

Queens College

CS344/715 Distributed Systems

RMI Assignment: My RMI Bank

Idea: RMI Application simulating a simple daily operation of a bank.

Server: Bank

Client: Customers

Basic Requirements of RMI

1. Develop Interface(s).
2. Develop the remote object class(es) for implementing interfaces.
3. Develop the driver Server and driver Client program.

Classes extends `*UnicastRemoteObject` implements Interface
(extending the `UnicastRemoteObject` class from `java.rmi.server.*` allows you to create and export remote objects)*

4. All methods that need to be remotely called must throw `RemoteExceptions`

Server (Bank)

The server (the bank) should maintain the list of customer information, with the information of their id, username, password and balance. Write a proper class and choose your own data structures to implement it.

Required Remote Methods:

1. `createNewAccount(string, string, double)` - username, password and initial amount. Make sure to verify username is unique.
2. `login(string, string)` - verify login information: if username exists and if password matches
3. `viewAccountDetail()` - simply display account id and balance.
4. `deposit(double)` - make sure to check amount is not negative
5. `withdraw(double)` - make sure to check there are balance to withdraw.

Other Methods:

1. `helpMsg(string)` - messages to be displayed to client such as welcome message, show menu, goodbye, etc. If you have this, make sure to add it to interface as well.
2. Any other possible helper functions to be called by the above required remote methods by the bank itself but not by the client should be kept private.

Implementation:

1. Write a Bank interface
2. Write a Bank object that implements the interface with all the required functions.
3. Command line `args[0]` for hostname (localhost), `args[1]` for portname. Create RMI Registry with the portname.
4. Create a Bank stub (the remote object) and bind it to the registry. (So RMI client can search for it.)

Client (Customer)

The client's purpose is to connect to the bank server and then run the remote methods provided by the bank (those listed on the Bank interface class only) to create account, login, deposit or withdraw.

Implementation:

1. Command line `args[0]` for hostname (localhost), `args[1]` for portname.
2. Connect to the registry using the hostname and portname, look for the bank in the registry and obtain a server stub copy so you can run the remote methods.
3. Call proper remote methods from the bank to display messages and interact with customer. Write codes to allow customer inputs when necessary.

Hint

1. To display bank's message on customer's screen, simply return string for the remote methods and print the returned message on customer's program. No need to create remote methods for the client. (If you want you can, but in that case you would also need to create client stub, register and have the bank lookup for it.)
2. The Bank remote object should only contain appropriate methods for the client to use. Do not expose any methods or any other sensitive information to clients (e.g. clients should not be allowed to view or manipulate the account list, and they can only adjust their own account's balance once they are logged in).
3. Predefine some simple dummy accounts (at least 3) in the account list to get started. Pretend the account list to be the database. When new accounts are created, or balance are updated, the account list data would be updated, so data would be maintained as long as the server is open. In case the server gets restarted, any client

created accounts or balance updates will be reset back to your predefined version.
(This is just for programming practice. It will never be the real-world case.)

Example Output

Server Example

Leave the Server window open for all incoming customers. The account list (available on server side only) would maintain all the changes.

```
>javac *.java
>java BankServer localhost 3000

Bank Server Started.

Client logging in:                                     // Client Example 1
Error logging in.

Client logging in:
Client logged in successfully.

Client viewing account info.

Client making deposit amount: 500
Account ID: 1
Balance: 10500.0

Client withdrawing amount: 200
Account ID: 1
Balance: 10300.0

Client logged out.

Client creating New Account:                             // Client Example 2
Error creating new account.

Client creating New Account:
Client created account successfully.

Client logging in:
Client logged in successfully.

Client viewing account info.

Client withdrawing amount: 3000.0
Account ID: 4
Balance: 997000.0
```

Client viewing account info.

Client logged out.

Client logging in:
Error logging in.

// Client Example 3

Client logging in:
Client logged in successfully.

Client viewing account info.

Client making deposit amount: 5000.0
Account ID: 4
Balance: 1002000.0

Client viewing account info.

Client logged out.

Client Example 1

```
>java Client localhost 3000
```

Thank you for choosing MY RMI BANK!
Please login or create new account to begin:
1. Login (Please enter 1)
2. Create New Account (Please enter 2)
3. Exit (Please enter 'exit')

1
===== LOGIN =====
Please enter username:
123
Please enter password:
123
Error: Invalid username or password.

Thank you for choosing MY RMI BANK!
Please login or create new account to begin:
1. Login (Please enter 1)
2. Create New Account (Please enter 2)
3. Exit (Please enter 'exit')

1
===== LOGIN =====

Please enter username:

amy@123.com

Please enter password:

amy123456

login success!

===== MENU =====

Please select from one of the option below:

1. View Account Detail. (Please enter 1)

2. Deposit (Please enter 2)

3. Withdraw (Please enter 3)

4. Logout (Please enter 'exit')

1

Account ID: 1

Balance: 10000.0

===== MENU =====

Please select from one of the option below:

1. View Account Detail. (Please enter 1)

2. Deposit (Please enter 2)

3. Withdraw (Please enter 3)

4. Logout (Please enter 'exit')

2

===== DEPOSIT =====

Please enter the amount to deposit:

500

Deposit success!

===== MENU =====

Please select from one of the option below:

1. View Account Detail. (Please enter 1)

2. Deposit (Please enter 2)

3. Withdraw (Please enter 3)

4. Logout (Please enter 'exit')

3

===== WITHDRAWAL =====

Please enter the amount to withdraw:

200

Withdraw success!

===== MENU =====

Please select from one of the option below:

1. View Account Detail. (Please enter 1)

2. Deposit (Please enter 2)

3. Withdraw (Please enter 3)

4. Logout (Please enter 'exit')

exit

Thank you very much for choosing MY RMI BANK. Have a nice day!

Client Example 2

```
>java Client localhost 3000

Thank you for choosing MY RMI BANK!
Please login or create new account to begin:
1. Login (Please enter 1)
2. Create New Account (Please enter 2)
3. Exit (Please enter 'exit')

2
===== CREATE NEW ACCOUNT =====
Please enter username:
amy@123.com
Please enter password:
123
Please enter amount to deposit:
123
Error: Username has already been registered.

Thank you for choosing MY RMI BANK!
Please login or create new account to begin:
1. Login (Please enter 1)
2. Create New Account (Please enter 2)
3. Exit (Please enter 'exit')

2
===== CREATE NEW ACCOUNT =====
Please enter username:
eva@123.com
Please enter password:
eva1234567
Please enter amount to deposit:
1000000
===== LOGIN =====
Please enter username:
eva@123.com
Please enter password:
eva1234567

===== MENU =====
Please select from one of the option below:
1. View Account Detail. (Please enter 1)
2. Deposit (Please enter 2)
3. Withdraw (Please enter 3)
4. Logout (Please enter 'exit')

1
Account ID: 4
Balance: 1000000.0

===== MENU =====
Please select from one of the option below:
1. View Account Detail. (Please enter 1)
```

```

2. Deposit (Please enter 2)
3. Withdraw (Please enter 3)
4. Logout (Please enter 'exit')

3
===== WITHDRAWAL =====
Please enter the amount to withdraw:
3000
Withdraw success!

===== MENU =====
Please select from one of the option below:
1. View Account Detail. (Please enter 1)
2. Deposit (Please enter 2)
3. Withdraw (Please enter 3)
4. Logout (Please enter 'exit')

1
Account ID: 4
Balance: 997000.0

===== MENU =====
Please select from one of the option below:
1. View Account Detail. (Please enter 1)
2. Deposit (Please enter 2)
3. Withdraw (Please enter 3)
4. Logout (Please enter 'exit')

exit

Thank you very much for choosing MY RMI BANK. Have a nice day!

```

Client Example 3

```

>java Client localhost 3000

Thank you for choosing MY RMI BANK!
Please login or create new account to begin:
1. Login (Please enter 1)
2. Create New Account (Please enter 2)
3. Exit (Please enter 'exit')

1
===== LOGIN =====
Please enter username:
eva@123.com
Please enter password:
123
Error: Invalid username or password.

Thank you for choosing MY RMI BANK!
Please login or create new account to begin:
1. Login (Please enter 1)
2. Create New Account (Please enter 2)

```

3. Exit (Please enter 'exit')

1

===== LOGIN =====

Please enter username:

eva@123.com

Please enter password:

eva1234567

===== MENU =====

Please select from one of the option below:

1. View Account Detail. (Please enter 1)

2. Deposit (Please enter 2)

3. Withdraw (Please enter 3)

4. Logout (Please enter 'exit')

1

Account ID: 4

Balance: 997000.0

===== MENU =====

Please select from one of the option below:

1. View Account Detail. (Please enter 1)

2. Deposit (Please enter 2)

3. Withdraw (Please enter 3)

4. Logout (Please enter 'exit')

2

===== DEPOSIT =====

Please enter the amount to deposit:

5000

Deposit success!

===== MENU =====

Please select from one of the option below:

1. View Account Detail. (Please enter 1)

2. Deposit (Please enter 2)

3. Withdraw (Please enter 3)

4. Logout (Please enter 'exit')

1

Account ID: 4

Balance: 1002000.0

===== MENU =====

Please select from one of the option below:

1. View Account Detail. (Please enter 1)

2. Deposit (Please enter 2)

3. Withdraw (Please enter 3)

4. Logout (Please enter 'exit')

exit

Thank you very much for choosing MY RMI BANK. Have a nice day!