GTU

DEPARTMENT OF
COMPUTER ENGINEERING

CSE 344 – Spring 2022

FINAL
REPORT

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1. REQUIREMENTS

NONFUNCTIONAL REQUIREMENTS

1. Portability → The application should be portable. All computers that have Linux Distro with POSIX and GCC compiler can run the program.

2. Maintainability → In case of an error occurrence, the system uses perror in order to give feedback on terminal.

3. Performance → The system should initially be able to process as many entries as possible. Each request must be processed with different terminals. The system's performance should be fast enough to show user the feedback.

FUNCTIONAL REQUIREMENTS

In order to compile the program, user have to use "make" command that uses gcc. If make or gcc is not installed user can install it via *"sudo apt-get install build-essential"* command.
Make command runs 1 command.

```
    gcc -pthread -Wall -std=gnu17 src/server.c
src/common.c -lm -o bin/server

    gcc -pthread -Wall -std=gnu17 src/servant.c
src/common.c -lm -o bin/servant

    gcc -pthread -Wall -std=gnu17 src/client.c
src/common.c -lm -o bin/client
```

To run, we need to use command line arguments with parameters i, j, o,n and m.

```
# ./bin/server -p 33000 -t 11
# ./bin/servant -d dataset -c 1-9 -r 127.0.0.1 -p 33000
# ./bin/client -r requestFile -q 33000 -s 127.0.0.1
```

If input file exists and we have permissions to read the input file and write to the output file, the executable will run successfully.

2. PROBLEM SOLUTION APPROACH AND REQUIREMENT ACHIEVEMENT

To get the file names alphabetically from the folders, I used scandir which is a part of POSIX.1-2008.

```c
*/
#include "common.h"

typedef struct SgDateLinkedList{
    String date;
    SgLinkedList *transactions;
    struct SgCityLinkedList *next;
} SgDateLinkedList;

typedef struct SgCityLinkedList{
    String cityName;
    SgDateLinkedList *dateLL;
    struct SgCityLinkedList *next;
} SgCityLinkedList;
```

For the data structure I used linked list because it helps dynamically adding or removing values easily.

I have SgCityLinkedList struct, it holds a SgDateLinkedList struct and it holds SgLinkedList struct for transactions.

> However, the server can be contacted either by servant processes on its PORT, or by a client process. It is up to you to decide a mechanism to figure out who's at the other end of the connection.

For the mechanism above I selected to use a variable that I get before I get any value, "int servantOrClient". If client I'm getting different values and if instead of client, it's server it means that servant.

```
205    int getPidWithProp(){
206        // Using pidof with open() system call
207        int procIdFd = open("/proc/self/status", O_RDONLY);
208        if(procIdFd < 0)
209            errorAndExit("Error opening /proc/self/status");
210
211        // Reading /proc/self/status
212        char *buffer = malloc(100);
213        if(read(procIdFd, buffer, 100) < 0)
214            errorAndExit("Error reading /proc/self/status");
215        printf("buffer is %s\n", buffer);
216
217        // Finding "Pid:\t" in file with strstr
218        char *pid, *ppid;
219        if((pid = strstr(buffer, "Pid:\t")) == NULL)
220            errorAndExit("Error finding pid in /proc/self/sta
221        pid += 5;
222        // Finding "\nPPid:" in file with strstr
223        if((ppid = strstr(buffer, "\nPPid:")) == NULL)
224            errorAndExit("Error finding ppid in /proc/self/st
225        ppid[0] = '\0';
226
227        int pidInteger = atoi(pid);
228        free(buffer);
229
230        return pidInteger;
231    }
232
233    SgDateLinkedList *addDateToLinkedList(SgDateLinkedList *h
```

PROBLEMS   OUTPUT   DEBUG CONSOLE   **TERMINAL**

```
(Fri Jun 10 20:39:40 2022) 30-12-2096
(Fri Jun 10 20:39:40 2022) 10-01-2093                    Head:
(Fri Jun 10 20:39:40 2022) 06-06-2048                    Accept
(Fri Jun 10 20:39:40 2022) 28-06-2025
(Fri Jun 10 20:39:40 2022) 04-01-2087                    Head:
(Fri Jun 10 20:39:40 2022) 27-04-2035                    Accept
(Fri Jun 10 20:39:40 2022) 17-11-2018
(Fri Jun 10 20:39:40 2022) 11-08-2017                    Head:
(Fri Jun 10 20:39:40 2022) 14-10-2081                    Accept
Head is 1 and tail is 9
buffer is Name:  servant                                 Head:
Umask:   0002                                            Accept
State:   R (running)
Tgid:    86258                                           Head:
Ngid:    0                                               Accept
Pid:     86258      <----
PPid:    5967                                             Head:
```

 To find the pid of process without getpid I used, proc like in screenshot.

For synchronization randevou point of client I implemented a barrier. To implement it I used both mutex and conditional variable which both of them are available on pthread library.

Then other problem of mine was to send more than 1 variable to thread. So I've created a struct which contains thread id index, size, number of columns to calculate.

3) TEST CASES AND RESULTS

```
sglbl@sglblPC:~/Desktop/CSE344/FinalProject$ ./bin/server -p 33000 -t 11
(Thu Jun 16 08:49:47 2022) Server is waiting
(Thu Jun 16 08:49:47 2022) Thread-1 is running and waiting for incoming connection
(Thu Jun 16 08:49:47 2022) Thread-0 is running and waiting for incoming connection
(Thu Jun 16 08:49:47 2022) Thread-2 is running and waiting for incoming connection
(Thu Jun 16 08:49:47 2022) Thread-3 is running and waiting for incoming connection
(Thu Jun 16 08:49:47 2022) Thread-8 is running and waiting for incoming connection
(Thu Jun 16 08:49:47 2022) Thread-5 is running and waiting for incoming connection
(Thu Jun 16 08:49:47 2022) Thread-10 is running and waiting for incoming connection
(Thu Jun 16 08:49:47 2022) Thread-6 is running and waiting for incoming connection
(Thu Jun 16 08:49:47 2022) Thread-4 is running and waiting for incoming connection
(Thu Jun 16 08:49:47 2022) Thread-9 is running and waiting for incoming connection
(Thu Jun 16 08:49:47 2022) Thread-7 is running and waiting for incoming connection
Thread id-1 is handling connection
(Thu Jun 16 08:49:51 2022) Servant 241487 present at port 59170 and handling cities: A
DANA-ARDAHAN
Thread id-0 is handling connection
(Thu Jun 16 08:49:55 2022) Servant 241518 present at port 59180 and handling cities: A
RTVIN-BOLU
Thread id-3 is handling connection
Thread id-8 is handling connection
```

```
(Thu Jun 16 08:49:51 2022) Servant-241487: Loaded dataset, cities ADANA-AR
DAHAN
Getting info data from server: TARLA
ADANA
Estate type: TARLA, city: ADANA
Beginning date: 756676, ending date: 757400
City is specified and sdir is dataset
```

```
sglbl@sglblPC:~/Desktop/CSE344/FinalProject$ ./bin/client -r requestFile -q 33000 -s 127.0.0.1
(Thu Jun 16 08:49:57 2022) Number of lines is 10
(Thu Jun 16 08:49:57 2022) Client: I have loaded 10 requests and I'm creating 10 threads.
(Thu Jun 16 08:49:57 2022) Client-Thread-0: Thread-0 has been created
(Thu Jun 16 08:49:57 2022) Client-Thread-1: Thread-1 has been created
(Thu Jun 16 08:49:57 2022) Client-Thread-4: Thread-4 has been created
(Thu Jun 16 08:49:57 2022) Client-Thread-3: Thread-3 has been created
(Thu Jun 16 08:49:57 2022) Client-Thread-2: Thread-2 has been created
(Thu Jun 16 08:49:57 2022) Client-Thread-5: Thread-5 has been created
(Thu Jun 16 08:49:57 2022) Client-Thread-7: Thread-7 has been created
(Thu Jun 16 08:49:57 2022) Client-Thread-9: Thread-9 has been created
(Thu Jun 16 08:49:57 2022) Client-Thread-8: Thread-8 has been created
(Thu Jun 16 08:49:57 2022) Client-Thread-6: Thread-6 has been created
(Thu Jun 16 08:49:57 2022) Client-Thread-6: I am requesting "/transactionCount FABRIKA 22-07-2004 11-05-2072 ANKARA"
(Thu Jun 16 08:49:57 2022) Client-Thread-0: I am requesting "/transactionCount TARLA 01-01-2073 30-12-2074 ADANA "
(Thu Jun 16 08:49:57 2022) Client-Thread-5: I am requesting "/transactionCount BAHCE 02-03-2005 17-01-2084"
(Thu Jun 16 08:49:57 2022) Client-Thread-1: I am requesting "/transactionCount MERA 03-02-2018 09-11-2050 "
(Thu Jun 16 08:49:57 2022) Client-Thread-3: I am requesting "/transactionCount BAG 01-12-2004 27-09-2089 ADIYAMAN"
(Thu Jun 16 08:49:57 2022) Client-Thread-4: I am requesting "/transactionCount FIDANLIK 02-09-2016 12-09-2081 BALIKESIR"
(Thu Jun 16 08:49:57 2022) Client-Thread-8: I am requesting "/transactionCount VILLA 22-04-2049 20-03-2061"
(Thu Jun 16 08:49:57 2022) Client-Thread-9: I am requesting "/transactionCount IMALATHANE 04-06-2004 11-11-2011 ISPARTA"
(Thu Jun 16 08:49:57 2022) Client-Thread-9: "transactionCount IMALATHANE 04-06-2004 11-11-2011 ISPARTA" -> Error, no servant can
satisfy this request because city couldn't be found
(Thu Jun 16 08:49:57 2022) Client-Thread-7: I am requesting "/transactionCount AMBAR 28-01-2044 13-09-2050 AKSARAY"
(Thu Jun 16 08:49:57 2022) Client-Thread-2: I am requesting "/transactionCount DUKKAN 20-04-2000 23-01-2031  KILIS"
(Thu Jun 16 08:49:57 2022) Client-Thread-2: "transactionCount DUKKAN 20-04-2000 23-01-2031  KILIS" -> Error, no servant can satis
```