

(Due: April 8)

The purpose of this project is to familiarize yourself with the TCP/UDP socket in C and the advanced UNIX file operations such as `lseek`, `lockf`, etc. You are asked to write a client-server program in which the client can contact the db server to access a database.

You also need to write a service-map program which resides at a well-known UDP socket. Each group should use a five-digit number which is a "2" followed by the last four digits of your student id. The service-map server accepts registration from the db server and advertises socket addresses to the prospective client. When a database server starts, it first requests a local TCP port. Then, it broadcasts a registration message in UDP. For example,

```
PUT BANK620 tcp-portnum
```

The service-mapper will receive this message, store the service name BANK620 along with the IP address and port number of the db server in its table, and reply an ASCII string "OK" to the db server. When a client starts, it broadcasts a request message:

```
GET BANK620
```

The service-mapper will return a datagram containing the information of the database server (i.e. dotted IP and port number in ASCII). An example of the datagram is shown below

```
137.148.204.16:8765
```

You need to copy the database db21 from the directory `~cis620s/pub` to your working directory. Each record in the database has the following fixed format:

```
struct record {
    int    acctnum; /* unique key in sorted order */
    char   name[20];
    float  value;
    char   phone[16];
    int    age;
}
```

The field value is stored in binary (not ASCII) format. You can use the command `od` if you want to see the file content.

The following are the two commands which can be issued from a client to a database server:

```
query acctnum
update acctnum amount
```

The query command requests the server to get and reply the record for a person. The update command asks the server to add an amount to a person's record in the database.

The client uses the following message formats to communicate with the server:

query message format

2020	acct num
4-byte int	4-byte int

update message format

2021	acct num	amount
4-byte int	4-byte int	4-byte float

Both of the integer and float fields are transmitted in big-endian order. The server returns the result via an ASCII string and then closes the TCP connection.

After the server establishes a connection with a client, it forks a child process to handle the request. The child process has to use the operations `lseek` and `lockf` in UNIX. The `lseek` function can locate the position to be rewritten in a file, while the `lockf` can lock a file (or even a record) to prevent multiple clients updating the same record simultaneously. The parent process should use a signal-catching routine to clean up any child process which has terminated. The following is an example to run the service mapper on monet, the database server on the machine bach, and the client on chopin.

```
monet% ./servicemap
Received from 137.148.204.16: PUT BANK620 8765
Received from 137.148.204.10: GET BANK620
```

```
bach% ./server
Registration OK from 137.148.204.24
Service Requested from 137.148.204.10
Service Requested from 137.148.204.10
```

```
chopin% ./client
Service provided by 137.148.204.16 at port 8765
> query 11111
MULAN HUA 11111 99.9 (440)687-2001
> update 34567 8.2
BILL SUN 34567 74.2
> quit
```

Turnin

Each group (at most two students) has to submit this project electronically using the following turnin command on grail:

```
turnin -c cis620s -p proj3 report.pdf client.c server.c servicemap.c makefile
```

Your report should include the description of your design/implementation, the protocol, experiences in debugging/testing, project status(works or not), etc. The cover page should contain your picture(s), name(s) and the login id you used to turnin the project. Start on time and good luck. If you have any questions, send e-mail to j.sang@csuohio.edu.