaction 2.1 API Gateway checks for token availability (alternative explicit options for this stage are outside the scope of this case) 2.2 API Gateway sends a request to check the sender and recipient 2.3 SQL query 2.4 DB processes the request 2.4.1 DB returns a response: Accounts exist 3.1 Checking whether the balance is sufficient to complete the transaction: check_balance(); 3.1.1 There are enough funds to complete the transaction 4.1 API Gateway sends a request to create a transaction 4.2 SQL query 4.3 DB processes the request 4.3.1 DB returns a response: Transaction created 5.1 After completing the transaction, balances need to be updated, SQL query 5.2 DB processes the request 5.2.1 DB returns a response: Balances updated 5.2.2 - 5.2.4 - Returning a “200 OK” response - Transaction completed
Alternative scenario: Accounts for the transaction not found	2.4.2 DB returns a response: Accounts not found 2.4.3 An entry is made in the log: Accounts not found 2.4.4 - 2.4.6 - Returning a “404 Not Found” response - Accounts not found
Alternative scenario: Error updating balance	5.2.5 DB returns a response: Error updating balance 5.2.6 An entry is made in the log: Error updating balance 5.2.7 - 5.2.8 Deleting a transaction from the database (SQL query) 5.2.9 - 5.2.10 The database returns a response: Transaction deleted 5.2.11 - 5.2.13 Returning a response “500 Internal Error” - Error: Transaction aborted
Alternative scenario: Error writing transaction	4.3.2 The database returns a response: Error writing transaction 4.3.3 An entry is made in the log: Error writing transaction 4.3.4 - 4.3.6 Returning a response “500 Internal Error” - Error: Transaction not created
Alternative scenario: Not enough funds to complete transactions	3.1.2 An entry is made in the log: Insufficient funds 3.1.3 - 3.1.5 Returning a “409 Conflict” response - Error: insufficient funds
SQL queries	2.3 Checking the recipient and sender accounts: SELECT COUNT(*) AS total FROM accounts WHERE user_id IN (:sender_account_id, :recipient_account_id);
	4.2 Creating a transaction: INSERT INTO transactions (sender_account_id, recipient_account_id, amount, status) VALUES (:sender_account_id, :recipient_account_id, :amount, :status)

	5.1 Updating balances:
	BEGIN;
	
	UPDATE accounts
	SET balance = balance - :amount
	WHERE account_id = :sender_account_id;
	
	UPDATE accounts
	SET balance = balance + :amount
	WHERE account_id = :recipient_account_id;
	
	COMMIT;

	5.2.7 Deleting a transaction:
	DELETE FROM transactions WHERE transaction_id =
	:transaction_id;

Once the money transfer process sequence has been defined, the API requests can be designed:

User requests	
POST /auth/login	
Description	User login
Required fields	username, password

Request example	{
	"username": "john",
	"password": "1234"
	}

Response example	{
	"token": "jwt-token"
	}

Response codes	200, 400, 401, 500
GET /user/{id}	
Description	Get profile

Response example	{
	"id": "u1",
	"username": "john"
	}

Response codes	200, 401, 500
Accounts requests	
GET /accounts	
Description	List of accounts
Response example	[{ "id":"a1", "account_id":"123" }]
Response codes	200, 401, 500
GET /accounts/{id}/balance	
Description	Account balance

Required fields	id

Response example	{
	"balance":"200.0"
	}

Response codes	200, 401, 404, 500
Transactions requests	
POST /transactions	
Description	Creating a transaction
Required fields	sender_account_id, recipient_account_id, amount

Request example	{
	"sender_account_id": "a1",
	"recipient_account_id": "a2",
	"amount": 50.0
	}

Response example	{
	"transactionId": "t1"
	}

Response codes	200, 400, 404, 409, 500
GET /transactions/list	
Description	All transactions
Response example	[{ "id":"t1", "amount":50.0 }]
Response codes	200, 401, 500
GET /transactions/{id}	
Description	Transaction details
Response example	{ "id":"t1","amount":50.0,"description":"Payment" }
Response codes	200, 401, 404, 500