



# CSCI 370 Project Report Banker

Bank Customer and Account Management System

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April 2019

## Introduction

My project is a customer and account management system for banks. A customer can have multiple accounts and can make wire transfers between accounts which he or another customer owns. He can view bank statements of his accounts. Java is used for the application, while MySQL is used as database management system.

## Application Requirements

The following functionalities will be accessible through a command-line interface. A menu is displayed after every completed operation, and the user can select the next operation or choose to exit.

### Substantial Functionalities

- Create customer: Create a new customer, having a customer ID, name, address, email and phone number. The ID should be auto-generated.
- Open account: Create a new account, having an owning customer, account number, currency and initial balance. The application must ensure that there is no existing account for this customer with this account number. An account is uniquely identified by the combination of customer ID and account number.
- Make wire transfer: Insert a transfer into the transaction table, having a sender, receiver, amount, currency and date of execution. The amount must be positive. The transfer should only be executed if the sender has enough funds.
- Show bank statement: List all incoming and outgoing transactions for an account. Then retrieve the account's current balance, by adding the initial balance and all incoming wire transfers, then subtracting all outgoing wire transfers. The according exchange rate must be used for transfers which were not made in the account currency.

### Additional Functionalities

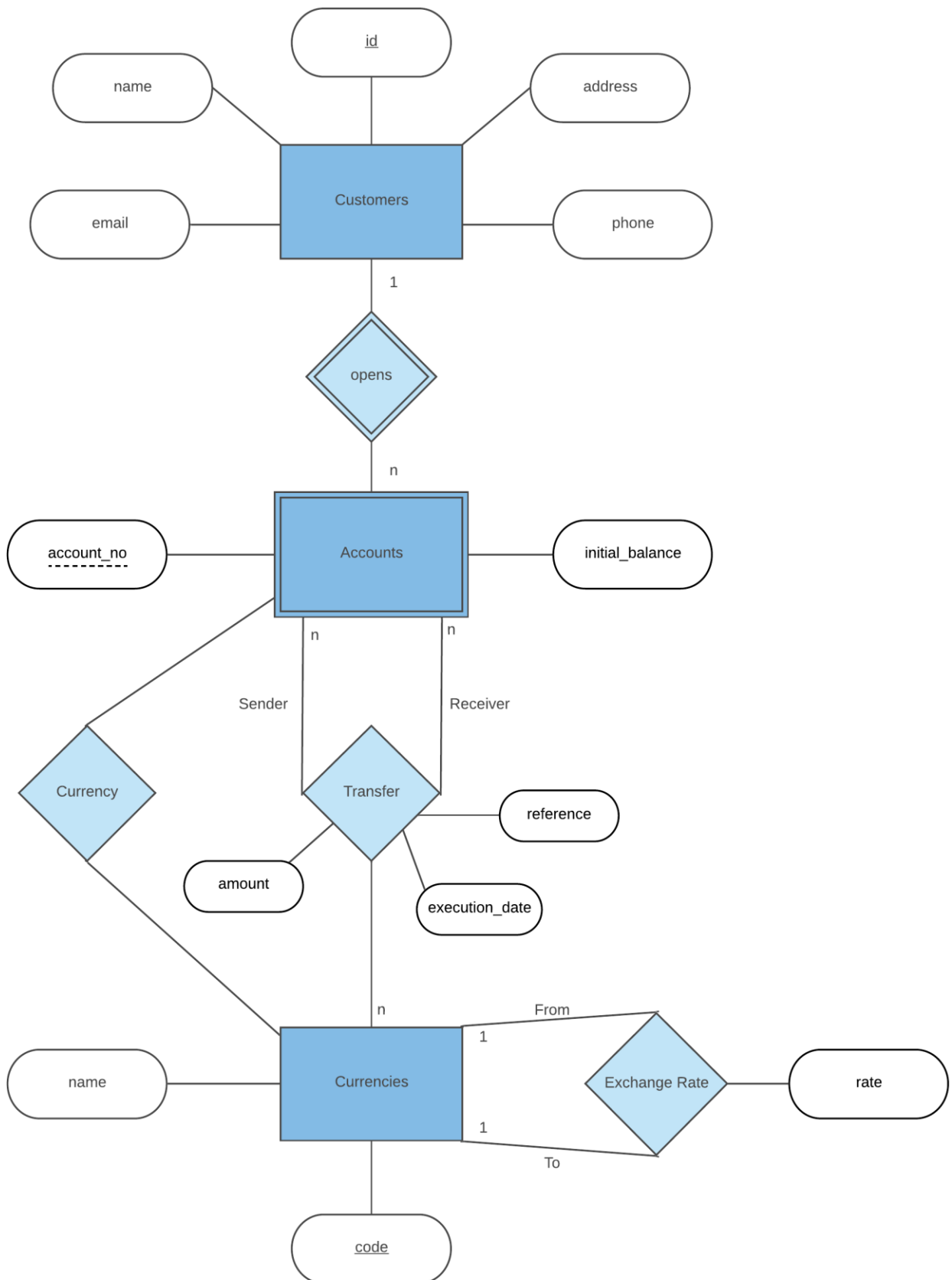
- List all customers: List all customers and the number of accounts they own. Also show this when prompting for a customer ID to assist the user.
- List all accounts: List all accounts and their current balance for a customer. Also show this when prompting for an account number to assist the user.
- Configurable through file: Database connection settings and debug mode can be set in a configuration file.

### Necessary Data

The functionalities listed above necessitate the storage of the following data in a database:

- Customers
- Accounts
- Wire transfers
- Currencies and their exchange rates

## ER Diagram



## Sample Data

### Customers

| id | name                 | address  | email                                     | phone        |
|----|----------------------|--|---|--------------|
| 1  | Roxane Weavers       | 78976 Almo Drive, North Bay Ontario<br>P1A T7N         | rweavers<br>4@cargo<br>collective<br>.com | 126-293-9927 |
| 2  | Theresina Whitehouse | 7 Butterfield Hill, Edson Alberta T7E A0A              | twhiteho<br>use3@ab<br>c.net.au           | 663-893-1617 |
| 3  | Nicol Powdrell       | 669 Buell Plaza, Pemberton British<br>Columbia E1W G8A | npowdrel<br>l7@canal<br>blog.com          | 622-687-1447 |
| 4  | Worth Rotherham      | 763 Sherman Trail, Sylvan Lake Alberta<br>T4S T4T      | wrotherh<br>am1t@e<br>conomist<br>.com    | 480-982-2219 |
| 5  | Wye Najara           | 073 Hermina Lane, Olds Alberta T4H P7L                 | wnajara2<br>5@ning.c<br>om                | 179-338-0077 |

### Accounts

| customer_id | account_no | currency | initial_balance |
|-------------|------------|----------|-----------------|
| 1           | 1          | CAD      | 523.21          |
| 1           | 2          | USD      | 2934.12         |
| 2           | 1          | EUR      | 10.32           |
| 3           | 1          | CAD      | 14235.00        |
| 4           | 1          | CAD      | 18900.32        |
| 4           | 2          | EUR      | 25002.88        |
| 5           | 1          | USD      | 239.12          |
| 5           | 2          | EUR      | 521.01          |

## Transfers

| id | sender_id | sender_account | receiver_id | receiver_account | amount  | currency | execution_date      | reference                 |
|----|-----------|----------------|-------------|------------------|---------|----------|---------------------|---------------------------|
| 1  | 1         | 1              | 3           | 1                | 200.00  | CAD      | 2019-03-18 19:30:12 |                           |
| 2  | 2         | 1              | 4           | 1                | 2.57    | EUR      | 2019-04-05 02:52:18 | Movie Theatre Tickets     |
| 3  | 5         | 2              | 5           | 1                | 300.97  | EUR      | 2019-04-01 09:38:31 |                           |
| 4  | 4         | 1              | 1           | 2                | 1500.00 | EUR      | 2019-03-30 12:23:52 | Birthday Gift             |
| 5  | 4         | 1              | 5           | 1                | 1281.34 | CAD      | 2019-04-01 00:00:00 | Rent                      |
| 6  | 3         | 1              | 5           | 1                | 890.23  | USD      | 2019-04-02 12:34:35 |                           |
| 7  | 4         | 2              | 4           | 1                | 7000.00 | EUR      | 2019-03-29 16:45:12 | Transfer to other account |

## Currencies

| code | name            |
|------|-----------------|
| CAD  | Canadian Dollar |
| EUR  | Euro            |
| USD  | US Dollar       |

## Exchange Rates

| from_currency | to_currency | rate    |
|---------------|-------------|---------|
| CAD           | CAD         | 1.00000 |
| CAD           | EUR         | 0.66356 |
| CAD           | USD         | 0.75126 |
| EUR           | CAD         | 1.50715 |
| EUR           | EUR         | 1.00000 |
| EUR           | USD         | 1.13220 |
| USD           | CAD         | 1.33114 |
| USD           | EUR         | 0.88323 |
| USD           | USD         | 1.00000 |

## Testing

### Create customer

...

LIST CUSTOMERS:

| ID  | NAME           | NO. OF ACCOUNTS | EMAIL                         | PHONE        | ADDRESS                                     |
|-----|----------------|-----------------|-------------------------------|--------------|---|
| 1   | Roxane Weavers | 2               | rweavers4@cargocollective.com | 126-293-9927 | 78976 Almo Drive, North Bay Ontario P1A T7N |
| ... |                |                 |                               |              |   |
| 5   | Wye Najara     | 2               | wnajara25@ning.com            | 179-338-0077 | 073 Hermina Lane, Olds Alberta T4H P7L      |

5 customers found

...

CREATE NEW CUSTOMER:

Name: Simon Richards

Address: Nanaimo, BC

Email: simon@richards.me

Phone: 123-456-7890

Successfully created customer Simon Richards

...

LIST CUSTOMERS:

| ID  | NAME           | NO. OF ACCOUNTS | EMAIL                         | PHONE        | ADDRESS                                     |
|-----|----------------|-----------------|-------------------------------|--------------|---|
| 1   | Roxane Weavers | 2               | rweavers4@cargocollective.com | 126-293-9927 | 78976 Almo Drive, North Bay Ontario P1A T7N |
| ... |                |                 |                               |              |   |
| 5   | Wye Najara     | 2               | wnajara25@ning.com            | 179-338-0077 | 073 Hermina Lane, Olds Alberta T4H P7L      |
| 6   | Simon Richards | 0               | simon@richards.me             | 123-456-7890 | Nanaimo, BC                                 |

6 customers found

### Created database row

| id | name           | address     | email             | phone        |
|----|----------------|-------------|-------------------|--------------|
| 6  | Simon Richards | Nanaimo, BC | simon@richards.me | 123-456-7890 |

## Open account

...

ACCOUNTS FOR CUSTOMER Simon Richards (ID 6)

| ACCOUNT NO. | INITIAL BALANCE | CURRENT BALANCE |
|-------------|-----------------|-----------------|
|-------------|-----------------|-----------------|

0 accounts found

...

CREATE NEW ACCOUNT:

CUSTOMERS:

| ID | NAME |
|----|------|
|----|------|

|   |                |
|---|----------------|
| 1 | Roxane Weavers |
|---|----------------|

...

|   |                |
|---|----------------|
| 6 | Simon Richards |
|---|----------------|

Customer ID: 6

EXISTING ACCOUNTS FOR CUSTOMER Simon Richards

| NO. | BALANCE |
|-----|---------|
|-----|---------|

Account Number: 1

Initial balance in CAD/EUR/USD: CAD

Invalid amount, must be positive number

Initial balance in CAD/EUR/USD: 500 CAD

Successfully created account 6-1

...

ACCOUNTS FOR CUSTOMER Simon Richards (ID 6)

| ACCOUNT NO. | INITIAL BALANCE | CURRENT BALANCE |
|-------------|-----------------|-----------------|
|-------------|-----------------|-----------------|

|     |            |            |
|-----|------------|------------|
| 6-1 | 500.00 CAD | 500.00 CAD |
|-----|------------|------------|

1 accounts found

## Created database row

| customer_id | account_no | currency | initial_balance |
|-------------|------------|----------|-----------------|
| 6           | 1          | CAD      | 500.00          |

## Make wire transfer

### Successful

SENDER ACCOUNT:

CUSTOMERS:

ID NAME

1 Roxane Weavers

...

6 Simon Richards

Customer ID: 6

EXISTING ACCOUNTS FOR CUSTOMER Simon Richards

NO. BALANCE

1 500.00 CAD

Account Number: 1

RECEIVER ACCOUNT:

CUSTOMERS:

ID NAME

1 Roxane Weavers

...

6 Simon Richards

Customer ID: 4

EXISTING ACCOUNTS FOR CUSTOMER Worth Rotherham

NO. BALANCE

1 25912.18 CAD

2 18002.88 EUR

Account Number: 1

Amount in CAD/EUR/USD: 245.38 USD

Reference: Test transfer

Successfully made wire transfer

TRANSFER DETAILS

Date: 04/11/19 14:25

Sender: Simon Richards (Account 6-1)

Receiver: Worth Rotherham (Account 4-1)

Amount: 245.38 USD

Reference: Test transfer

### Unsuccessful

SENDER ACCOUNT:

CUSTOMERS:

ID NAME

1 Roxane Weavers

...

6 Simon Richards

Customer ID: 6

EXISTING ACCOUNTS FOR CUSTOMER Simon Richards

NO. BALANCE

1 500.00 CAD

Account Number: 1

RECEIVER ACCOUNT:

CUSTOMERS:

ID NAME

1 Roxane Weavers

...

6 Simon Richards

Customer ID: 4

EXISTING ACCOUNTS FOR CUSTOMER Worth Rotherham

NO. BALANCE

1 25912.18 CAD

2 18002.88 EUR

Account Number: 1

Amount in CAD/EUR/USD: 500 USD

Reference: Test transfer

Sender account does not have sufficient funds.

Sender account balance: 500.00 CAD

Transfer amount: 500.00 USD

Missing amount: -124.37 USD

## Created database row (successful)

| id | sender_id | sender_account | receiver_id | receiver_account | amount | currency | execution_date      | reference     |
|----|-----------|----------------|-------------|------------------|--------|----------|---------------------|---------------|
| 8  | 6         | 1              | 4           | 1                | 245.38 | USD      | 2019-04-11 14:25:25 | Test transfer |



## Show bank statement

### BANK STATEMENT:

#### CUSTOMERS:

| ID | NAME                 |
|----|----------------------|
| 1  | Roxane Weavers       |
| 2  | Theresina Whitehouse |
| 3  | Nicol Powdrell       |
| 4  | Worth Rotherham      |
| 5  | Wye Najara           |
| 6  | Simon Richards       |

Customer ID: 4

#### EXISTING ACCOUNTS FOR CUSTOMER Worth Rotherham

| NO. | BALANCE      |
|-----|--------------|
| 1   | 26238.81 CAD |
| 2   | 18002.88 EUR |

Account Number: 1

#### TRANSFERS FOR ACCOUNT 4-1

| DATE             | TIME  | AMOUNT         | SENDER                     | RECEIVER              | REFERENCE                 |
|------------------|-------|----------------|----------------------------|-----------------------|---------------------------|
| 03/29/19         | 16:45 | + 7000.00 EUR  | Worth Rotherham (4-2)      | Worth Rotherham (4-1) | Transfer to other account |
| 03/30/19         | 12:23 | - 1500.00 EUR  | Worth Rotherham (4-1)      | Roxane Weavers (1-2)  | Birthday Gift             |
| 04/01/19         | 00:00 | - 1281.34 CAD  | Worth Rotherham (4-1)      | Wye Najara (5-1)      | Rent                      |
| 04/05/19         | 02:52 | + 2.57 EUR     | Theresina Whitehouse (2-1) | Worth Rotherham (4-1) | Movie Theatre Tickets     |
| 04/11/19         | 14:25 | + 245.38 USD   | Simon Richards (6-1)       | Worth Rotherham (4-1) | Test transfer             |
|                  |       |                |                            |                       |                           |
| INITIAL BALANCE: |       | + 18900.32 CAD |                            |                       |                           |
|                  |       |                |                            |                       |                           |
| TOTAL BALANCE:   |       | + 26238.81 CAD |                            |                       |                           |

## No operation

Welcome to Banker!

MENU:

- |                        |                              |
|------------------------|------------------------------|
| 1. List customers      | 2. List accounts of customer |
| 3. Create customer     | 4. Create account            |
| 5. Show bank statement | 6. Make wire transfer        |
| 0. Exit                |                              |

Choice: 0

Goodbye from Banker!