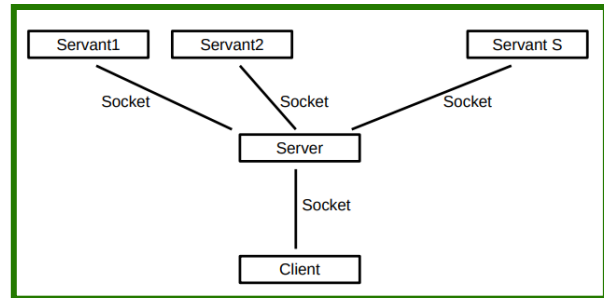


CSE344 – System Programming
Final Project
Report

Muhammet Fikret ATAR
1801042693

Objective: In this project we created , we have 3 programs(servant, server and client). The servant processes aim to answer the requests coming from the server through sockets. The client aim to make requests to the server through sockets, and the server will respond to those requests via the information acquired from the servants. Project scheme like this figure.



Design Decision:

In the project, I first handled the client side. The requests received from the request file and it was parsed and send to the relevant threads. After these requests are connected with the socket created and written to the file created by the socket with the write system call. Finally requests send to the server.

After I created the client, I started to progress on the servant side. On the Servant side, i had to put the whole data set in a data structure first. In this part, I chose the linked list as the data structure. Then I proceeded in the relevant path in the range of donates i received arguments. I keep my node type in a struct type containing the headers from the dataset. In this way, I filled in the relevant headings as I progressed through the path. I have a node class as shown in the figure. I had the whole data set in the linked list structure. I have defined some methods in order to respond to requests easily. Finally, in the servant section, each servant's own sockets were set up. With the help of these sockets, the threads of the servant can send the answers to the server.

```

typedef struct date{
    char day[5];
    char month[5];
    char year[5];
}Date;

typedef struct dataset{
    char street[1024];
    char type[1024];
    char city[1024];
    Date date;
    int surface;
    int price;
    int transaction_id;
}Dataset;

typedef struct node{
    Dataset data;
    struct node* next;
}Node;
  
```

Any more, I started to develop the server design, which is the brain of the project. I read the fd from the queue on the server. Is the request from the server or the servant? After distinguishing the character forward, I parse the request. Servant whose city is known, i connect here and send the message. Then the servant receives the relevant message and creates a thread for itself. This thread makes the relevant calculation and returns this value to its servant. The servant sends the answer back to the server without waiting. Likewise, the server sends this response to the first fd received from the client. and the client gets the response.

This is how I set up my design plan, now I will tell you how I solved the problems that I encountered during the project process.

Problem Solving :

->First of all, I used sync barrier to make clients send requests at the same time.

->In order not to lose the requests coming to the server, I stored them in queue.

->I solved the available problem using monitor. In this way, the server was able to send a request to the appropriate thread. And there were no sync problems.

->On the servant side, I placed all my datasets in the linked list data structure. I used the readdir function to navigate through the files.

->In order to understand that the incoming request was in the right range, I designed the date struct so that I could easily compare the relevant date.

->I understand whether the incoming message belongs to the client or the server by looking at the first character.

Test And Result:

Request File;

```
1 transactionCount TARLA 01-01-2073 30-12-2074 ADANA
2 transactionCount MERA 03-02-2018 09-11-2050
3 transactionCount DUKKAN 20-04-2000 23-01-2031 KILIS
4 transactionCount BAG 01-12-2004 27-09-2089 ADIYAMAN
5 transactionCount FIDANLIK 02-09-2016 12-09-2081 BALIKESIR
6 transactionCount BAHCE 02-03-2005 17-01-2084
7 transactionCount FABRIKA 22-07-2004 11-05-2072 ANKARA
8 transactionCount AMBAR 28-01-2044 13-09-2050 AKSARAY
9 transactionCount VILLA 22-04-2049 20-03-2061
10 transactionCount IMALATHANE 04-06-2004 11-11-2011 ISPARTA
```

Script.sh;

```
1 #!/bin/bash
2
3 PORT=33000
4
5 ./server -p $PORT -t 12 &
6 sleep 1
7 ./servant -d /home/atar/Desktop/final/dataset -c 1-9 -r 127.0.0.1 -p $PORT &
8 ./servant -d /home/atar/Desktop/final/dataset -c 10-18 -r 127.0.0.1 -p $PORT &
9 ./servant -d /home/atar/Desktop/final/dataset -c 19-27 -r 127.0.0.1 -p $PORT &
10 ./servant -d /home/atar/Desktop/final/dataset -c 28-36 -r 127.0.0.1 -p $PORT &
11 ./servant -d /home/atar/Desktop/final/dataset -c 37-45 -r 127.0.0.1 -p $PORT &
12 ./servant -d /home/atar/Desktop/final/dataset -c 46-54 -r 127.0.0.1 -p $PORT &
13 ./servant -d /home/atar/Desktop/final/dataset -c 55-63 -r 127.0.0.1 -p $PORT &
14 ./servant -d /home/atar/Desktop/final/dataset -c 64-72 -r 127.0.0.1 -p $PORT &
15 ./servant -d /home/atar/Desktop/final/dataset -c 73-81 -r 127.0.0.1 -p $PORT &
16 sleep 3
17 ./client -r /home/atar/Desktop/final/requestFile -q $PORT -s 127.0.0.1
18
```

Make;

```
atar@ubuntu:~/Desktop/final$ make
gcc -Wall -o server server.c -lm -lrt -lpthread
gcc -Wall -o client client.c -lm -lrt -lpthread
gcc -Wall -o servant servant.c -lm -lrt -lpthread
atar@ubuntu:~/Desktop/final$
```

Outputs;

```
atar@ubuntu:~/Desktop/final$ ./script.sh
2022-06-15 19:25:46,Servant 6672: loaded dataset, cities ADANA-ARDAHAN
2022-06-15 19:25:46,Servant 6672: loaded dataset, cities ARTVIN-BITLIS
2022-06-15 19:25:46,Servant 6672: loaded dataset, cities BOLU-DUZCE
2022-06-15 19:25:46,Servant 6672: loaded dataset, cities KASTAMONU-KUTAHYA
2022-06-15 19:25:46,Servant 6672: loaded dataset, cities TEKIRDAG-ZONGULDAK
2022-06-15 19:25:46,Servant 6672: loaded dataset, cities OSMANIYE-SIVAS
2022-06-15 19:25:46,Servant 6672: loaded dataset, cities MALATYA-ORDU
2022-06-15 19:25:46,Servant 6672: loaded dataset, cities HATAY-KARS
2022-06-15 19:25:46,Servant 16810: listening at port 19810
2022-06-15 19:25:46,Servant 16810 present at port 19810 handling cities ADANA-ARDAHAN
2022-06-15 19:25:46,Servant 16812 present at port 19812 handling cities BOLU-DUZCE
2022-06-15 19:25:46,Servant 16812: listening at port 19812
2022-06-15 19:25:46,Servant 6672: loaded dataset, cities EDIRNE-HAKKARI
2022-06-15 19:25:46,Servant 16818: listening at port 19818
2022-06-15 19:25:46,Servant 16818 present at port 19818 handling cities TEKIRDAG-ZONGULDAK
2022-06-15 19:25:46,Servant 16816: listening at port 19816
2022-06-15 19:25:46,Servant 16816 present at port 19816 handling cities MALATYA-ORDU
2022-06-15 19:25:46,Servant 16815: listening at port 19815
2022-06-15 19:25:46,Servant 16815 present at port 19815 handling cities KASTAMONU-KUTAHYA
2022-06-15 19:25:46,Servant 16814 present at port 19814 handling cities HATAY-KARS
2022-06-15 19:25:46,Servant 16814: listening at port 19814
2022-06-15 19:25:46,Servant 16813: listening at port 19813
2022-06-15 19:25:46,Servant 16813 present at port 19813 handling cities EDIRNE-HAKKARI
2022-06-15 19:25:46,Servant 16817: listening at port 19817
2022-06-15 19:25:46,Servant 16817 present at port 19817 handling cities OSMANIYE-SIVAS
2022-06-15 19:25:46,Servant 16811: listening at port 19811
2022-06-15 19:25:46,Servant 16811 present at port 19811 handling cities ARTVIN-BITLIS
Client: I have loaded 10 requests and I'm creating 10 threads.
Client-Thread-0: Thread-0 has been created.
Client-Thread-1: Thread-1 has been created.
Client-Thread-2: Thread-2 has been created.
Client-Thread-3: Thread-3 has been created.
Client-Thread-4: Thread-4 has been created.
Client-Thread-5: Thread-5 has been created.
Client-Thread-6: Thread-6 has been created.
Client-Thread-7: Thread-7 has been created.
Client-Thread-8: Thread-8 has been created.
Client-Thread-9: Thread-9 has been created.
Client-Thread-3: I am requesting "transactionCount BAG 01-12-2004 27-09-2089 ADIYAMAN"
Client-Thread-0: I am requesting "transactionCount TARLA 01-01-2073 30-12-2074 ADANA "
Client-Thread-4: I am requesting "transactionCount FIDANLIK 02-09-2016 12-09-2081 BALIKESIR"
Client-Thread-1: I am requesting "transactionCount MERA 03-02-2018 09-11-2050 "
Client-Thread-2: I am requesting "transactionCount DUKKAN 20-04-2000 23-01-2031 KILIS"
2022-06-15 19:25:49,Contacting servant 16810
```

```

Client-Thread-7: I am requesting "transactionCount AMBAR 28-01-2044 13-09-2050 AKSARAY"
Client-Thread-6: I am requesting "transactionCount FABRIKA 22-07-2004 11-05-2072 ANKARA"
Client-Thread-9: I am requesting "transactionCount IMALATHANE 04-06-2004 11-11-2011 ISPARTA"
Client-Thread-8: I am requesting "transactionCount VILLA 22-04-2049 20-03-2061"
Client-Thread-5: I am requesting "transactionCount BAHCE 02-03-2005 17-01-2084"
2022-06-15 19:25:49,Response received: 3, forwarded to client
Client-Thread-0: The server's response to "transactionCount TARLA 01-01-2073 30-12-2074 ADANA " is 3
Client-Thread-0: Terminating
2022-06-15 19:25:49,Contacting servant 16810
2022-06-15 19:25:49,Response received: 5, forwarded to client
Client-Thread-3: The server's response to "transactionCount BAG 01-12-2004 27-09-2089 ADIYAMAN" is 5
2022-06-15 19:25:49,Contacting servant 16811
Client-Thread-3: Terminating
2022-06-15 19:25:49,Response received: 2, forwarded to client
Client-Thread-4: The server's response to "transactionCount FIDANLIK 02-09-2016 12-09-2081 BALIKESIR" is 2
Client-Thread-4: Terminating
2022-06-15 19:25:49,Contacting ALL servants
2022-06-15 19:25:49,Response received: 158, forwarded to client
Client-Thread-1: The server's response to "transactionCount MERA 03-02-2018 09-11-2050 " is 158
Client-Thread-1: Terminating
2022-06-15 19:25:49,Contacting servant 16815
2022-06-15 19:25:49,Response received: 1, forwarded to client
Client-Thread-2: The server's response to "transactionCount DUKKAN 20-04-2000 23-01-2031 KILIS" is 1
Client-Thread-2: Terminating
2022-06-15 19:25:49,Contacting servant 16810
2022-06-15 19:25:49,Response received: 0, forwarded to client
Client-Thread-7: The server's response to "transactionCount AMBAR 28-01-2044 13-09-2050 AKSARAY" is 0
Client-Thread-7: Terminating
2022-06-15 19:25:49,Contacting servant 16810
2022-06-15 19:25:49,Response received: 4, forwarded to client
Client-Thread-6: The server's response to "transactionCount FABRIKA 22-07-2004 11-05-2072 ANKARA" is 4
Client-Thread-6: Terminating
2022-06-15 19:25:49,Contacting servant 16814
2022-06-15 19:25:49,Response received: 4, forwarded to client
Client-Thread-9: The server's response to "transactionCount IMALATHANE 04-06-2004 11-11-2011 ISPARTA" is 4
Client-Thread-9: Terminating
2022-06-15 19:25:49,Contacting ALL servants
2022-06-15 19:25:49,Response received: 26, forwarded to client
2022-06-15 19:25:49,Contacting ALL servants
Client-Thread-8: The server's response to "transactionCount VILLA 22-04-2049 20-03-2061" is 26
Client-Thread-8: Terminating
2022-06-15 19:25:49,Response received: 340, forwarded to client
Client-Thread-5: The server's response to "transactionCount BAHCE 02-03-2005 17-01-2084" is 340
Client-Thread-5: Terminating
Client: All threads have terminated, goodbye.atar@ubuntu:~/Desktop/final$ █

```

SIGINT ;

For servant

```

atar@ubuntu:~/Desktop/final$ kill -2 servant
Servant 16337: termination message received, handled 4 requests in total.
Servant 16334: termination message received, handled 4 requests in total.
Servant 16336: termination message received, handled 3 requests in total.
Servant 16339: termination message received, handled 3 requests in total.
Servant 16340: termination message received, handled 3 requests in total.
Servant 16338: termination message received, handled 4 requests in total.
Servant 16341: termination message received, handled 3 requests in total.
atar@ubuntu:~/Desktop/final$ Servant 16335: termination message received, handled 3 requests in total.
Servant 16333: termination message received, handled 7 requests in total.

```

Server;

```

atar@ubuntu:~/Desktop/final$ kill -2 server
SIGINT has been received.I handled a total of 10 requests. Goodbye.
atar@ubuntu:~/Desktop/final$

```