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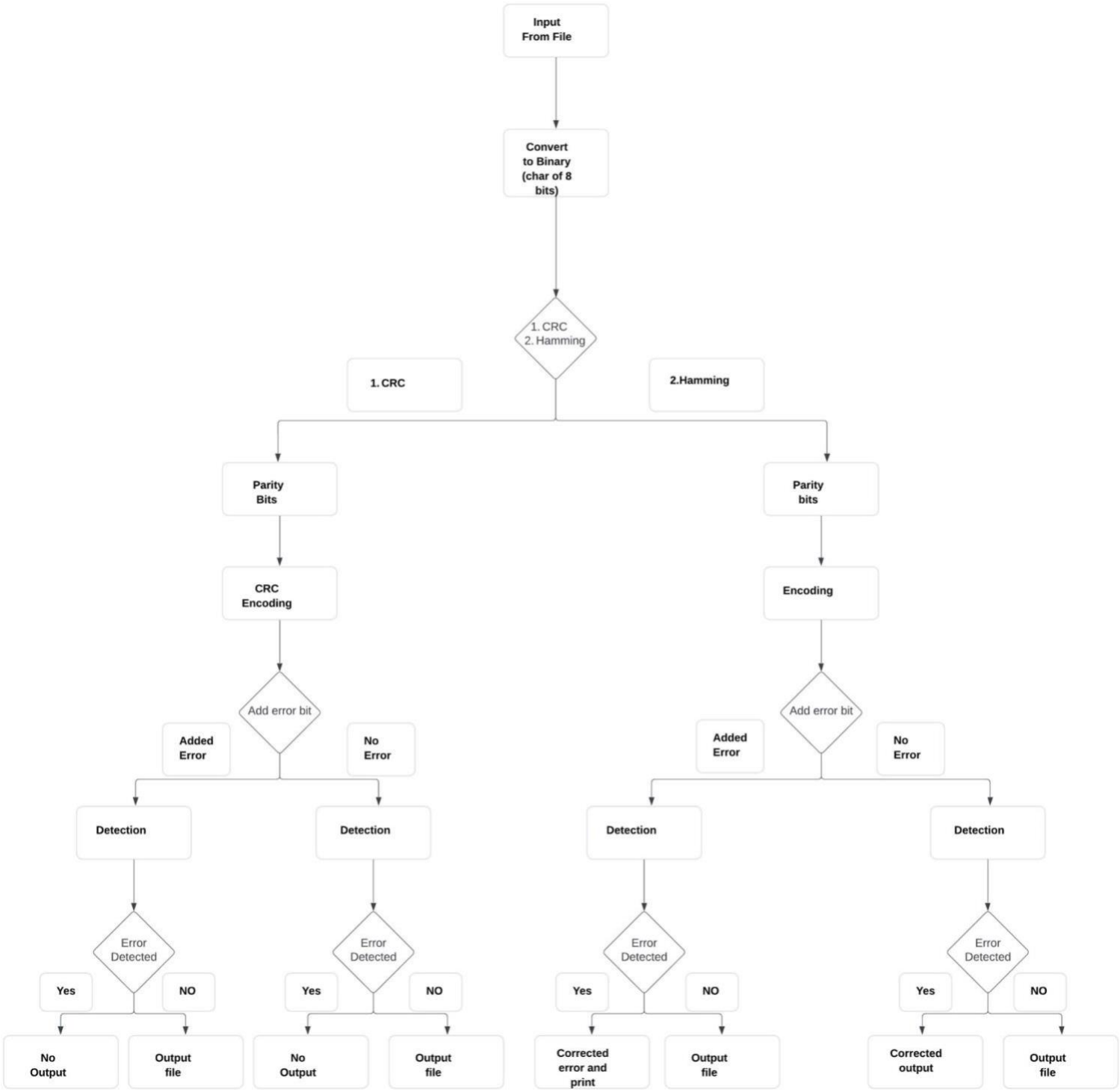
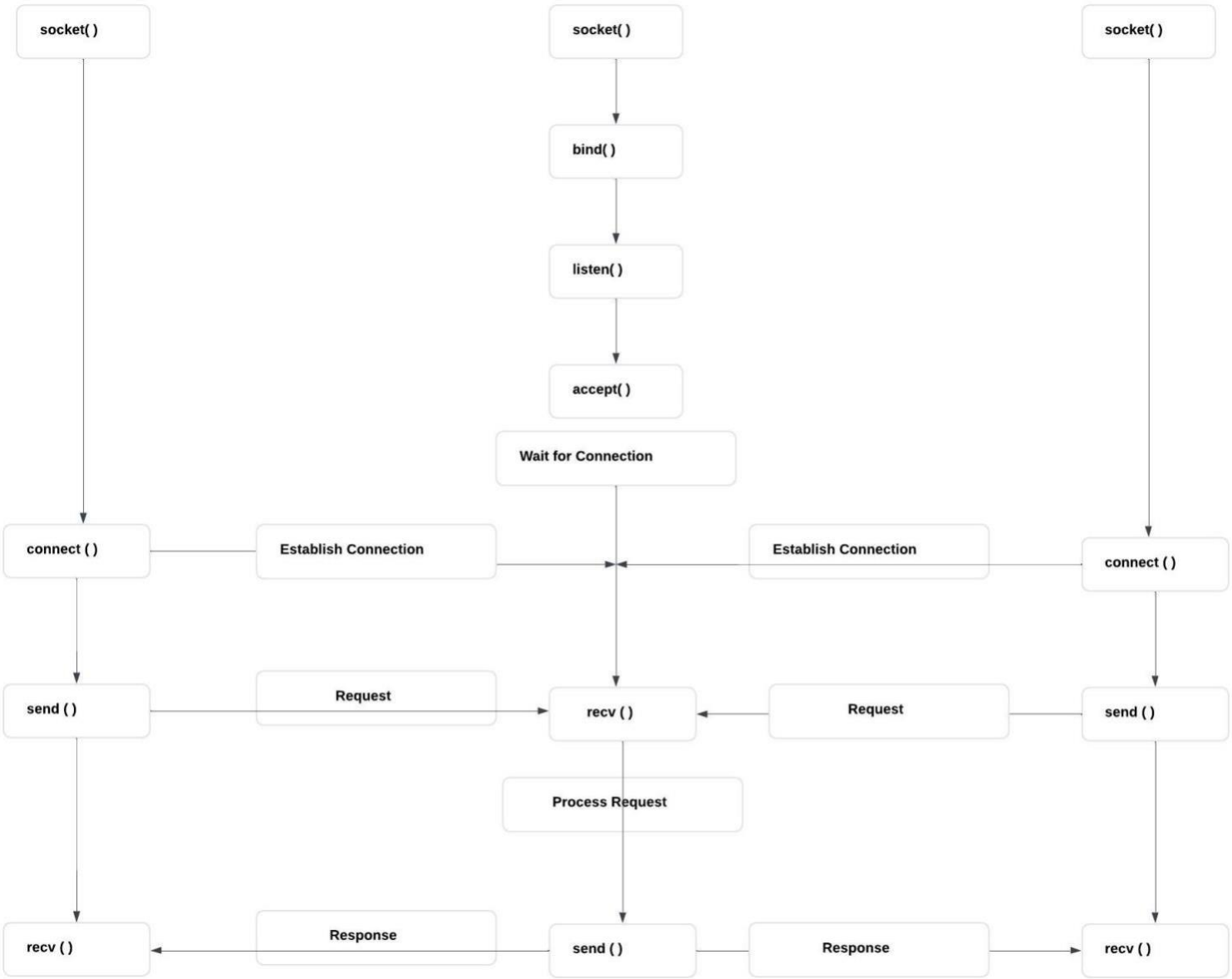
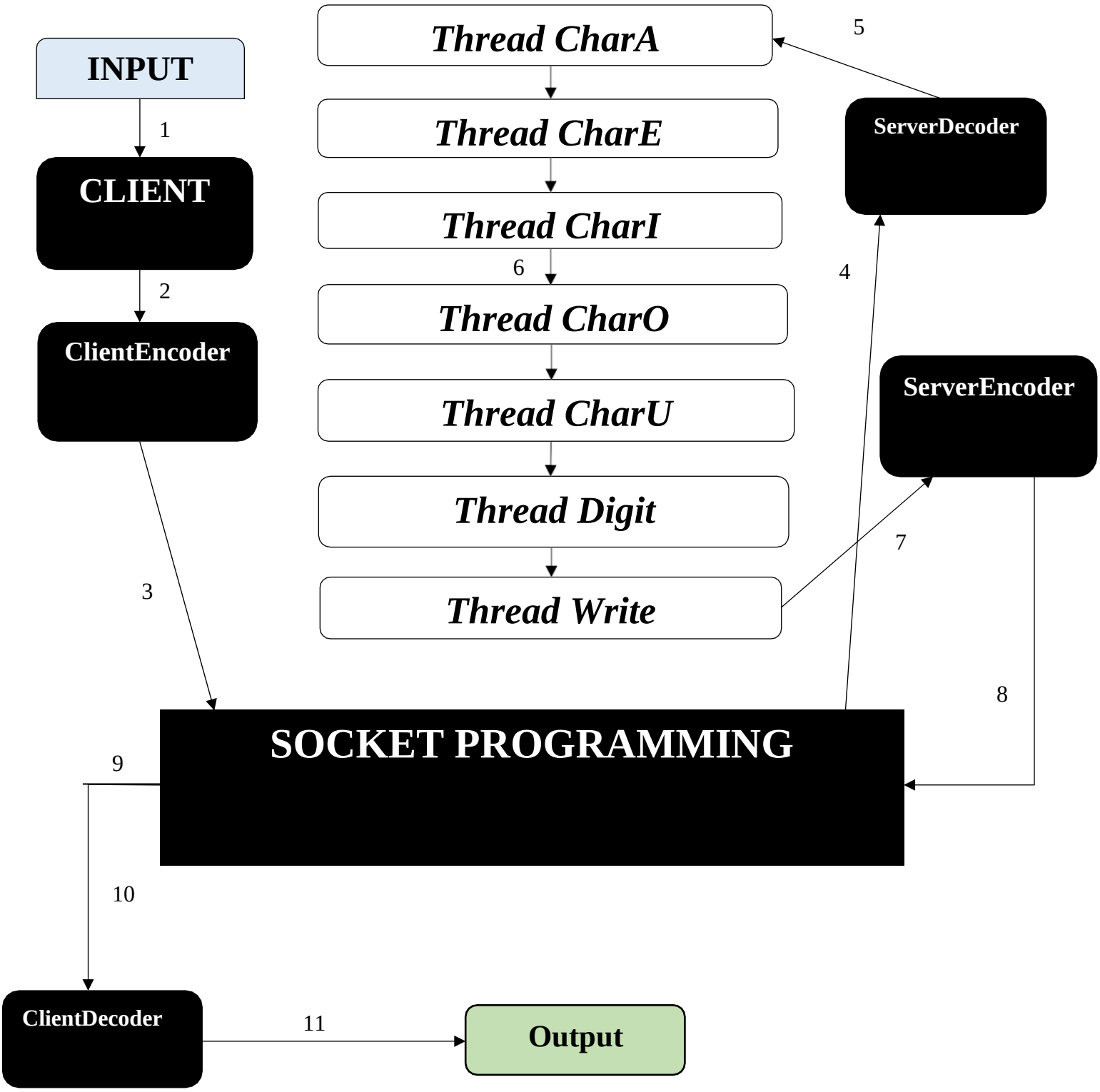
System Documentation

i. High-level data flow diagram for the client server system




socket( )
socket( )
socket( )
bind( )
listen( )
accept( )
Wait for Connection
connect ( )
Establish Connection
Establish Connection
connect ( )
send ( )
Request
recv ( )
Request
send ( )
Process Request
recv ( )
Response
send ( )
Response
recv ( )

ii. High-level data flow diagram for the system



iii. List or routines and their brief description

a) characterConvert( ):

It is a thread function that performs operations such as conversion of lowercase vowels into uppercase, count the sum of digits, write the data into pipe based on the input passed to the thread when thread_join( ) is used.

b) pthread_create( ):

It will create a thread with required parameters such as Thread name, invoking function, return type and input parameter.

c) pthread_join( ):

It will execute the created thread.

d) FTOB( ):

This function converts frames of data into respective binary format and returns the binary data

e) BTOF( ):

This function converts binary format of the data and converts them into frames and furtherly converts them into characters

f) Fork( ):

It is an inbuilt C library function used to create two different processes.

g) Pipe( ):

It is a system call which is a one-way communication such that one process created by fork( ) writes into the pipe and another process can read. It is very much similar to FIFO or Queue.

h) serverEncoder( ):

This is used by Server. This is used to encode the data shared by the *write* thread and sends the data to client through sockets.

i) serverDecoder( ):

This is used by Server to decode the encoded data received by the client and creates seven threads for replacing lowercase vowels to uppercase vowels and also to compute the sum of all digits in the inout and sends the final output to serverEncoder().

iv. Implementation Details

I have developed a C program that performs client – server application using TCP Sockets. It is implemented as one-to-one client chat system where multiple clients are created which are handled by a single server using the TCP socket communication. Firstly server is executed and later multiple clients are created. These clients communicate with each other by following some tags like LOGIN, MSG etc. They go through the process of data encoding and decoding by means of CRC and Hamming methods. Another node is implemented in order to convert the lowercase vowels into uppercase which can be seen as server encoder and decoder. Here, a new node is created through which server sends the client data to the new node so the new node will perform case conversion for the vowels where multiple threads are used to convert vowels. Each vowel is converted by using a single thread at once and forwarding the processed/modified data to the next thread so the second vowel will be converted there.This converted data is finally sent back to the server by socket from there to the receiver client.

Test Documentation

i) How you tested your program

I have used the *winVirus.inpf* given in the question to test my code.
Source code represents the part of process thatcontains the programming language itself. You may use a text editor to write your sourcecode file. A compiler will be used to produce a machine representation of your source code.Such representation may show your code as hexadecimal or binary formats. The resulting hexadecimal code will contain combinations of numbers such 1 3 5 8 2 4 6 9 12 21 13 31 14 41 15 51 16 61 17 71 18 81 19 91 100 or combinations of characters and numbers such as 1A3B4C0DEFA, for example.

ii) List of your test sets including the results obtained by each set

SOUrcE cOdE rEprEsEnt0s thE pArt Of prOcEss thAt cOntA0Ins thE prOgrAmmIng lAngUAgE Its0Elf. YOU mAy UsE A tExt EdItOr t0O wrItE yOUr sOUrcE cOdE fIlE. A0 cOmpIlEr wIll bE UsEd
tO prOdUc0E A mAchInE rEprEsEntAtIOn Of yO0Ur sOUrcE cOdE. SUch rEprEsEntAt0IOn mAy shOw yOUr cOdE As hExAdE0cImAl Or
bInAry fOrmAts. ThE rEs0UltIng hExAdEcImAl cOdE wIll cOn0tAIn cOmbInAtIOns Of nUmbErs sUc0h 1 3 5 8 2 4 6 9
12 21 13 31 1457 41 15 51 16 61 17 71 18 81 19 9841 100 Or
cOmbInAtIOns Of chArAct2Ers And nUmbErs sUch As 1A3B4C0D8C0DEFA, fOr Er ExAmplE.

User Documentation

i) How to run your program

All the required files are in the *'CSI500Project3_SravyaVaddi.zip'* folder

Execute the below commands:

- **Open a new terminal for Server**

  gcc server.c -o server.o

  ./server.o

- **Open a 4 new terminal for Clients**

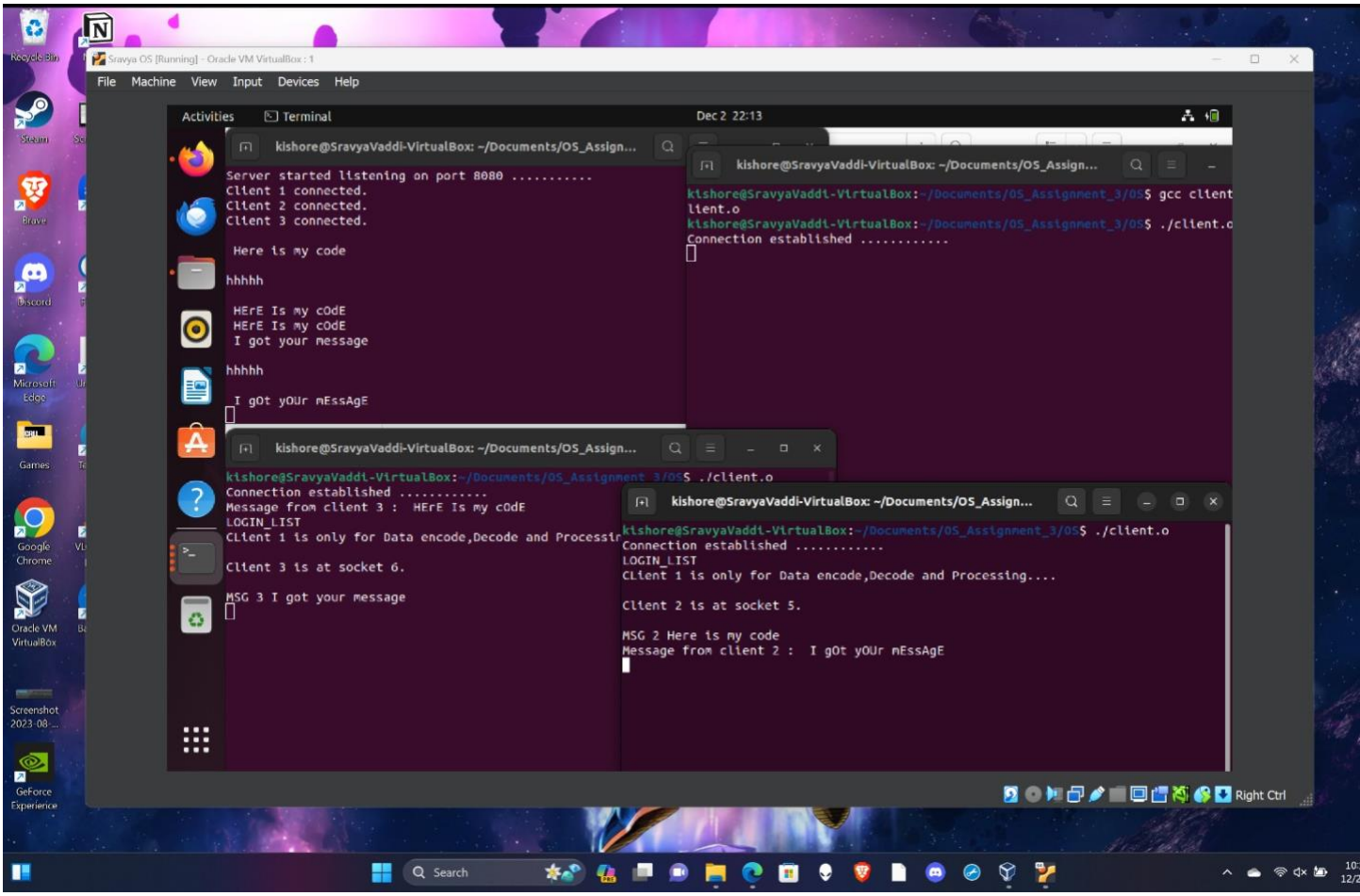
  gcc client.c -o client.o

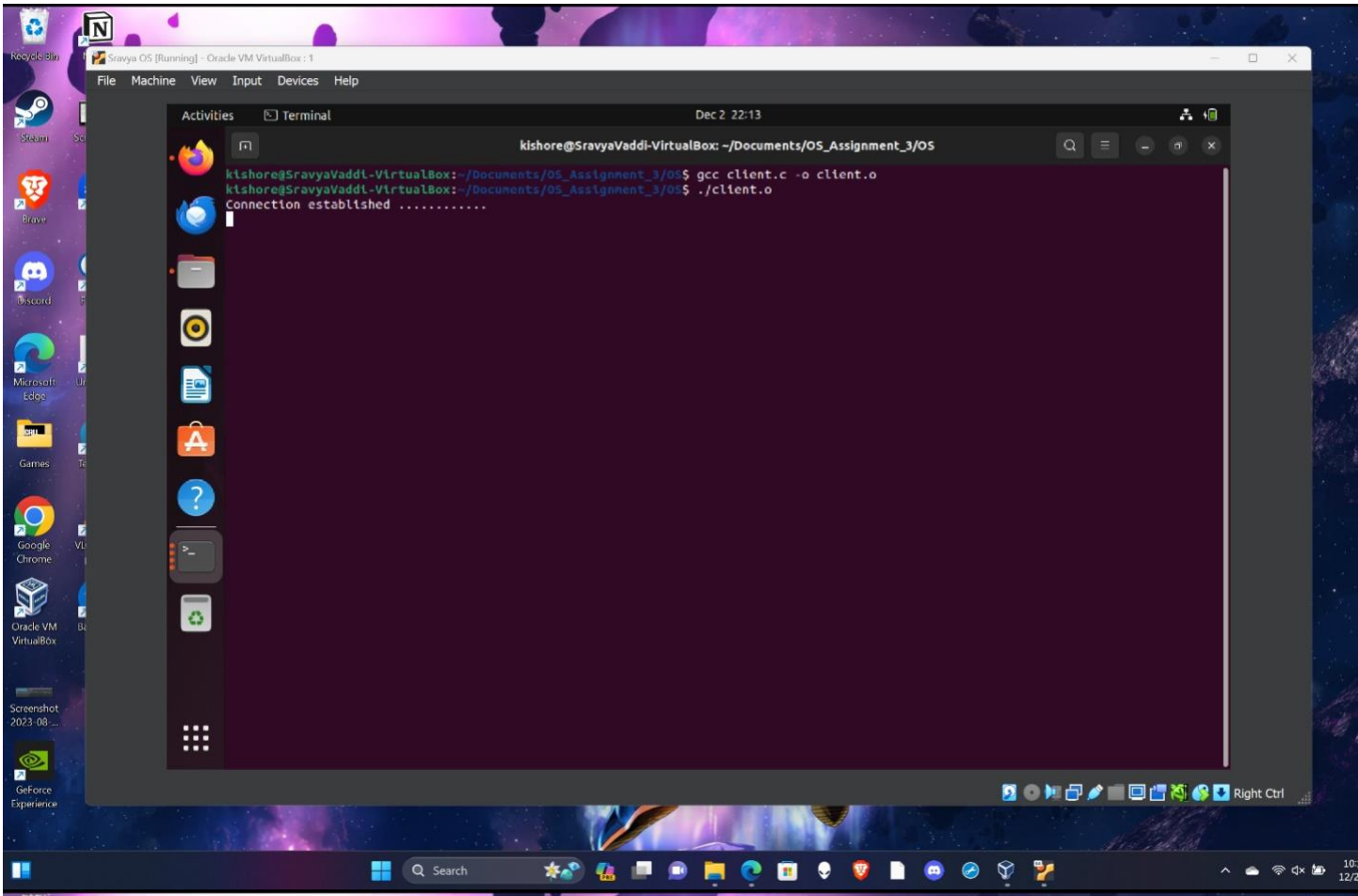
  ./client.o

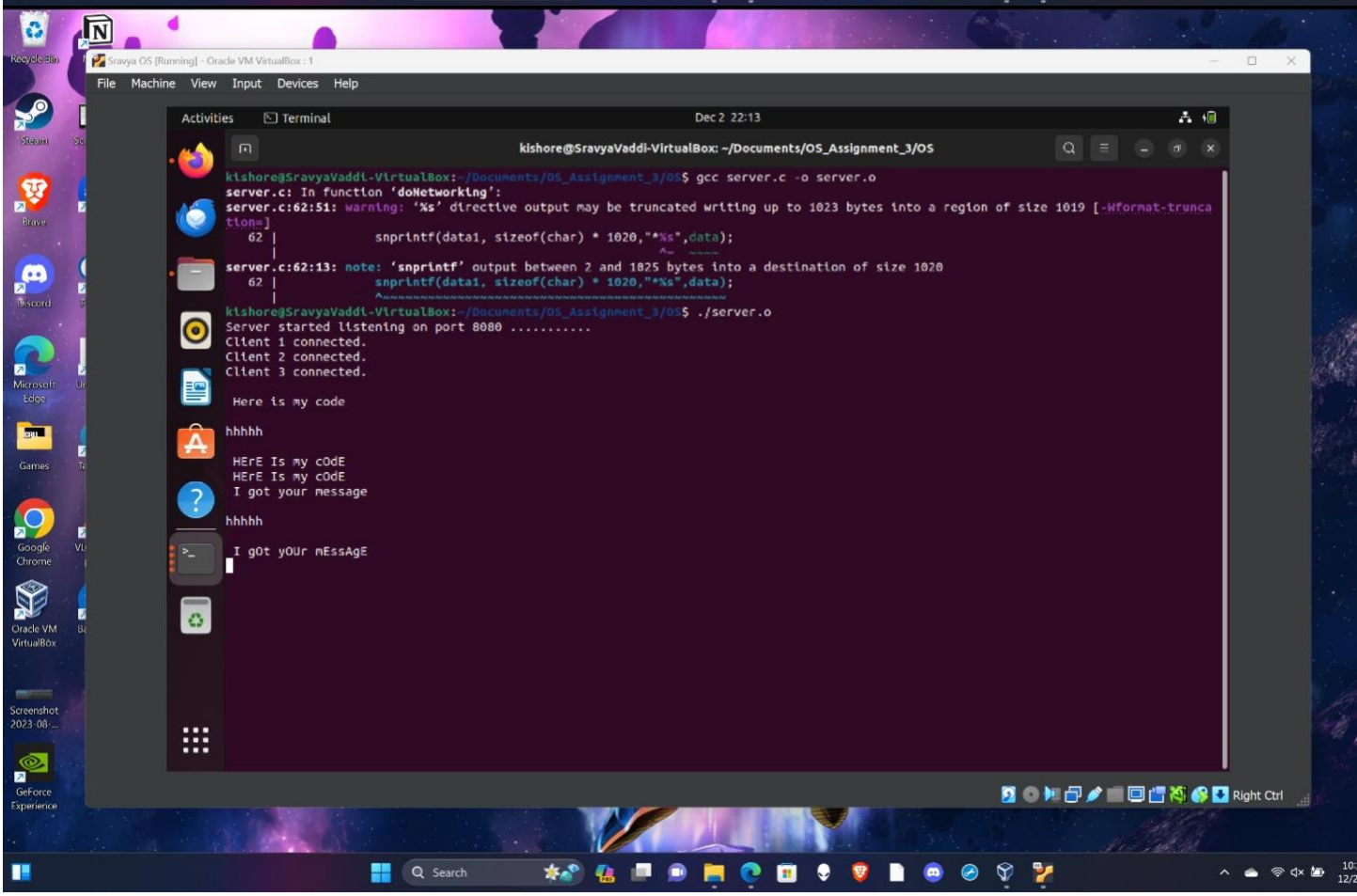
ii) Describe any parameters

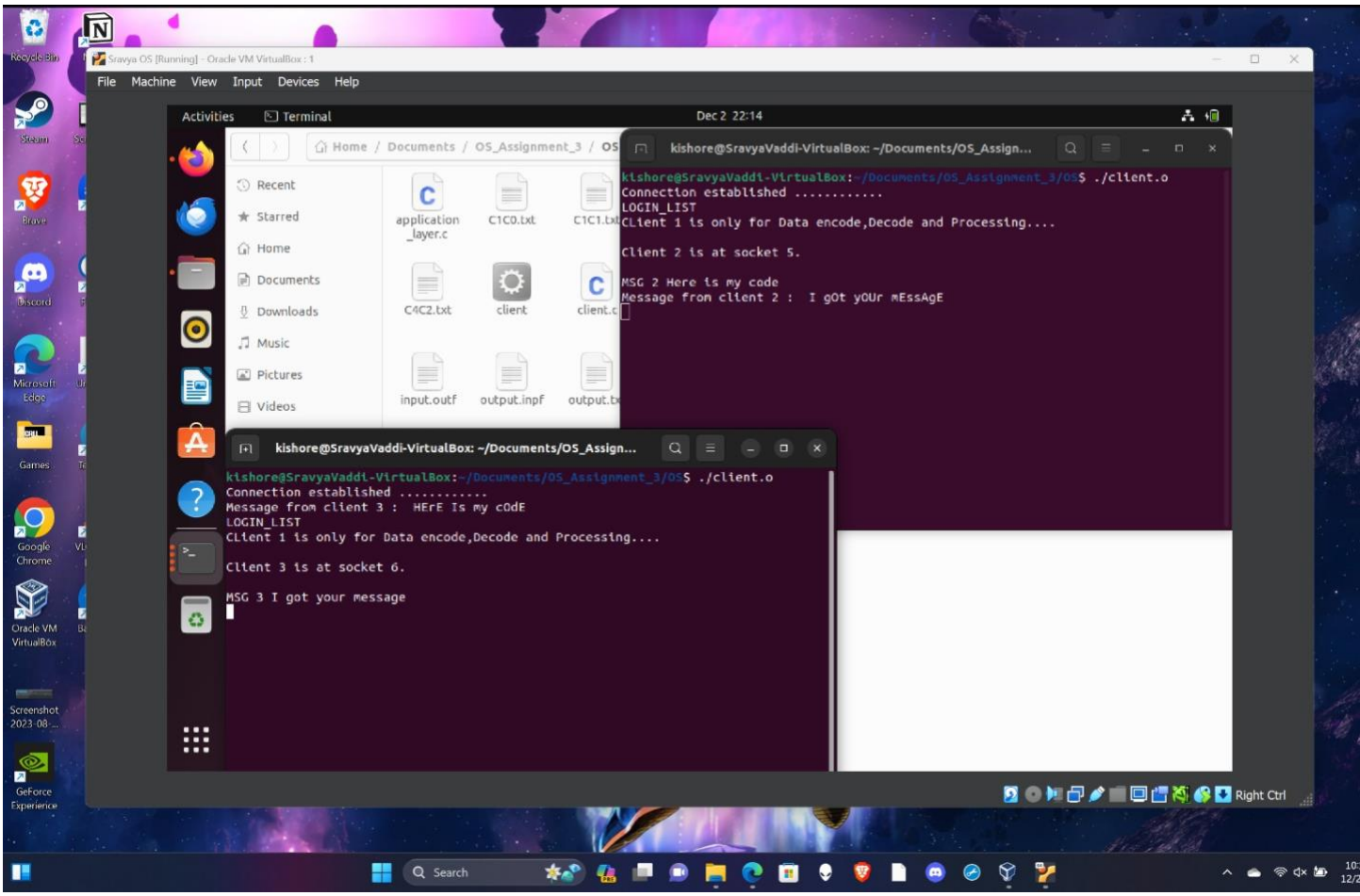
- Before the execution of above commands make sure to delete all the .txt files.
- Execute the server command and also the client commands.
- The first client created will act as the helper node in order to convert the lower case vowels to upper case. So make sure not to communicate with other clients from Client 1.
- While providing the commands like LOGIN_LIST or MSG make sure to follow uppercase.
- MSG command will work as follows : MSG <client number> <message>

Outputs:


Sravya OS [Running] - Oracle VM VirtualBox : 1
File Machine View Input Devices Help
Activities Terminal Dec 2 22:13
kishore@SravyaVaddi-VirtualBox: ~/Documents/OS_Assign...
Server started listening on port 8080 ....
Client 1 connected.
Client 2 connected.
Client 3 connected.
Here is my code
hhhhh
HErE Is my cOdE
HErE Is my cOdE
I got your message
hhhhh
I gOt yOUr mEssAgE
kishore@SravyaVaddi-VirtualBox: ~/Documents/OS_Assignment_3/OS$ gcc client
lient.o
kishore@SravyaVaddi-VirtualBox: ~/Documents/OS_Assignment_3/OS$ ./client.o
Connection established ....
kishore@SravyaVaddi-VirtualBox: ~/Documents/OS_Assign...
kishore@SravyaVaddi-VirtualBox: ~/Documents/OS_Assignment_3/OS$ ./client.o
Connection established ....
Message from client 3 : HErE Is my cOdE
LOGIN_LIST
CLient 1 is only for Data encode,Decode and Processir
Client 3 is at socket 6.
MSG 3 I got your message
kishore@SravyaVaddi-VirtualBox: ~/Documents/OS_Assign...
kishore@SravyaVaddi-VirtualBox: ~/Documents/OS_Assignment_3/OS$ ./client.o
Connection established ....
LOGIN_LIST
CLient 1 is only for Data encode,Decode and Processing....
Client 2 is at socket 5.
MSG 2 Here is my code
Message from client 2 : I gOt yOUr mEssAgE
Right Ctrl
Search


Sravya OS [Running] - Oracle VM VirtualBox : 1
File Machine View Input Devices Help
Activities Terminal Dec 2 22:13
kishore@SravyaVaddi-VirtualBox: ~/Documents/OS_Assignment_3/OS
kishore@SravyaVaddi-VirtualBox:~/Documents/OS_Assignment_3/OS$ gcc client.c -o client.o
kishore@SravyaVaddi-VirtualBox:~/Documents/OS_Assignment_3/OS$ ./client.o
Connection established .....
Right Ctrl


Sravya OS [Running] - Oracle VM VirtualBox : 1
File Machine View Input Devices Help
Activities Terminal Dec 2 22:13
kishore@SravyaVaddi-VirtualBox: ~/Documents/OS_Assignment_3/OS
kishore@SravyaVaddi-VirtualBox:~/Documents/OS_Assignment_3/OS$ gcc server.c -o server.o
server.c: In function 'doNetworking':
server.c:62:51: warning: '%s' directive output may be truncated writing up to 1023 bytes into a region of size 1019 [-Wformat-truncation=]
62 | snprintf(data1, sizeof(char) * 1020,"*%s",data);
server.c:62:13: note: 'snprintf' output between 2 and 1025 bytes into a destination of size 1020
62 | snprintf(data1, sizeof(char) * 1020,"*%s",data);
kishore@SravyaVaddi-VirtualBox:~/Documents/OS_Assignment_3/OS$ ./server.o
Server started listening on port 8080 .....
Client 1 connected.
Client 2 connected.
Client 3 connected.
Here is my code
hhhhh
HErE Is my cOdE
HErE Is my cOdE
I got your message
hhhhh
I gOt yOUr mEssAgE
Right Ctrl


Sravya OS [Running] - Oracle VM VirtualBox : 1
File Machine View Input Devices Help
Activities
Terminal
Dec 2 22:14
Home / Documents / OS_Assignment_3 / OS
Recent
Starred
Home
Documents
Downloads
Music
Pictures
Videos
application_layer.c
C1C0.txt
C1C1.txt
C4C2.txt
client
input.outf
output.inpf
kishore@SravyaVaddi-VirtualBox: ~/Documents/OS_Assign...
kishore@SravyaVaddi-VirtualBox:~/Documents/OS_Assignment_3/OS$ ./client.o
Connection established .....
LOGIN_LIST
CLient 1 is only for Data encode,Decode and Processing....
Client 2 is at socket 5.
MSG 2 Here is my code
Message from client 2 : I gOt yOUr mEssAgE
kishore@SravyaVaddi-VirtualBox: ~/Documents/OS_Assign...
kishore@SravyaVaddi-VirtualBox:~/Documents/OS_Assignment_3/OS$ ./client.o
Connection established .....
Message from client 3 : HErE Is my cOdE
LOGIN_LIST
CLient 1 is only for Data encode,Decode and Processing....
Client 3 is at socket 6.
MSG 3 I got your message
Right Ctrl
Search