

PROJECT REPORT

HOSTED VIRTUAL MACHINE IP : 35.246.29.33

GROUP MEMBERS:

NAMES	ROLL NUMBER	PUBLIC IP
D Tejashree	COE18B016	103.232.131.194
Jaya Sathwika	COE18B019	49.204.9.179
Sanjana Dara	CED18I015	157.47.124.14
V.Harini	CED18I023	157.46.114.111
K.Sai Dheekshitha	CED18I026	223.228.93.135
Kavya Vemuri	CED18I027	202.62.86.30

Multithreading Client Server Communication

1)Develop a client and server program, where the server generates a separate thread for each incoming client request. Server shows the client accepted port number and ip address.

We developed a multi-threaded client-server chat program by using fork system call. Here clients are differentiated by IP ADDRESS and PORT NUMBER, also names are provided by the client at the start of the conversation so as to provide readability to the user.

OUTPUT:

SERVER SIDE(VM):

```
ssh.cloud.google.com/projects/seraphic-plexus-289709/zones/europe-west2-a/instances/instance-1?useAdm
Swap usage:  0%

0 packages can be updated.
0 updates are security updates.

Last login: Wed Sep 16 13:55:05 2020 from 35.235.242.1
sanjanadara1701@instance-1:~$ ls
games games.c multis multis.c
sanjanadara1701@instance-1:~$ ./multis

Connection 1 accepted from : 49.204.9.179 with port 45316

sathwika : hello
>>>Server to sathwika : Hey guddu
sathwika : how is ur semester going on??
>>>Server to sathwika : Donno

Connection 2 accepted from : 106.208.127.59 with port 59045

Dheekshitha : Hi!!!
>>>Server to Dheekshitha : Hellooo..!
sathwika : :(
>>>Server to sathwika : :)

Connection 3 accepted from : 202.62.86.30 with port 58262

Kavya : Heyyy am Kavya
>>>Server to Kavya : Hello am server
Kavya : Ate ?
>>>Server to Kavya : Yeah 1024 bits
Dheekshitha : nice to meet u server :) :) :)
>>>Server to Dheekshitha : Same here..))
Kavya : Nice joke... ^.^
>>>Server to Kavya : Ok go now
Disconnected from connection3 : 202.62.86.30 with port 58262

Connection 4 accepted from : 103.232.131.194 with port 50394

Teju : Heyy!
>>>Server to Teju : Hello tej
Teju : How's everything?
>>>Server to Teju : COOLL...!
Disconnected from connection2 : 106.208.127.59 with port 59045

Connection 5 accepted from : 157.47.124.14 with port 51090

sanjana : Hello
>>>Server to sanjana : Hello to me:)
sathwika : bye server!!
>>>Server to sathwika : Thanks for leaving

Disconnected from connection1 : 49.204.9.179 with port 45316

Connection 6 accepted from : 157.46.114.111 with port 48340

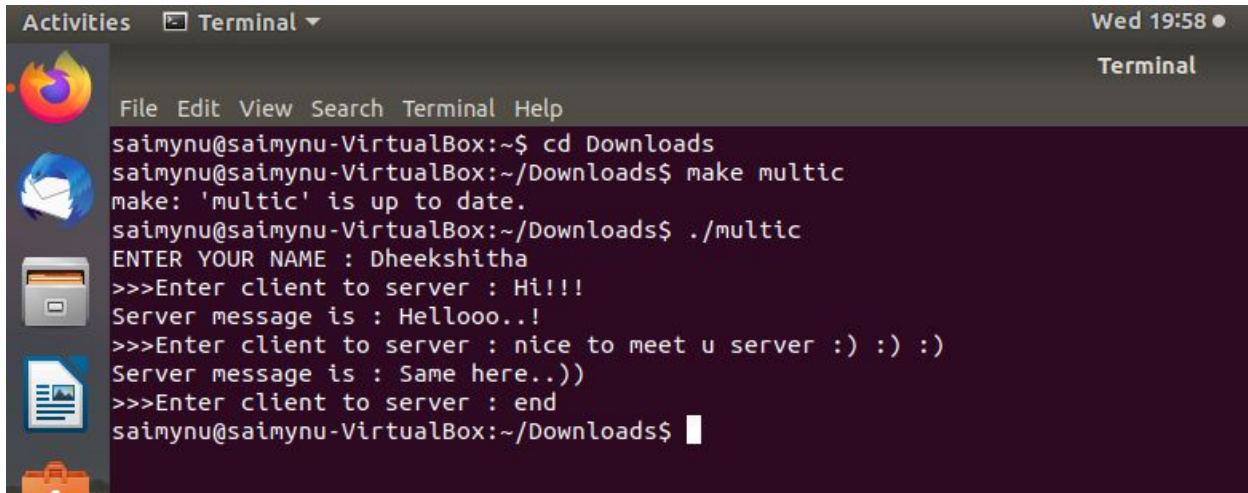
harini : hii
>>>Server to harini : Hey
harini : kaise ho aap server
>>>Server to harini : Teek hu..!Aur aap
Disconnected from connection6 : 157.46.114.111 with port 48340
Disconnected from connection4 : 103.232.131.194 with port 50394
```

CONNECTION 1: SATHWIK: PUBLICIP: 49.204.9.179

```
hpuser@boss: ~/Downloads
File Edit View Search Terminal Help

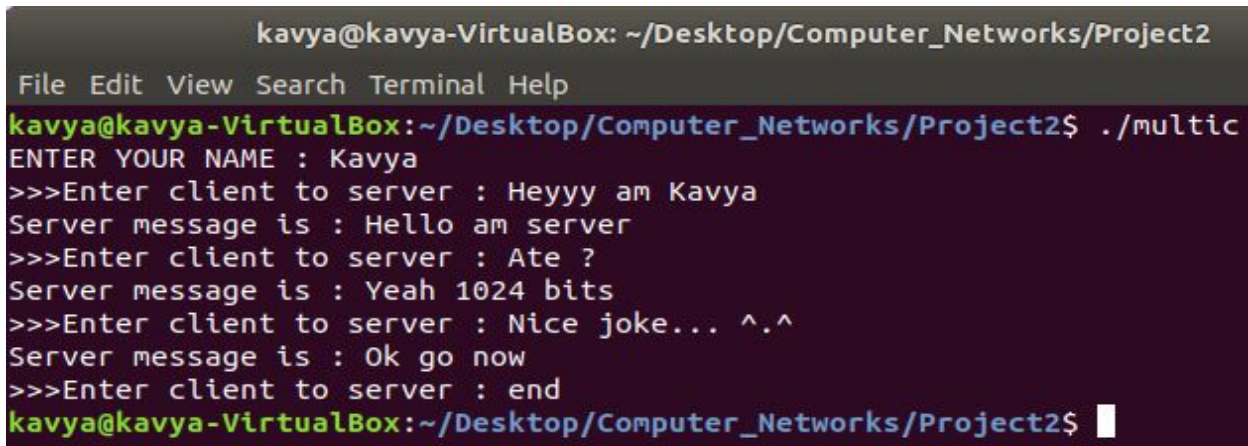
hpuser@boss:~/Downloads$ ./multic
ENTER YOUR NAME : sathwika
>>>Enter client to server : hello
Server message is : Hey guddu
>>>Enter client to server : how is ur semester going on??
Server message is : Donno
>>>Enter client to server : :(
Server message is : :)
>>>Enter client to server : bye server!!
Server message is : Thanks for leaving
>>>Enter client to server : end
hpuser@boss:~/Downloads$
```

CONNECTION 2: DHEEKSHITHA, PUBLIC IP: 223.228.93.135

A terminal window titled 'Terminal' with a menu bar (File, Edit, View, Search, Terminal, Help) and a sidebar with icons for Firefox, a mail client, a file manager, a document viewer, and a folder. The terminal shows a user named 'saimynu' in a 'VirtualBox' environment. The user navigates to the 'Downloads' directory and runs 'make multic'. The output indicates that 'multic' is up to date. The user then runs './multic', which prompts for a name. The user enters 'Dheekshitha'. The program then simulates a chat conversation where the client sends 'Hi!!!' and the server responds 'Hellooo..!'. The client then sends 'nice to meet u server :) :) :)' and the server responds 'Same here..)'. Finally, the client sends 'end' and the program returns to the shell prompt.

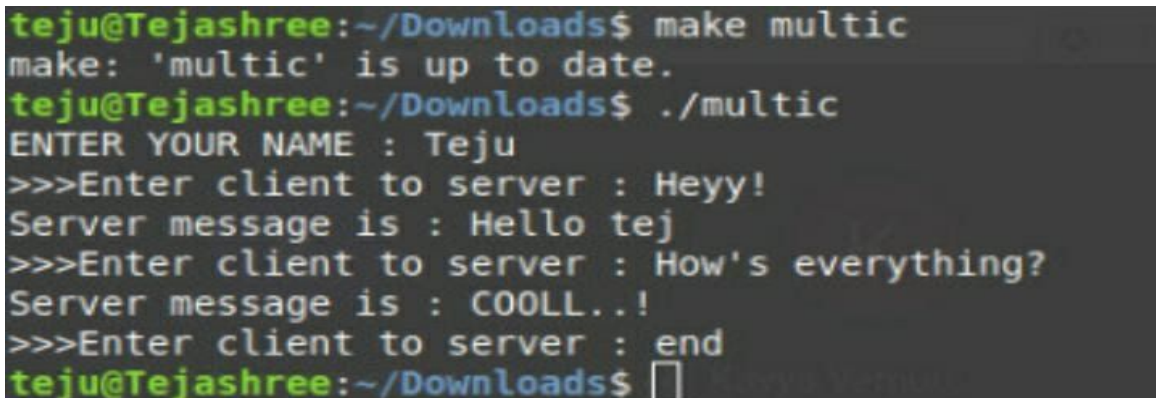
```
saimynu@saimynu-VirtualBox:~$ cd Downloads
saimynu@saimynu-VirtualBox:~/Downloads$ make multic
make: 'multic' is up to date.
saimynu@saimynu-VirtualBox:~/Downloads$ ./multic
ENTER YOUR NAME : Dheekshitha
>>>Enter client to server : Hi!!!
Server message is : Hellooo..!
>>>Enter client to server : nice to meet u server :) :) :)
Server message is : Same here..)
>>>Enter client to server : end
saimynu@saimynu-VirtualBox:~/Downloads$
```

CONNECTION 3: KAVYA, PUBLIC IP:202.62.86.30

A terminal window titled 'kavya@kavya-VirtualBox: ~/Desktop/Computer_Networks/Project2' with a menu bar (File, Edit, View, Search, Terminal, Help). The terminal shows a user named 'kavya' in a 'VirtualBox' environment. The user runs './multic', which prompts for a name. The user enters 'Kavya'. The program then simulates a chat conversation where the client sends 'Heyyy am Kavya' and the server responds 'Hello am server'. The client then sends 'Ate ?' and the server responds 'Yeah 1024 bits'. The client then sends 'Nice joke... ^.^' and the server responds 'Ok go now'. Finally, the client sends 'end' and the program returns to the shell prompt.

```
kavya@kavya-VirtualBox: ~/Desktop/Computer_Networks/Project2
File Edit View Search Terminal Help
kavya@kavya-VirtualBox:~/Desktop/Computer_Networks/Project2$ ./multic
ENTER YOUR NAME : Kavya
>>>Enter client to server : Heyyy am Kavya
Server message is : Hello am server
>>>Enter client to server : Ate ?
Server message is : Yeah 1024 bits
>>>Enter client to server : Nice joke... ^.^
Server message is : Ok go now
>>>Enter client to server : end
kavya@kavya-VirtualBox:~/Desktop/Computer_Networks/Project2$
```

CONNECTION 4: TejaShree, PUBLIC IP:103.232.131.194

A terminal window showing a user named 'teju' in a 'Tejashree' environment. The user runs 'make multic', which indicates 'multic' is up to date. The user then runs './multic', which prompts for a name. The user enters 'Teju'. The program then simulates a chat conversation where the client sends 'Heyy!' and the server responds 'Hello tej'. The client then sends 'How's everything?' and the server responds 'COOLL..!'. Finally, the client sends 'end' and the program returns to the shell prompt.

```
teju@Tejashree:~/Downloads$ make multic
make: 'multic' is up to date.
teju@Tejashree:~/Downloads$ ./multic
ENTER YOUR NAME : Teju
>>>Enter client to server : Heyy!
Server message is : Hello tej
>>>Enter client to server : How's everything?
Server message is : COOLL..!
>>>Enter client to server : end
teju@Tejashree:~/Downloads$
```

CONNECTION 5:SANJANA, PUBLIC IP:157.47.124.14

```
sanju@sanju:~/Documents$ ./multic
ENTER YOUR NAME : sanjana
>>>Enter client to server : Hello
Server message is : Hello to me:)
>>>Enter client to server : end
sanju@sanju:~/Documents$
```

CONNECTION 6:HARINI, PUBLIC IP:157.46.114.111

```
harini@Harini: ~/Desktop
File Edit View Search Terminal Help
harini@Harini:~/Desktop$ ./multic
ENTER YOUR NAME : Harini
>>>Enter client to server : hii
Server message is : Hey
>>>Enter client to server : kaise hai aap
Server message is : Teek hu..!Aur aap
>>>Enter client to server : end
harini@Harini:~/Desktop$
```

2) Develop a game , where multiuser participate in the game. Server has 5 questions with four options. if users are connected to the server, the server starts sending the question one by one with a timestamp reply of 1 minute. If the multiuser plays the game, then the winner is decided by the server based on the average minimum time taken by a client to reply to all answers. If a client gives a wrong reply to anyone of the answers, then the server sends a message to client "better luck next time" and terminates the connection of the client.

We developed a multi-threaded client-server chat program by using fork system call. Here clients are differentiated by IP ADDRESS and PORT NUMBER, also names are provided by the client at the start of the conversation.

Server sends 5 questions one by one to the client.It notes the time at which it sends a question and the time at which it receives the answer.

If the client gives the wrong answer or the time difference is greater than 60 seconds, the server disconnects the client saying "BETTER LUCK NEXT TIME" along with the reason for terminating the connection.

USAGE OF FILE I/O:

As per our knowledge of forking till now in the Operating systems course, we still don't know how to pass the changes(piping) made by the child process to the parent process.

So we simply stored the times noted by the server's each child process(thread) in the file using file i/o fprintf statements, and then accessed the data(times) from the file and printed times in the scoreboard.

Our score board contains id, name and time taken for each question along with total time. Comparing the total times of the clients who answers all 5 questions accurately.

Note: We don't calculate the total time of the answers given by clients who got terminated due to TIME UP and WRONG ANSWER.

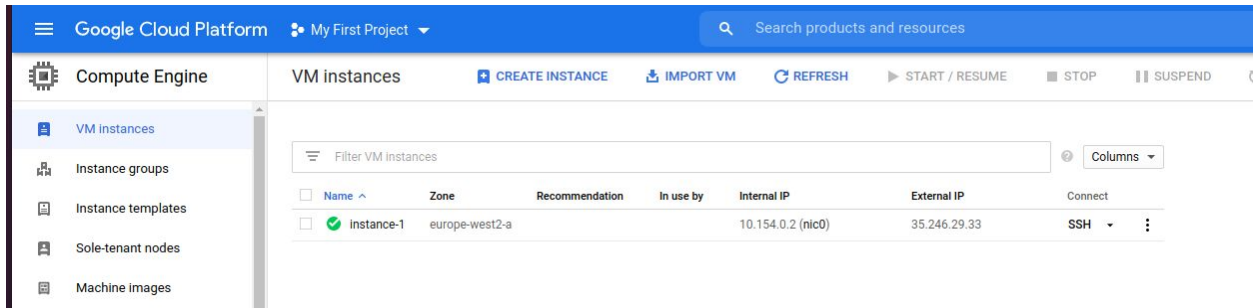
G CLOUD FOR HOSTING:

To connect to our server program from different networks, we used a public hosting method.

We hosted a Virtual Machine on google's infrastructure by using Compute engine API. We created a virtual instance(machine) of Ubuntu in Google cloud and transferred our server programs to the instance.

And we connected to the host/server file, with the public ip address of the virtual instance, i.e:"35.246.29.33".

OUR INSTANCE:



TERMINAL:

```
sanjanadara1701@instance-1: ~ - Google Chrome
ssh.cloud.google.com/projects/seraphic-plexus-289709/zones/europe-west2-a/instances/instance-1?authuser=0&hl=en_US&project...
Connected, host fingerprint: ssh-rsa 0 4F:5E:BD:7F:1C:42:A5:23:33:80:21:DC:C7:5D
:4F:2A:8D:EE:8B:E3:D6:F5:07:A6:D5:08:3A:F7:FA:C9:E0:8C
Welcome to Ubuntu 18.04.5 LTS (GNU/Linux 5.4.0-1024-gcp x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

System information as of Wed Sep 16 17:03:37 UTC 2020

System load:  0.0          Processes:    111
Usage of /:   17.8% of 9.52GB Users logged in: 1
Memory usage: 6%          IP address for ens4: 10.154.0.2
Swap usage:   0%

0 packages can be updated.
0 updates are security updates.

Last login: Wed Sep 16 15:59:02 2020 from 35.235.242.16
sanjanadara1701@instance-1:~$ ls
games  games.c  multis  multis.c  times.txt  total.txt
sanjanadara1701@instance-1:~$
```

OUTPUT:

SERVER SIDE(VM):

```
ssh.cloud.google.com/projects/seraphic-plexus-289709/zones/europe-west2-a/instances/instance-1?useAdminPro
make: 'games' is up to date.
sanjanadara1701@instance-1:~$ ./games
PRESS ENTER ---> TO ALLOW CLIENT
TYPE end ---> TO END THE GAME

Connection 1 accepted from : 223.238.67.2 with port 4644

PRESS ENTER ---> TO ALLOW CLIENT
TYPE end ---> TO END THE GAME

Connection 2 accepted from : 202.62.86.30 with port 58636

PRESS ENTER ---> TO ALLOW CLIENT
TYPE end ---> TO END THE GAME

Disconnected from connection 1 : 223.238.67.2 with port 4644

Connection 3 accepted from : 49.204.9.179 with port 58764

PRESS ENTER ---> TO ALLOW CLIENT
TYPE end ---> TO END THE GAME

Disconnected from connection 2 : 202.62.86.30 with port 58636

Disconnected from connection 3 : 49.204.9.179 with port 58764

Connection 4 accepted from : 157.46.114.111 with port 49314

PRESS ENTER ---> TO ALLOW CLIENT
TYPE end ---> TO END THE GAME

Connection 5 accepted from : 103.232.131.194 with port 50664

PRESS ENTER ---> TO ALLOW CLIENT
TYPE end ---> TO END THE GAME

Disconnected from connection 4 : 157.46.114.111 with port 49314

Connection 6 accepted from : 157.47.124.14 with port 51553

PRESS ENTER ---> TO ALLOW CLIENT
TYPE end ---> TO END THE GAME
Disconnected from connection 5 : 103.232.131.194 with port 50664

Disconnected from connection 6 : 157.47.124.14 with port 51553

Connection 7 accepted from : 157.47.124.14 with port 51569

PRESS ENTER ---> TO ALLOW CLIENT
TYPE end ---> TO END THE GAME
Disconnected from connection 7 : 157.47.124.14 with port 51569

end
SCORE BOARD
ID      NAMES      t1      t2      t3      t4      t5      Total-Time
-----
1       Mynu           4        2        7        4       14       31
2       Kavya           4        3        2        5        3       17
3       Sathwika       5        6        4        3        5        0
4       Harini         12       4        4        5       12       37
5       Teju           21       4        0        0        0        -
6       Sanju           4        0        0        0        0        -
7       Sanjana

WINNER DETAILS ARE :
TOTALTIME      ID      CLIENT-NAME
-----
17             2      Kavya
```

PARTICIPANT 1 : DHEEKSHITHA, PUBLIC IP: 223.228.93.135

```
Terminal
File Edit View Search Terminal Help
saimynu@saimynu-VirtualBox:~/Downloads$ ./gamec
YOUR SWEET NAME PLEASE >>>Mynu

ANSWER THE FOLLOWING MULTIPLE CHOICE QUESTIONS....SINGLE ANSWER IS ALLOWED[A|B|C|D]

QUESTION 1 : WHO IS CEO OF GOOGLE ?
A)TIM COOK
B)SUNDHAR PICHAI
C)SATYA NADELLA
D)JEFF BEZOS

>>>PLEASE ENTER YOUR ANSWER HERE : B

QUESTION 2 : EVALUATE THE GIVEN EXPRESSION :2+2*2-2%2 = ?
A)4
B)5
C)2
D)3

>>>PLEASE ENTER YOUR ANSWER HERE : B

QUESTION 3 : NAME THE LEAD MALE ACTOR OF BAAHUBALI?
A)SATHYARAJ
B)NASSAR
C)PRABHAS
D)RANA

>>>PLEASE ENTER YOUR ANSWER HERE : C

QUESTION 4 : WHICH COURSE DOES THIS PROJECT BELONGS TO?
A)OS
B)VLSI
C)DBMS
D)COMPUTER NETWORKS

>>>PLEASE ENTER YOUR ANSWER HERE : D

QUESTION 5 : WHAT IS THE NAME OF GIRLS HOSTEL OF IIITDM?
A)ASHOKA
B)ASHWATHA
C)JASMINE
D)LOTUS

>>>PLEASE ENTER YOUR ANSWER HERE : C

CONGRATULATIONS-YOU ANSWERED CORRECTLY!!
PLEASE WAIT FOR THE RESULTS!!
saimynu@saimynu-VirtualBox:~/Downloads$
```


PARTICIPANT 2 : KAVYA, PUBLIC IP:202.62.86.30

```
kavya@kavya-VirtualBox:~/Desktop/Computer_Networks/Project2s ./ganec
YOUR SWEET NAME PLEASE >>>Kavya

ANSWER THE FOLLOWING MULTIPLE CHOICE QUESTIONS....SINGLE ANSWER IS ALLOWED[A|B|C|D]

QUESTION 1 : WHO IS CEO OF GOOGLE ?
A)TIM COOK
B)SUNDHAR PICHAI
C)SATYA NADELLA
D)JEFF BEZOS

>>>PLEASE ENTER YOUR ANSWER HERE : B

QUESTION 2 : EVALUATE THE GIVEN EXPRESSION :2+2*2-2%2 = ?
A)4
B)5
C)2
D)3

>>>PLEASE ENTER YOUR ANSWER HERE : B

QUESTION 3 : NAME THE LEAD MALE ACTOR OF BAAHUBALI?
A)SATHYARAJ
B)NASSAR
C)PRABHAS
D)RANA

>>>PLEASE ENTER YOUR ANSWER HERE : C

QUESTION 4 : WHICH COURSE DOES THIS PROJECT BELONGS TO?
A)OS
B)VLSI
C)DBMS
D)COMPUTER NETWORKS

>>>PLEASE ENTER YOUR ANSWER HERE : D

QUESTION 5 : WHAT IS THE NAME OF GIRLS HOSTEL OF IIITDM?
A)ASHOKA
B)ASWATHA
C)JASMINE
D)LOTUS

>>>PLEASE ENTER YOUR ANSWER HERE : C

CONGRATULATIONS-YOU ANSWERED CORRECTLY!!
PLEASE WAIT FOR THE RESULTS!!
```

PARTICIPANT 3: SATHWIK, PUBLIC IP: 49.204.9.179

```
PLEASE WAIT FOR THE RESULTS!!
hpuser@boss: ~/Downloads$ ./gamec
YOUR SWEET NAME PLEASE >>>Sathwika

ANSWER THE FOLLOWING MULTIPLE CHOICE QUESTIONS....SINGLE ANSWER IS ALLOWED[A|B|C|D]

QUESTION 1 : WHO IS CEO OF GOOGLE ?
A)TIM COOK
B)SUNDHAR PICHAI
C)SATYA NADELLA
D)JEFF BEZOS

>>>PLEASE ENTER YOUR ANSWER HERE : B

QUESTION 2 : EVALUATE THE GIVEN EXPRESSION :  $2+2*2-2\%2 = ?$ 
A)4
B)5
C)2
D)3

>>>PLEASE ENTER YOUR ANSWER HERE : B

QUESTION 3 : NAME THE LEAD MALE ACTOR OF BAAHUBALI?
A)SATHYARAJ
B)NASSAR
C)PRABHAS
D)RANA

>>>PLEASE ENTER YOUR ANSWER HERE : C

QUESTION 4 : WHICH COURSE DOES THIS PROJECT BELONGS TO?
A)OS
B)VLSI
C)DBMS
D)COMPUTER NETWORKS

>>>PLEASE ENTER YOUR ANSWER HERE : D

QUESTION 5 : WHAT IS THE NAME OF GIRLS HOSTEL OF IIITDM?
A)ASHOKA
B)ASWATHA
C)JASMINE
D)LOTUS

>>>PLEASE ENTER YOUR ANSWER HERE : D

WRONG ANSWER!! BETTER LUCK NEXT TIME
```

PARTICIPANT 4 : HARINI, PUBLIC IP:157.46.114.111

```
File Edit View Search Terminal Help
harini@Harini:~$ cd Downloads
harini@Harini:~/Downloads$ ./gamec
YOUR SWEET NAME PLEASE >>>Harini

ANSWER THE FOLLOWING MULTIPLE CHOICE QUESTIONS....SINGLE ANSWER IS ALLOWED[A|B|C|D]

QUESTION 1 : WHO IS CEO OF GOOGLE ?
A)TIM COOK
B)SUNDHAR PICHAI
C)SATYA NADELLA
D)JEFF BEZOS

>>>PLEASE ENTER YOUR ANSWER HERE : B

QUESTION 2 : EVALUATE THE GIVEN EXPRESSION :2+2*2-2%2 = ?
A)4
B)5
C)2
D)3

>>>PLEASE ENTER YOUR ANSWER HERE : B

QUESTION 3 : NAME THE LEAD MALE ACTOR OF BAAHUBALI?
A)SATHYARAJ
B)NASSAR
C)PRABHAS
D)RANA

>>>PLEASE ENTER YOUR ANSWER HERE : C

QUESTION 4 : WHICH COURSE DOES THIS PROJECT BELONGS TO?
A)OS
B)VLSI
C)DBMS
D)COMPUTER NETWORKS

>>>PLEASE ENTER YOUR ANSWER HERE : D

QUESTION 5 : WHAT IS THE NAME OF GIRLS HOSTEL OF IIITDM?
A)ASHOKA
B)ASWATHA
C)JASMINE
D)LOTUS

>>>PLEASE ENTER YOUR ANSWER HERE : C

CONGRATULATIONS-YOU ANSWERED CORRECTLY!!
PLEASE WAIT FOR THE RESULTS!!
harini@Harini:~/Downloads$
```

PARTICIPANT 5 : TEJU, PUBLIC IP:103.232.131.194

```
File Edit View Search Terminal Help
teju@Tejashree:~/Downloads$ ./gamec
YOUR SWEET NAME PLEASE >>>Teju

ANSWER THE FOLLOWING MULTIPLE CHOICE QUESTIONS....SINGLE ANSWER IS ALLOWED[A|B|C|D]

QUESTION 1 : WHO IS CEO OF GOOGLE ?
A)TIM COOK
B)SUNDHAR PICHAI
C)SATYA NADELLA
D)JEFF BEZOS

>>>PLEASE ENTER YOUR ANSWER HERE : B

QUESTION 2 : EVALUATE THE GIVEN EXPRESSION :2+2*2-2%2 = ?
A)4
B)5
C)2
D)3

>>>PLEASE ENTER YOUR ANSWER HERE : B

QUESTION 3 : NAME THE LEAD MALE ACTOR OF BAAHUBALI?
A)SATHYARAJ
B)NASSAR
C)PRABHAS
D)RANA

>>>PLEASE ENTER YOUR ANSWER HERE : C

QUESTION 4 : WHICH COURSE DOES THIS PROJECT BELONGS TO?
A)OS
B)VLSI
C)DBMS
D)COMPUTER NETWORKS

>>>PLEASE ENTER YOUR ANSWER HERE : D

QUESTION 5 : WHAT IS THE NAME OF GIRLS HOSTEL OF IIITDM?
A)ASHOKA
B)ASWATHA
C)JASMINE
D)LOTUS

>>>PLEASE ENTER YOUR ANSWER HERE : C

CONGRATULATIONS-YOU ANSWERED CORRECTLY!!
PLEASE WAIT FOR THE RESULTS!!
teju@Tejashree:~/Downloads$
```

PARTICIPANT 6 : SANJU, PUBLIC IP: 157.47.124.14

```
sanju@sanju:~/Documents$ ./gamec
YOUR SWEET NAME PLEASE >>>sanju

ANSWER THE FOLLOWING MULTIPLE CHOICE QUESTIONS....SINGLE ANSWER IS ALLOWED[A|B|C|D]

QUESTION 1 : WHO IS CEO OF GOOGLE ?
A)TIM COOK
B)SUNDHAR PICHAI
C)SATYA NADELLA
D)JEFF BEZOS

>>>PLEASE ENTER YOUR ANSWER HERE : B

QUESTION 2 : EVALUATE THE GIVEN EXPRESSION :2+2*2-2%2 = ?
A)4
B)5
C)2
D)3

>>>PLEASE ENTER YOUR ANSWER HERE : B

QUESTION 3 : NAME THE LEAD MALE ACTOR OF BAAHUBALI?
A)SATHYARAJ
B)NASSAR
C)PRABHAS
D)RANA

>>>PLEASE ENTER YOUR ANSWER HERE : C

TIMEUP!! BETTER LUCK NEXT TIME
sanju@sanju:~/Documents$
```

PARTICIPANT 7:SANJANA,PUBLIC IP: 157.47.124.14

```
sanju@sanju: ~/Documents
sanju@sanju:~/Documents$ ./gamec
YOUR SWEET NAME PLEASE >>>Sanjana

ANSWER THE FOLLOWING MULTIPLE CHOICE QUESTIONS....SINGLE ANSWER IS ALLOWED[A|B|C|D]

QUESTION 1 : WHO IS CEO OF GOOGLE ?
A)TIM COOK
B)SUNDHAR PICHAI
C)SATYA NADELLA
D)JEFF BEZOS

>>>PLEASE ENTER YOUR ANSWER HERE : B

QUESTION 2 : EVALUATE THE GIVEN EXPRESSION :2+2*2-2%2 = ?
A)4
B)5
C)2
D)3

>>>PLEASE ENTER YOUR ANSWER HERE : B

TIMEUP!! BETTER LUCK NEXT TIME
sanju@sanju:~/Documents$
```


SOCKET COMMUNICATION API IN C :

Socket()-Endpoint for communication

It creates a socket. It returns a socket description, similar to a file handler.

int socket (domain, type, protocol);

- domain: communication domain e.g., AF_INET (IPv4 protocol) , AF_INET6 (IPv6 protocol)
- type: communication type
 - SOCK_STREAM: TCP(reliable, connection oriented)
 - SOCK_DGRAM: UDP(unreliable, connectionless)
- protocol: communication protocol. Protocol value for Internet Protocol(IP), which is 0.

Bind()-assign a unique telephone number

It binds the socket to the address and port number specified in addr(custom data structure).

int bind (int sockfd , const struct sockaddr * addr , socklen_t addrlen);

- sockfd: It stores the socket description.
- addr: It is the structure that stores the address and port number to which the socket must bind to.
- addrlen: It is the size of the aforementioned structure.

Listen()-Wait for a caller

It puts the server socket in a passive mode, where it waits for the client to approach the server to make a connection.

int listen (int sockfd , int backlog);

- sockfd: It stores the socket description.
- backlog: It is the maximum number of clients that can wait in the queue for connection.

Connect()-Dial a number

It sends a connection request to the server.

int connect (int sockfd , struct sockaddr * addr , socklen_t addrlen);

- sockfd: It stores the socket description.
- addr: It is the structure that stores the address and port number of the client.
- addrlen: It is the size of the aforementioned structure.

Accept()-Receive a call

It extracts the first client connection in the queue.

int new_socket= accept (int sockfd , struct sockaddr * addr , socklen_t * addrlen);

- new_socket: It stores the socket description of the incoming client.
- sockfd: It stores the server socket description.
- addr: It is the structure that stores the address and port number to which the socket must accept.
- addrlen: It is the size of the aforementioned structure.

Send(),Recv()-Talk

It sends a message to another socket.

```
int send ( int sockfd , void * message , int size , int flags );
```

- sockfd: It stores the socket description.
- message: It is a pointer to the message that needs to be received. It can be any datatype, or a custom structure.
- size: It is the size of the buffer.
- flags: It is used to send any flags.

Close()-hang up

```
close(int sockfd);
```

- If successful it returns 0 and if unsuccessful it returns -1