NAME

client, database, server

SYNOPSIS

#include"client.c"

#include"server.c"

#include"database.c"

struct account* createAccount(struct account* ,char*)

int changeBalance(struct account * , int)

int check(struct account* , char*)

void freestruct(struct *);

void print(struct *);

void * handler(void*)

void * diaprint(void*)

void diag(void)

void sighandler(int)

DESCRIPTION

The format struct table is a pointer points to a table struction.

The table structure:

Each Node:

```
struct account{
        char name[256];
        double balance;
        bool InSession;
        struct account* next;
};
```

head -> {name, balance, insession} -> { name, balance, insession} -> ... -> { name, balance, insession} -> NULL

this project have two sides of excutable files, one is server side and anther side is client side. The server file has to be excuted first and then

the client sides will be excuted. If connections between clients and server failed it returns an error.

operations traverse the account database and match the name with the target name and change the balance, if it is inserting a new account, it is inserting on

the top.

thread:

threads are used when client connects to the server, and binary semaphore are used whenever server tends to access the database.

after successfully connected between server and clients

the command for the clients are below:

1.Create:

ex: create<accountname(char)>

The create command creates a new account for database in on the server side. It will be an error if the bank already has an

duplicated account in the database. Session cannot create new accounts, but another client who is not in a customer session can

create new accounts. The name specified uniquely. An account name will be at most 255 characters. The initial balance of a new account

is zero.

2.Serve:

ex: serve <accountname (char)>

The serve command starts a service session for a account. however, withdraw,

query and end commands are only valid in a service session. It is not allowable to start more

than one service sessions in any single client windows. Once a client side ends a service session, they

can start a new one for a different account or the same account.

3.Deposit/Withdraw:

ex:

deposit <amount (double) >

withdraw <amount (double) >

The deposit and withdraw commands add or subtract amounts from the account. Both commands will result in an error if the client

is not in a service session. There are no constraints on the size of a deposit, but a withdrawal is invalid

if the requested amount exceeds the current balance for the account. Invalid withdrawal attempts. the current balance remains unchanged.

4.Query

ex: query

The query command simply returns the current account balance

5.End

ex: end

The end command ends the current service session. Once the service session is ended, it is possible

to create new accounts or start a new service session

6.quit

ex: quit

The quit command disconnects the client from the server and ends the client process. The server

process should continue execution.

RETURN VALUE

the function createAccount() return the head of the database

the function changeBalance() return a integer reprents the succes change or fail.

The function check() returns 1 or 0, 1 represnets the format of the command is correct, 0 represents the format of the command is incorrect.

the function hander() is a void function

the function diaprint() is a void function

void diag()

void sighandler()

ERRORS

client side:

command quit before end the session

commands deposit/withdraw before serve a account

commands serve before creating this account

server side:

if the user didnot enter enough arguments.

if the user gave enough arguents try to use them to get a port number and address.

error happens in lisening

error cannot find the account, if recieve command but cannot find the account name in the database.

error cannot quit if it is in the server.

error not n the session

error for under 0 balance

error if withdraw over the account balance

command line:

commands have to follow the commands sytax:

create <accountname (char) >

serve <accountname (char) >

deposit <amount (double) >

withdraw <amount (double) >

query

end

quit

semaphore was used in synchronized handling.

Over one client accessing the same account database at the same time will require the use of semaphore to protect all shared data

The server will handle each client in a separate client thread. Any client can create a new account at any time, so adding accounts to your bank must be a mutex-protected operation.

The server will deal with clients in different client threads, any client can create a new account at any time, so adding accounts to the database has to be a mutex-protected operation.

The bank server has to print out a complete list of all accounts every 15 seconds. And semaphore is applied on accessing database, since the synchronized problems.

In order to construct connection threads and print out all the service information, the signal handler needs to lock the database , it needs to use an synchronization mechanisms to make it safe.

Example:

```
// initialize a account in the data base
struct account* createAccount(struct account* head,char* name){
if(check(head,name)==-1){
        fprintf(stderr,"error in duplicate account name\n");
        return head;
}
struct account* row = (struct account* )malloc(sizeof(struct account));
strcpy(row->name,name);
row -> balance = 0;
row -> InSession = false;
row -> next = head;
head = row;
return head;
}
        //change the account balance
        int changeBalance(struct account * row, int number){
```

```
        if(((row -> balance)+number)<0){
                return -1;
        } else {
                printf("!!! %lf\n",(row->balance)+number);
                printf("before: %lf\n",row->balance);
                row -> balance = (row -> balance) + number;
                printf("after: %lf\n",row->balance);
                return 0;
        }
}
```

testfile:

client side:

```
[ll741@kill hw4]$ ./client null.cs.rutgers.edu 8909

[C]Please enter: create long2

[S]Trying to create a new account: long2

[C]Please enter: query

[S]Error for not in session

[C]Please enter: serve

[C]Error in command format

[C]wrong command format is: serve

[C]Please enter: serve long
```

[S]Got the account, open session

de

[C]Please enter: deposit 37517

[C]Error in command format

[C]wrong command format is: dedeposit 37517

[C]Please enter: deposit 12313214214123124214

[S]deposited your money

[C]Please enter: withdraw 892173.2314124

[S]withdrew your money

w

[C]Please enter: withdraw 0.000

[C]Error in command format

[C]wrong command format is: wwithdraw 0.000

[C]Please enter: withdraw 0.00000

[S]withdrew your money

[C]Please enter: query

[S]current balance is 123132142141222318 08.000000

[C]Please enter: withdraw 213124.213124

[S]withdrew your money

q

[C]Please enter:query

[S]current balance is 12313214214122018816.000000

[C]Please enter:

server side:

[ll741@null hw4]$ ./server 8909

-------start printing----------

-------finish printing-------

[S]Handler assigned

[S]Handler assigned

[S]Handler assigned

-------start printing----------

-------finish printing-------

creating account

finished

creating account

finished

-------start printing----------

long2 0.000000

long 0.000000

-------finish printing-------

creating account

finished

-------start printing----------

long9 0.000000

long2 0.000000

long 0.000000

-------finish printing-------

-------start printing----------

long9 0.000000

long2 0.000000

long 0.000000

-------finish printing-------

-------start printing----------

long9 0.000000

long2 0.000000

long 0.000000

-------finish printing-------

-------start printing----------

long9 0.000000

long2 0.000000 IN SERVICE

long 0.000000

-------finish printing-------

-------start printing----------

long9 0.000000

long2 0.000000 IN SERVICE

long 0.000000

-------finish printing-------

-------start printing----------

long9 0.000000

long2 0.000000 IN SERVICE

long 0.000000

-------finish printing-------

!!! 100.000000

before: 0.000000

after: 100.000000

-------start printing----------

long9 0.000000

long2 100.000000 IN SERVICE

long 0.000000

-------finish printing-------

!!! 90.001000

before: 100.000000

after: 90.001000

-------start printing----------

long9 0.000000

long2 90.001000 IN SERVICE

long 0.000000

-------finish printing-------

!!! 2000089.001000

before: 90.001000

after: 2000089.001000

-------start printing----------

long9 0.000000

long2 2000089.001000 IN SERVICE

long 0.000000

-------finish printing-------

-------start printing----------

long9 0.000000

long2 2000089.001000 IN SERVICE

long 0.000000

-------finish printing-------

-------start printing----------

long9 0.000000

long2 2000089.001000 IN SERVICE

long 0.000000

-------finish printing-------

-------start printing----------

long9 0.000000

long2 2000089.001000 IN SERVICE

long 0.000000 IN SERVICE

-------finish printing-------

!!! 12313214214123124736.000000

before: 0.000000

after: 12313214214123124736.000000

-------start printing----------

long9 0.000000

long2 2000089.001000 IN SERVICE

long 12313214214123124736.000000 IN SERVICE

-------finish printing-------

!!! 12313214214122231808.000000

before: 12313214214123124736.000000

after: 12313214214122231808.000000

-------start printing----------

long9 0.000000

long2 2000089.001000 IN SERVICE

long 12313214214122231808.000000 IN SERVICE

-------finish printing-------

-------start printing----------

long9 0.000000

long2 2000089.001000 IN SERVICE

long 12313214214122231808.000000 IN SERVICE

-------finish printing-------

!!! 12313214214122231808.000000

before: 12313214214122231808.000000

after: 12313214214122231808.000000

-------start printing----------

long9 0.000000

long2 2000089.001000 IN SERVICE

long 12313214214122231808.000000 IN SERVICE

-------finish printing-------

-------start printing----------

long9 0.000000

long2 2000089.001000 IN SERVICE

long 12313214214122231808.000000 IN SERVICE

-------finish printing-------

!!! 12313214214122018816.000000

before: 12313214214122231808.000000

after: 12313214214122018816.000000

-------start printing----------

long9 0.000000

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

-------start printing----------

long9 0.000000 IN SERVICE

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

!!! 100.000000

before: 0.000000

after: 100.000000

-------start printing----------

long9 100.000000 IN SERVICE

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

!!! 99.500000

before: 100.000000

after: 99.500000

-------start printing----------

long9 99.500000 IN SERVICE

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

-------start printing----------

long9 99.500000 IN SERVICE

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

!!! 84.267660

before: 99.500000

after: 84.267660

-------start printing----------

long9 84.267660 IN SERVICE

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

!!! 69.035217

before: 84.267660

after: 69.035217

-------start printing----------

long9 69.035217 IN SERVICE

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

!!! 53.803884

before: 69.035217

after: 53.803884

-------start printing----------

long9 53.803884 IN SERVICE

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

-------start printing----------

long9 53.803884 IN SERVICE

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

-------start printing----------

long9 53.803884 IN SERVICE

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

creating account

finished

-------start printing----------

0.000000

long9 53.803884

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

creating account

finished

-------start printing----------

\n 0.000000

0.000000

long9 53.803884

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

-------start printing----------

\n 0.000000

0.000000

long9 53.803884

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

creating account

finished

-------start printing----------

0.000000

\n 0.000000

0.000000

long9 53.803884

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

-------start printing----------

0.000000 IN SERVICE

\n 0.000000

0.000000

long9 53.803884

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

-------start printing----------

0.000000 IN SERVICE

\n 0.000000

0.000000

long9 53.803884

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

-------start printing----------

0.000000 IN SERVICE

\n 0.000000

0.000000

long9 53.803884

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

-------start printing----------

0.000000 IN SERVICE

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long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

-------start printing----------

0.000000 IN SERVICE

\n 0.000000

0.000000

long9 53.803884

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

-------start printing----------

0.000000 IN SERVICE

\n 0.000000

0.000000

long9 53.803884

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

-------start printing----------

0.000000 IN SERVICE

\n 0.000000

0.000000

long9 53.803884

long2 2000089.001000 IN SERVICE

long 12313214214122018816.000000 IN SERVICE

-------finish printing-------

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