1. Write a Program to design Chat Application using Client and Server Approach.

Aim: To perform chat application using client and server approach

Program:

i.Client Code:

```
import java.io.*;

import java.net.*;

try{

        String ip = IP.getText();

        Integer port = Integer.parseInt(Port.getText());

        Socket s = new Socket(ip,port);

        DataInputStream dis = new DataInputStream(s.getInputStream());

        DataOutputStream dos = new DataOutputStream(s.getOutputStream());

        String str = Cmessage.getText();

        dos.writeUTF(str);

        String newStr = dis.readUTF();

        Cmessage.append("\n"+newStr);

        s.close();

      }

      catch(Exception e){

        e.printStackTrace();

      }
```

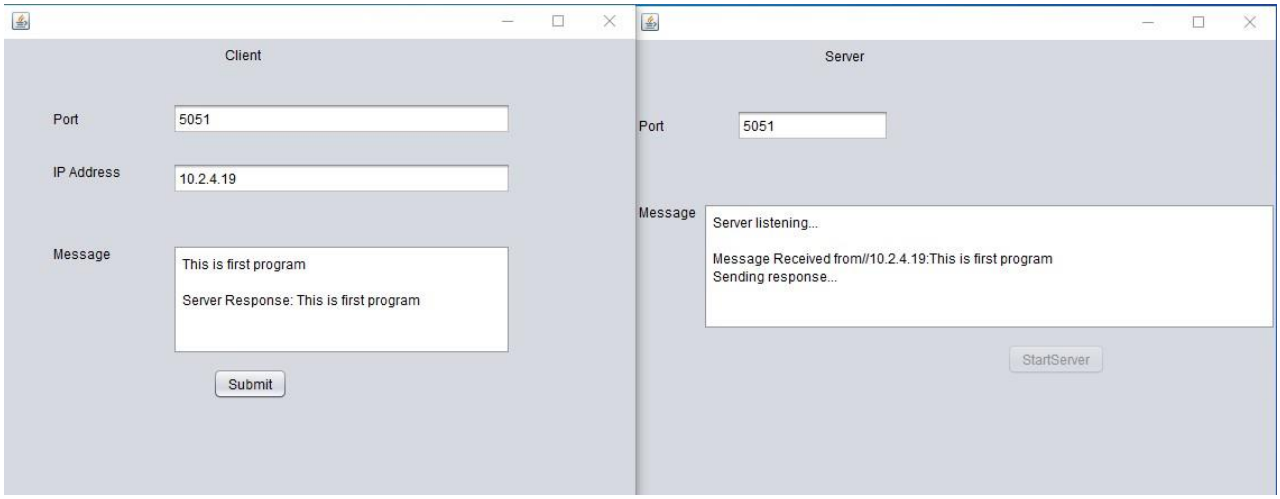
ii.Server Code:

```
import java.io.*;

import java.net.*;

public class Server extends javax.swing.JFrame implements Runnable {

public void run(){

    try{
```

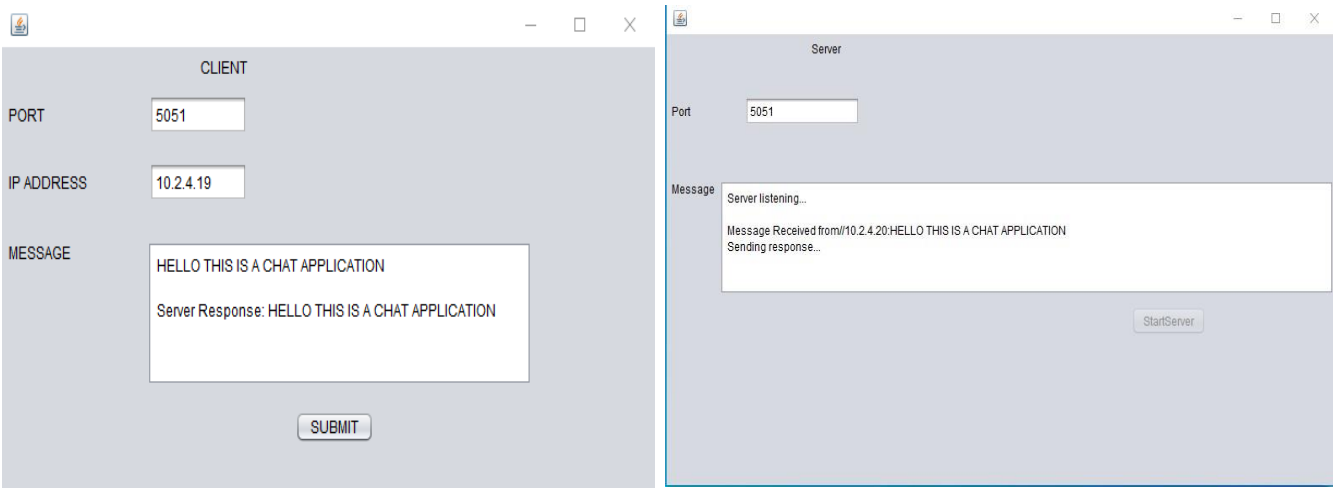
```
        Integer port = Integer.parseInt(SPort.getText());
        ServerSocket ss = new ServerSocket(port);
        while(true){
            Socket s = ss.accept();
            DataInputStream dis = new DataInputStream(s.getInputStream());
            DataOutputStream dos = new DataOutputStream(s.getOutputStream());
            String str = dis.readUTF();
            Smessage.append("\nMessage Received
from/"+s.getInetAddress().toString()+":"+str+"\nSending response...\n");
            dos.writeUTF("\nServer Response: "+str);
            s.close();
        }
    }
    catch(Exception e){
        e.printStackTrace();
    }
  }
private void ReceiveActionPerformed(java.awt.event.ActionEvent evt) {
            Thread t = new Thread(this,"t1");
            t.start();
            Smessage.append("Server listening...\n");
            Receive.setEnabled(false);// TODO add your handling code here:
  }
```

Output: Execution Steps

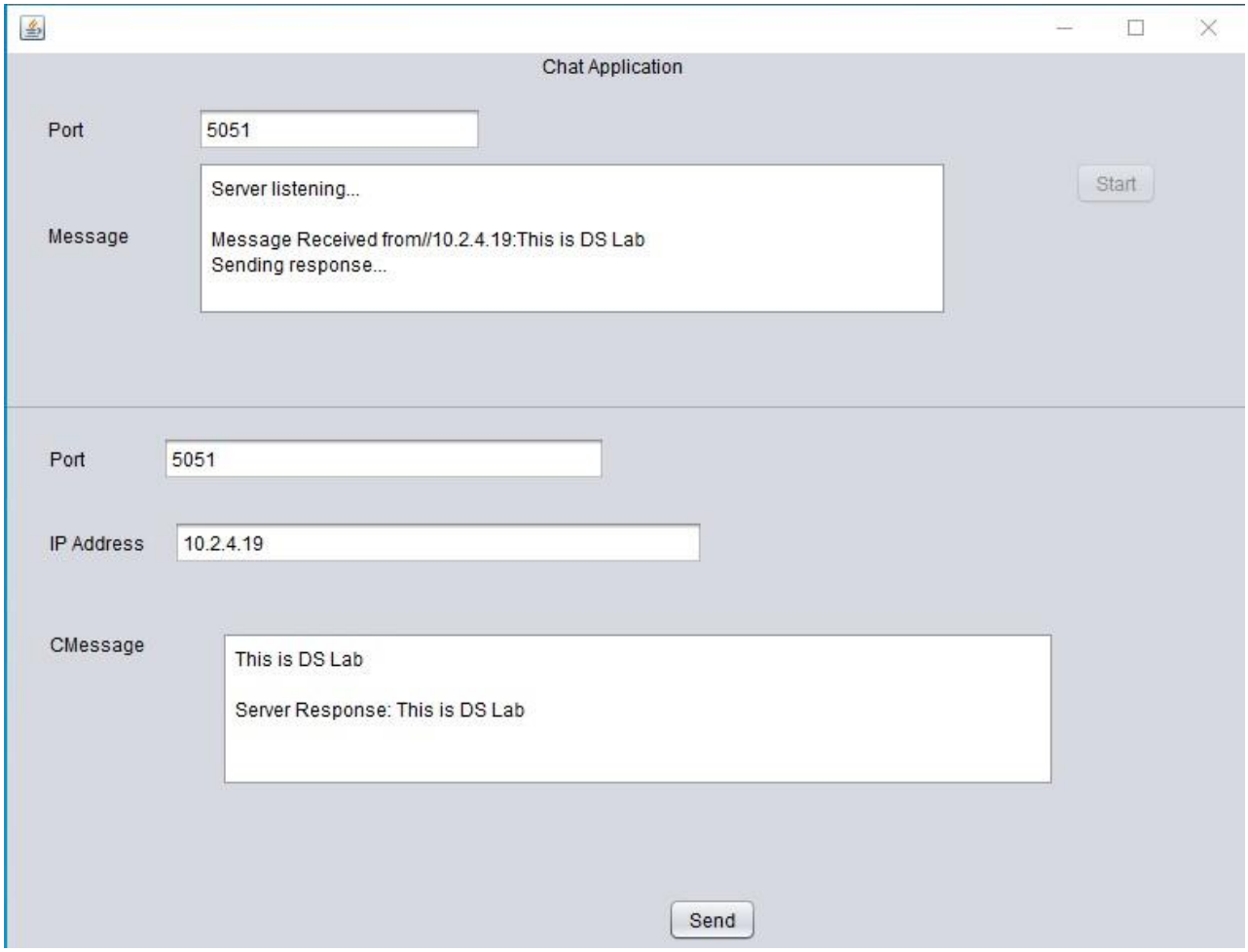
a. Executing from same system:



b. Executing from remote system:



c. Executing from local machine(Single Framework):



2. Write a Program to demonstrate Domain Name Server.

Aim: To demonstrate Name Server using Domain Name Server.

Program:

i.Client Code:

```
import java.io.*;

import java.net.*;

private void SubmitActionPerformed(java.awt.event.ActionEvent evt) {

    try{

        String ip =IP.getText();

        int port =Integer.parseInt(CPort.getText());

        Socket s=new Socket(ip,port);

        DataInputStream dis=new DataInputStream(s.getInputStream());

        DataOutputStream dos=new DataOutputStream(s.getOutputStream());

        String domain=DName.getText();

        dos.writeUTF(domain);

        String response=dis.readUTF();

        Message.append(" "+response+"\n");

        s.close();

    }

    catch(Exception e)

      {

        e.printStackTrace();

      }
```

ii.Server Code:

```
import java.io.*;

import java.net.*;

import java.util.*;
```

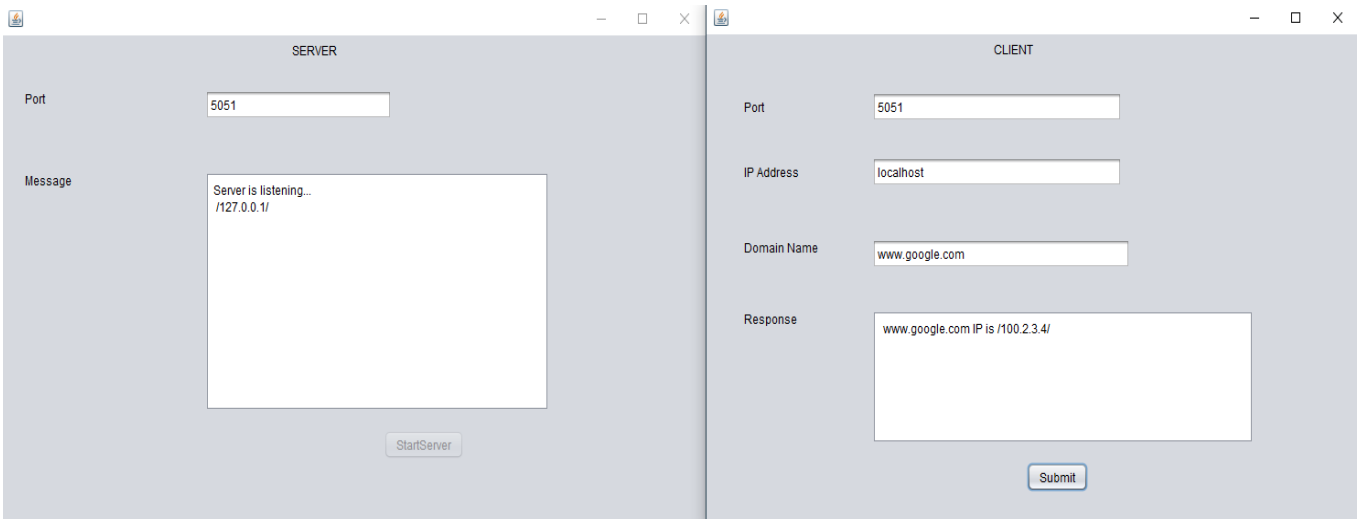
```
public class dnsserver extends javax.swing.JFrame implements Runnable {
   public void run()
   {
      try{
      int sPort=Integer.parseInt(SPort.getText());
      ServerSocket ss=new ServerSocket(sPort);
      //binded server socket - listens for connections
       while(true)
       {
          Socket s=ss.accept();
      //client's request has come; connection is established
                        /* Getting I/O Streams */
          DataInputStream dis=new DataInputStream(s.getInputStream());
          DataOutputStream dos=new DataOutputStream(s.getOutputStream());
          //Get the request
          String req=dis.readUTF();
            Smessage.append(" " +s.getInetAddress().toString()+"/");
 //displaying from which client what domain request is coming
          /* READING FROM FILE */
          try{
               BufferedReader br=new BufferedReader(new InputStreamReader(new
FileInputStream("DNS.txt")));
               String fInput=br.readLine();
               int flag=0;
               while(fInput!=null)
               {
                  StringTokenizer stk=new StringTokenizer(fInput); //tokens
                  String dname=stk.nextToken();
```

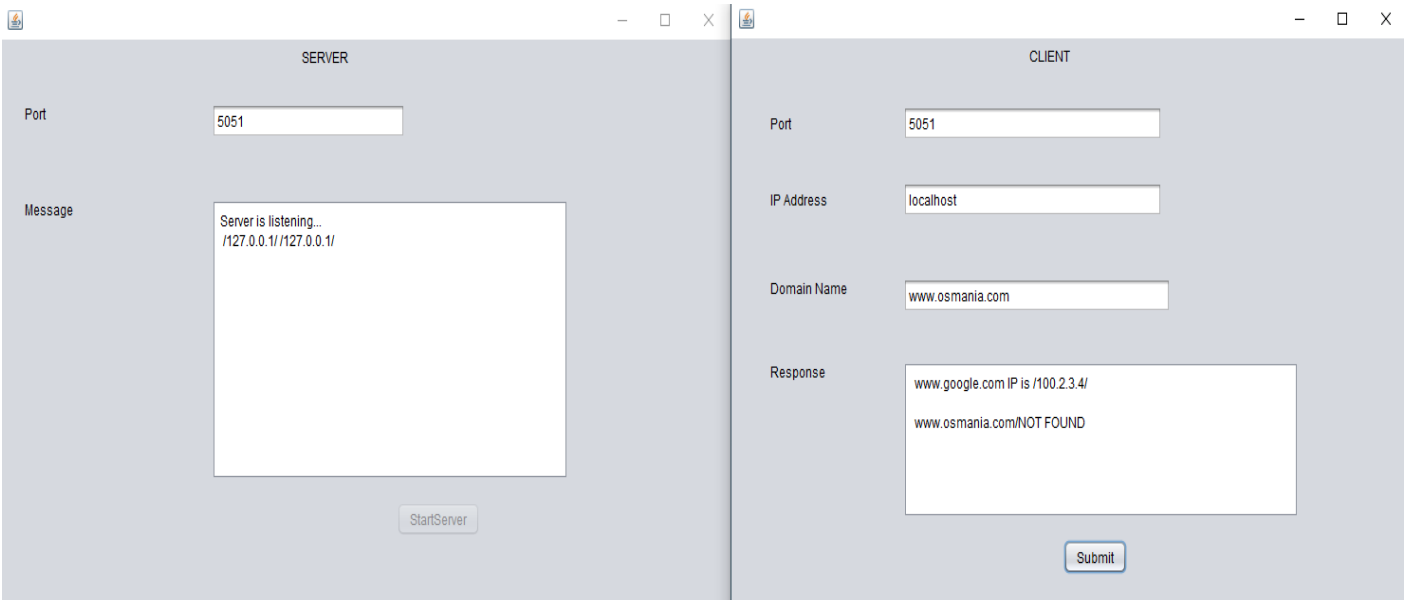
```
                String dIP=stk.nextToken();
                if(req.equals(dname))
                {
                    dos.writeUTF(dname+" " +"IP is "+"/"+dIP+"/"+"\n");
                    flag=1;
                }
                fInput=br.readLine();
            }
            if(flag==0)
                dos.writeUTF(req+"/NOT FOUND");
        }
        catch(Exception e)
        {
            e.printStackTrace();
        }
    }
}
catch(Exception e)
{
    e.printStackTrace();
}
}
private void StartActionPerformed(java.awt.event.ActionEvent evt) {
    // TODO add your handling code here:
    Thread t=new Thread(this,"ns");
    t.start();
    Start.setEnabled(false);
```

```
        Smessage.append("Server is listening...\n");
    }
```

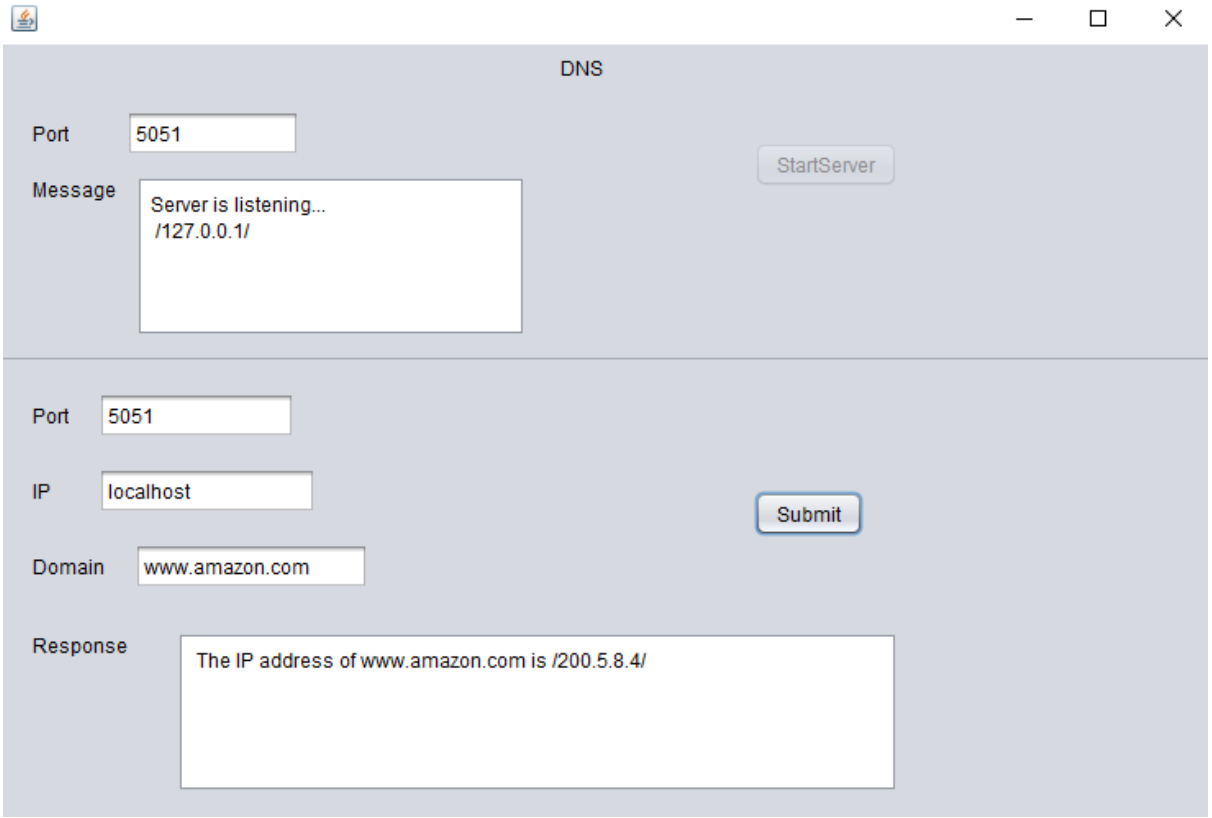
Output:

a. DNS using Two Frameworks

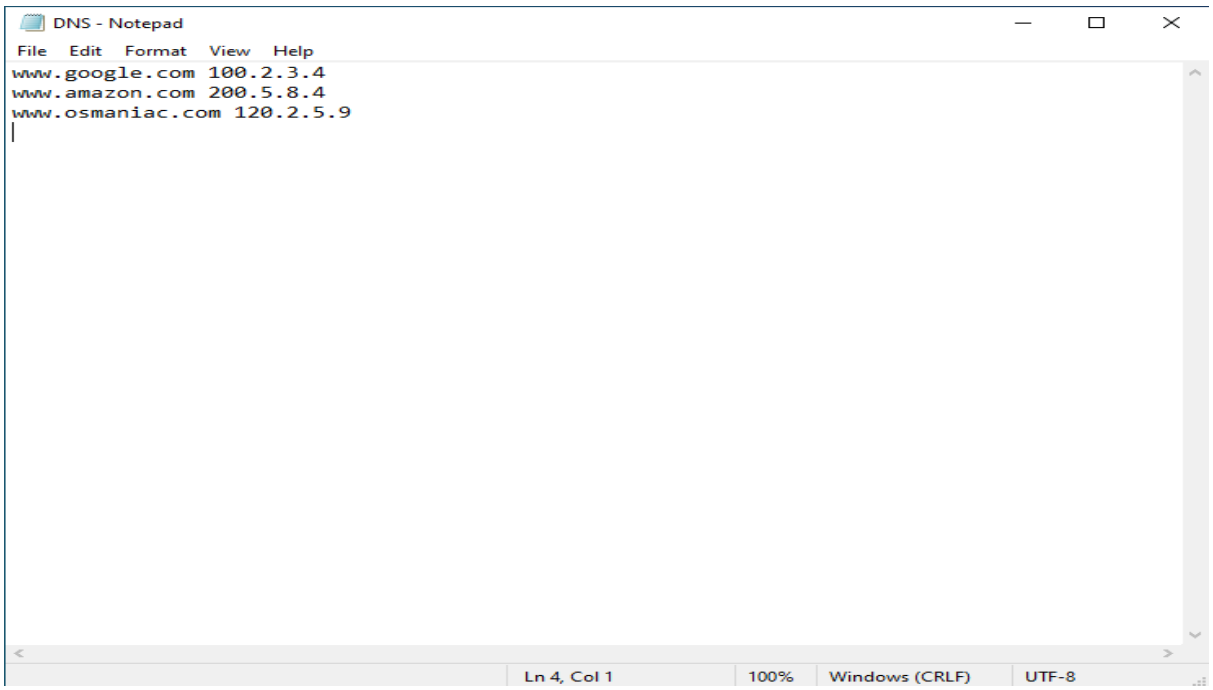




b. <u>DNS using Single Framework</u>



Input File:



3. Write a Program to demonstrate Chat Server bulletin.

Aim: To perform Chat Server Bulletin

Program:

Client Code:

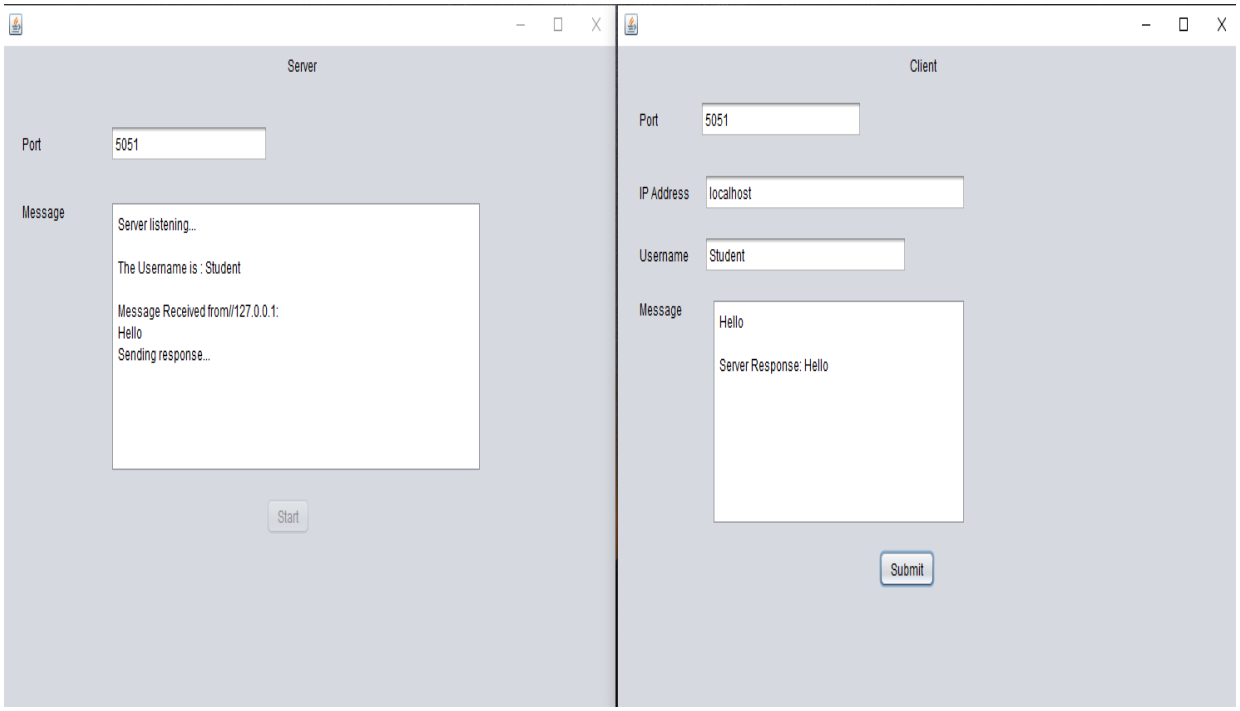
```
private void SubmitActionPerformed(java.awt.event.ActionEvent evt) {
    try{
        String ip = IP.getText();
        Integer port = Integer.parseInt(CPort.getText());
        Socket s = new Socket(ip,port);
        DataInputStream dis = new DataInputStream(s.getInputStream());
        DataOutputStream dos = new DataOutputStream(s.getOutputStream());
        String st = Username.getText();
        dos.writeUTF(st);
        String str = CMessage.getText();
        dos.writeUTF(str);
        String newStr = dis.readUTF();
        CMessage.append("\n"+newStr);
        s.close();
      }
      catch(Exception e){
        e.printStackTrace();
      }     // TODO add your handling code here:
  }
```

Server Code:

```
public class Server extends javax.swing.JFrame implements Runnable {
  public void run(){
    try{
```

```
        Integer port = Integer.parseInt(SPort.getText());
        ServerSocket ss = new ServerSocket(port);
        while(true){
            Socket s = ss.accept();
            DataInputStream dis = new DataInputStream(s.getInputStream());
            DataOutputStream dos = new DataOutputStream(s.getOutputStream());
            String st = dis.readUTF();
            String str = dis.readUTF();
            SMessage.append("\nThe Username is : "+st+"\n");
            SMessage.append("\nMessage Received
from/"+s.getInetAddress().toString()+":\n"+str+"\nSending response...\n");
            dos.writeUTF("\nServer Response: "+str);
            s.close();
        }
    }
    catch(Exception e){
        e.printStackTrace();
    }
  }
private void StartActionPerformed(java.awt.event.ActionEvent evt) {
            Thread t = new Thread(this,"t1");
            t.start();
            SMessage.append("Server listening...\n");
            Start.setEnabled(false);
    // TODO add your handling code here:
  }
```

Output:


Server
Port
5051
Message
Server listening...
The Username is : Student
Message Received from//127.0.0.1:
Hello
Sending response...
Start
Client
Port
5051
IP Address
localhost
Username
Student
Message
Hello
Server Response: Hello
Submit

4. Write a Program to perform FTP Upload.

Aim: To perform FTP Upload.

Program:

FtpUpload:

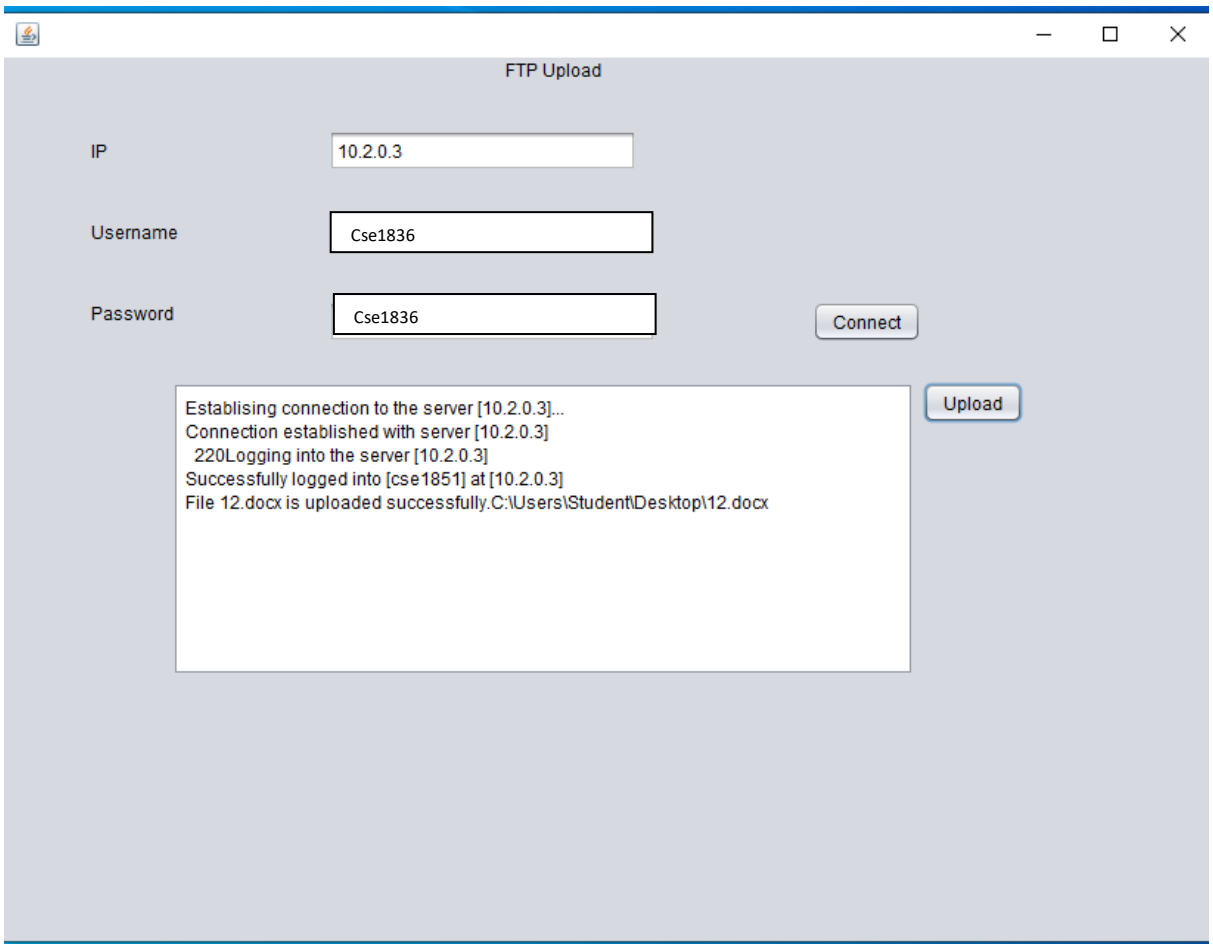
```
import java.io.*;

import java.util.*;

import org.apache.commons.net.ftp.*;

import org.apache.commons.net.ftp.FTPClient;

import org.apache.commons.net.ftp.FTPReply;

import javax.swing.*; //will have to search all classes of swing package. takes time

import javax.swing.SwingUtilities; //saves search. immediate reference

import javax.swing.filechooser.*; //for file dialog for upload/download

public class ftpUpload extends javax.swing.JFrame {

        private void btnConnectActionPerformed(java.awt.event.ActionEvent evt) {

       try{

            String IP=txtIP.getText();  //GET IP

            FTPClient ftpc=new FTPClient();  //CREATE CLIENT

            txtAC.append("Establising connection to the server ["+IP+"]...\n");

            ftpc.connect(IP);  //CONNECT WITH SERVER

            int reply=ftpc.getReplyCode();

    //to check the status of the connection

            //     Positive Completion reply: the requested action has been successfully     completed.
A new request may be initiated.

            if(FTPReply.isPositiveCompletion(reply))

              txtAC.append("Connection established with server ["+IP+"]\n"+"  "+reply);//220
        Service ready for new user.

            else

              txtAC.append("Connection failed with the server ["+IP+"]\n");
```

```
            String uname=txtUN.getText();  //GET USERNAME
            String pwd=txtPW.getText();     //GET PASSWORD
            txtAC.append("Logging into the server ["+IP+"]\n");
            if(ftpc.login(uname,pwd))
               txtAC.append("Successfully logged into ["+uname+"] at ["+IP+"]\n");
            else
               txtAC.append("Unable to login to ["+uname+"] at ["+IP+"]\n");
            //txtAC.append("Disconnecting from the server...\n");
            ftpc.disconnect();
//if client is idle for long then server disconnects and other operations fail. That is why disconnected here.
         }
      catch(Exception e)
      {
         e.printStackTrace();
      }
   // TODO add your handling code here:
   }
private void btnuploadActionPerformed(java.awt.event.ActionEvent evt) {
      String fileName = "";
      String fileAbsName = "";
      JFileChooser fc=new JFileChooser();//JFileChooser is a easy and an effective way to prompt the user to choose a file or a directory
      int returnVal = fc.showOpenDialog(ftpUpload.this);
      if (returnVal == JFileChooser.APPROVE_OPTION) //Approve option: returns yes or ok
      {
            File file = fc.getSelectedFile();
            fileAbsName = file.getAbsolutePath();
```

```
        fileName = file.getName();
    }
        try
    {
      String ServerIP = txtIP.getText();
      FTPClient f = new FTPClient();
      f.connect(ServerIP);
      String user = txtUN.getText();
      String passwd = txtPW.getText();
      f.login(user, passwd);
      File firstLocalFile = new File(fileAbsName);
      String firstRemoteFile = fileName;
      InputStream inputStream = new FileInputStream(firstLocalFile);
      boolean done = f.storeFile(firstRemoteFile, inputStream);
      inputStream.close();
      if (done)
        txtAC.append("File "+ fileName +" is uploaded successfully."+fileAbsName);
      else
        txtAC.append("File "+ fileName +" cannot be uploaded.");
      f.disconnect();
    }
    catch (Exception ex)
    {
      ex.printStackTrace();
    }
    // TODO add your handling code here:
  }
```

```
public static void main(String args[]) {
    java.awt.EventQueue.invokeLater(new Runnable() {
      public void run() {
        new ftpc1().setVisible(true);
      }
    });
}
```

Output:



5. Write a Program to perform FTP Download.

Aim: To perform FTP Download

Program:

```
import java.io.*;

import java.util.*;

import org.apache.commons.net.ftp.*;

import org.apache.commons.net.ftp.FTPClient;

import org.apache.commons.net.ftp.FTPReply;

import javax.swing.*; //will have to search all classes of swing package. takes time

import javax.swing.SwingUtilities; //saves search. immediate reference

import javax.swing.filechooser.*; //for file dialog for upload/download

public class ftpDownload extends javax.swing.JFrame {

private void btnConnectActionPerformed(java.awt.event.ActionEvent evt) {

 try{

        String IP=txtIP.getText();  //GET IP

        FTPClient ftpc=new FTPClient();  //CREATE CLIENT

        txtAC.append("Establising connection to the server ["+IP+"]...\n");

        ftpc.connect(IP);  //CONNECT WITH SERVER

        int reply=ftpc.getReplyCode();

//to check the status of the connection

        //          Positive Completion reply: the requested action has been successfully     completed.
A new request may be initiated.

        if(FTPReply.isPositiveCompletion(reply))

           txtAC.append("Connection established with server ["+IP+"]\n"+"  "+reply);//220
          Service ready for new user.

        else

           txtAC.append("Connection failed with the server ["+IP+"]\n");

        String uname=txtUN.getText();  //GET USERNAME
```

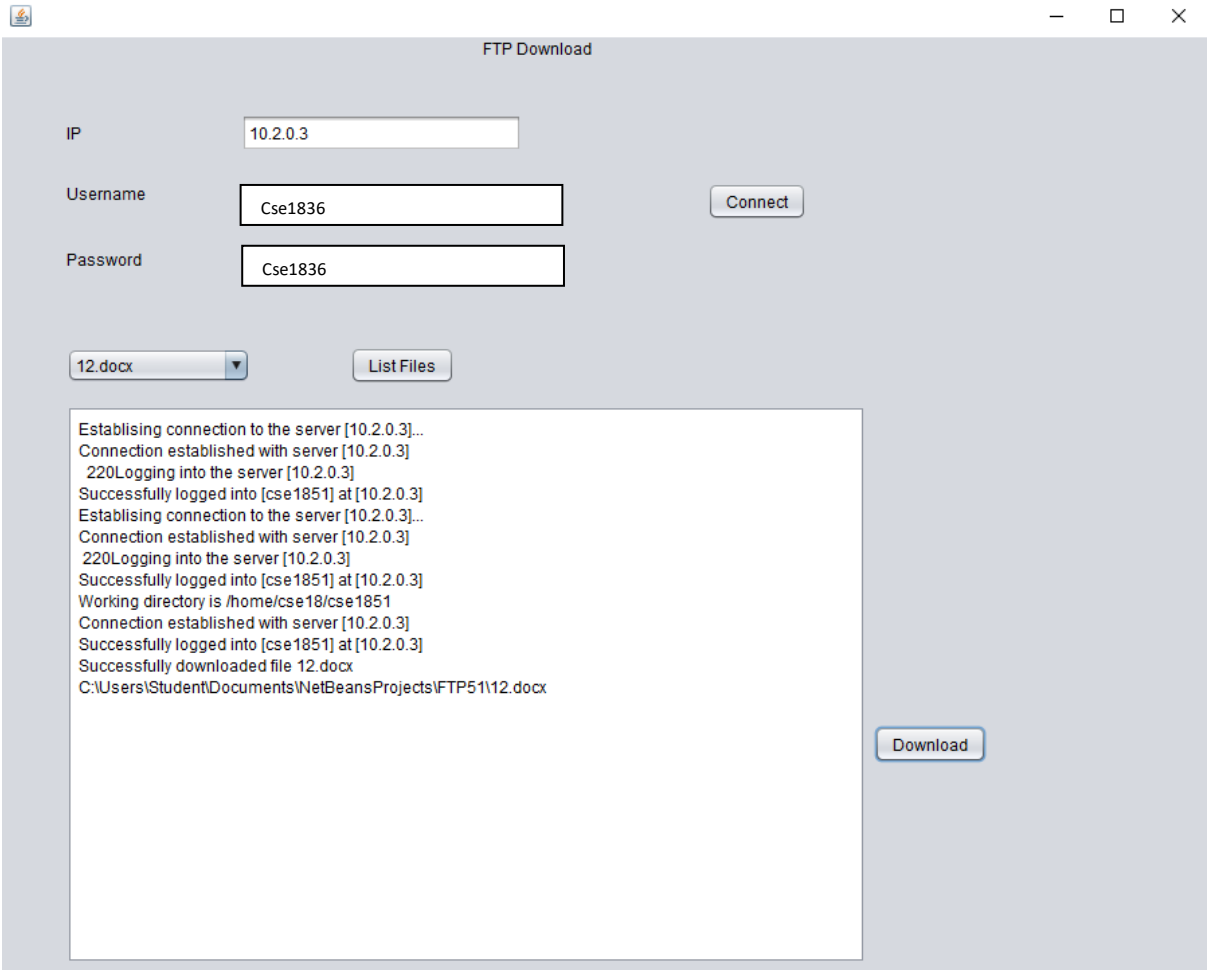
```
        String pwd=txtPW.getText();     //GET PASSWORD
        txtAC.append("Logging into the server ["+IP+"]\n");
        if(ftpc.login(uname,pwd))
            txtAC.append("Successfully logged into ["+uname+"] at ["+IP+"]\n");
        else
            txtAC.append("Unable to login to ["+uname+"] at ["+IP+"]\n");
        txtAC.append("Disconnecting from the server...\n");
        ftpc.disconnect();
//if client is idle for long then server disconnects and other operations fail. That is why disconnected here.
    }
    catch(Exception e)
    {
        e.printStackTrace();
    }
    // TODO add your handling code here:
  }
private void btndownloadActionPerformed(java.awt.event.ActionEvent evt) {
    // TODO add your handling code here:
     try{
        String IP=txtIP.getText();
        String uname=txtUN.getText();
        String pwd=txtPW.getText();
         FTPClient ftpc=new FTPClient();
        ftpc.connect(IP);
        int reply=ftpc.getReplyCode();
        if(FTPReply.isPositiveCompletion(reply))
```

```
            txtAC.append("Connection established with server ["+IP+"]\n");
        else
           txtAC.append("Connection failed with server ["+IP+"]\n");
        if(ftpc.login(uname, pwd))
        {
            txtAC.append("Successfully logged into ["+uname+"] at ["+IP+"]\n");
            txtIP.enableInputMethods(false);
/*Since we have successfully logged in, disable input on these fields*/
            txtUN.enableInputMethods(false);
            txtPW.enableInputMethods(false);
            String selectedFile=cb1.getSelectedItem().toString();
//get name of the file chosen for download
            File dFileName=new File(selectedFile);
//to get the file object for reading and writing
            OutputStream os=new BufferedOutputStream(new FileOutputStream(dFileName)); //since
reading is done in parts :.BufferedOutputStream
            boolean success=ftpc.retrieveFile(selectedFile,os);
//storeFile() for upload
            os.close();
            if(success)
txtAC.append("Successfully downloaded file "+selectedFile+"\n"+dFileName.getAbsolutePath());
            else
                txtAC.append("Could not download file "+selectedFile+"\n");
        }
        else
            txtAC.append("Unable to log into ["+uname+"] at ["+IP+"]\n");
        ftpc.disconnect();
              }
```

```
        catch(Exception e)
        {
            e.printStackTrace();
        }
    }
//listing
 private void btnlistfilesActionPerformed(java.awt.event.ActionEvent evt) {
        // TODO add your handling code here:
         try{
            String IP=txtIP.getText();
            FTPClient ftpc=new FTPClient();
            txtAC.append("Establising connection to the server ["+IP+"]...\n");
            ftpc.connect(IP);
            int reply=ftpc.getReplyCode();//to check the status of the connection
            if(FTPReply.isPositiveCompletion(reply))
              txtAC.append("Connection established with server ["+IP+"]\n"+" "+reply);
            else
               txtAC.append("Connection failed with the server ["+IP+"]\n");
            String uname=txtUN.getText();
            String pwd=txtPW.getText();
            txtAC.append("Logging into the server ["+IP+"]\n");
            if(ftpc.login(uname,pwd))
            {
               txtAC.append("Successfully logged into ["+uname+"] at ["+IP+"]\n");
               String pdir=ftpc.printWorkingDirectory();
//changeWorkingDirectory() to change current directory
               txtAC.append("Working directory is "+pdir+"\n");
```

```
            FTPFile ftpf[]=ftpc.listFiles();  //takes names of all files in current directory pdir
            //ComboBox.removeAllItems(); //to remove the default 5 items
            for(int i=0;i<ftpf.length;i++)
            {
                cb1.addItem(ftpf[i].getName());
            }
        }
        else
            txtAC.append("Unable to login to ["+uname+"] at ["+IP+"]\n");
        txtAC.append("Disconnecting from the server...\n");
        ftpc.disconnect();
    }
    catch(Exception e)
    {
        e.printStackTrace();
    }
    }
public static void main(String args[]) {
    java.awt.EventQueue.invokeLater(new Runnable() {
        public void run() {
            new ftpc1().setVisible(true);
        }
    });
  }
}
```

Output:


FTP Download
IP
10.2.0.3
Username
Cse1836
Connect
Password
Cse1836
12.docx
List Files
Establising connection to the server [10.2.0.3]...
Connection established with server [10.2.0.3]
220Logging into the server [10.2.0.3]
Successfully logged into [cse1851] at [10.2.0.3]
Establising connection to the server [10.2.0.3]...
Connection established with server [10.2.0.3]
220Logging into the server [10.2.0.3]
Successfully logged into [cse1851] at [10.2.0.3]
Working directory is /home/cse18/cse1851
Connection established with server [10.2.0.3]
Successfully logged into [cse1851] at [10.2.0.3]
Successfully downloaded file 12.docx
C:\Users\Student\Documents\NetBeansProjects\FTP51\12.docx
Download

6. Write a Program to demonstrate Client Server using RMI.

Aim: To Perform Client Server using RMI.

Program:

i. AddServerIntf

```
import java.rmi.*;
public interface AddServerIntf extends Remote
{
        double add(double d1,double d2) throws RemoteException;
}
```

ii. AddServerImpl

```
import java.rmi.*;
import java.rmi.server.*;
public class AddServerImpl extends UnicastRemoteObject implements AddServerIntf
{
        public AddServerImpl() throws RemoteException
{
}
public double add(double d1,double d2) throws RemoteException
{
        return d1+d2;
}
}
```

iii. AddClient

```
import java.rmi.*;
public class AddClient
{
        public static void main(String args[])

        {

                try

                {

                        String addServerURL="rmi://"+args[0]+"/AddServer";
                        AddServerIntf addServerIntf=
                        (AddServerIntf)Naming.lookup(addServerURL);
                        System.out.println("First no. is"+args[1]);
                        double d1=Double.valueOf(args[1]).doubleValue();
                        System.out.println("Second no. is"+args[2]);
                        double d2=Double.valueOf(args[2]).doubleValue();
                        System.out.println("the sum is "+addServerIntf.add(d1,d2));
                }
```

```
                catch(Exception e)
                {
                        System.out.println("Exception:" +e);
                }
        }
            }
```

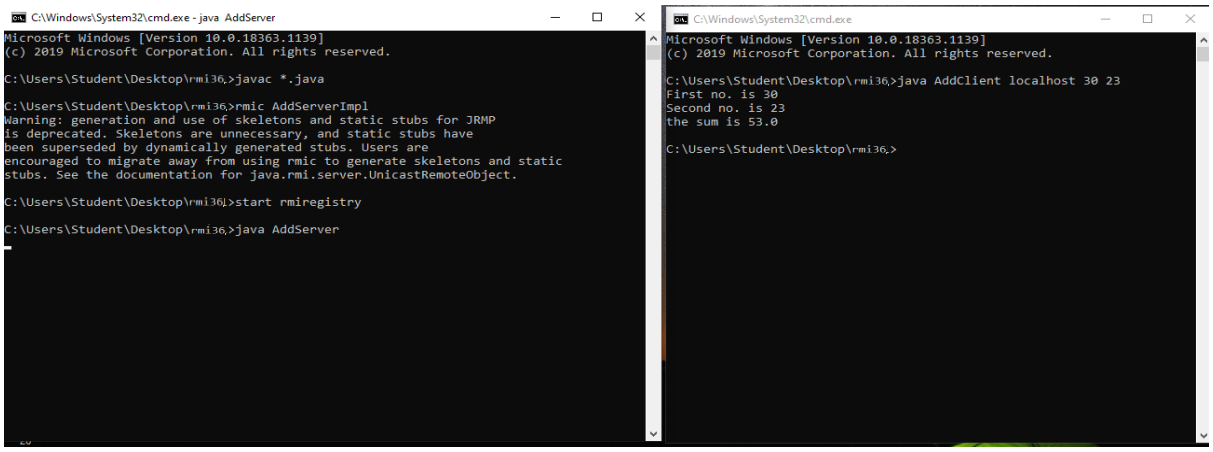
iv. <u>AddServer</u>

```
        import java.rmi.*;
        import java.rmi.server.*;
        public class AddServer
        {
            public static void main(String args[])
            {
                try
                {
                    AddServerImpl addServerImpl=new AddServerImpl();

                    Naming.rebind("AddServer",addServerImpl);
                    }
                catch(Exception e)
                {
                    System.out.println("Exception:" +e);
                }
            }
        }
```

<u>Exectuion Steps</u>

C: javac *.java
C: rmic AddServerImpl
C: start rmiregistry
C: java AddServer
C: java AddClient localhost 30 23

<u>Output:</u>



7. Write a Program to perform Simple Calculator using RMI (Addition,Subtraction.Multiplication,Division)

Aim: To perform simple calculator using RMI.

Program:

i.One

```
import java.rmi.*;

interface one extends Remote

{

public int add(int a, int b) throws RemoteException;

public int sub(int a, int b) throws RemoteException;

public int mul(int a, int b) throws RemoteException;

public int div(int a, int b) throws RemoteException;

}
```

ii.Two

```
import java.rmi.*;

import java.rmi.server.*;

public class two extends UnicastRemoteObject implements one

{

public two() throws RemoteException { }

public int add(int a, int b) throws RemoteException

{

System.out.println("Hello");

return (a + b);

}

public int sub(int a, int b) throws RemoteException

{

System.out.println("Hello");

return (a - b);
```

```
}
public int mul(int a, int b) throws RemoteException
{
System.out.println("Hello");
return (a * b);
}
public int div(int a, int b) throws RemoteException
{
System.out.println("Hello");
return (a / b);
}
}
```

iii.RmiClient

```
import java.io.*;
import java.rmi.*;
import java.net.*;
public class rmiclient
{
public static void main(String args[]) throws Exception
{
try
{
System.out.println("The Two numbers are 40 and 5");
String s1 = "rmi://localhost/add";
one onex = (one)Naming.lookup(s1);
int m = onex.add(40,5);
System.out.println("Addition : " + m);
```

```
String s2 = "rmi://localhost/sub";
one oney = (one)Naming.lookup(s2);
int n = oney.sub(40, 5);
System.out.println("Subtraction : " + n);
String s3 = "rmi://localhost/mul";
one onez = (one)Naming.lookup(s3);
int o = onez.mul(40, 5);
System.out.println("Multiplication : " + o);
String s4 = "rmi://localhost/div";
one onew = (one)Naming.lookup(s4);
int p = onew.div(40, 5);
System.out.println("Division : " + p);
}
catch (Exception e)
{
System.out.println("Exception" + e);
}
}
}
```

iv.RmiServer

```
import java.io.*;
import java.rmi.*;
import java.net.*;
public class rmiserver
{
public static void main(String args[]) throws Exception
{
```

```
try
{
two twox = new two();
Naming.bind("add", twox);
System.out.println("Object registered");
two twoy = new two();
Naming.bind("sub", twoy);
System.out.println("Object registered");
two twoz = new two();
Naming.bind("mul", twoz);
System.out.println("Object registered");
two twow = new two();
Naming.bind("div", twow);
System.out.println("Object registered");
}
catch(Exception e)
{
System.out.println("Exception" + e);
}
}
}
```

Exectuion Steps

C: javac *.java
C: rmic two
C: start rmiregistry
C: java rmiserver
C: java rmiclient

Output:

```
C:\Windows\System32\cmd.exe - java rmiserver
Microsoft Windows [Version 10.0.18363.1139]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\Student\Desktop\rmi36\addsub>javac *.java

C:\Users\Student\Desktop\rmi36\addsub>rmic two
Warning: generation and use of skeletons and static stubs for JRMP
is deprecated. Skeletons are unnecessary, and static stubs have
been superseded by dynamically generated stubs. Users are
encouraged to migrate away from using rmic to generate skeletons and static
stubs. See the documentation for java.rmi.server.UnicastRemoteObject.

C:\Users\Student\Desktop\rmi36\addsub>start rmiregistry

C:\Users\Student\Desktop\rmi36\addsub>java rmiserver
Object registered
Object registered
Object registered
Object registered
Hello
Hello
Hello
Hello
```

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.18363.1139]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\Student\Desktop\rmi36\addsub>java rmiclient
The Two numbers are 40 and 5
Addition : 45
Subtraction : 35
Multiplication : 200
Division : 8

C:\Users\Student\Desktop\rmi36\addsub>
```

8. Write a Program to demonstrate Domain Name Server using RMI.

Aim: To perform DNS using RMI.

Program:

i.AddDNSServerIntf

```
import java.rmi.*;

public interface DNSServerIntf extends Remote

{

String DNS(String s1) throws RemoteException;

}
```

ii.DNSServerImpl

```
import java.rmi.*;

import java.rmi.server.*;

public class DNSServerImpl extends UnicastRemoteObject implements DNSServerIntf

{

public DNSServerImpl() throws RemoteException

{

}

public String DNS(String s1) throws RemoteException

{ if(s1.equals("www.osmania.ac.in"))

return "50.32.24.29";

if(s1.equals("www.mjcollege.ac.in"))

return "90.82.44.89";

if(s1.equals("www.jntu.ac.in"))

return "150.32.64.20";

if(s1.equals("www.yahoo.com"))

return "88.39.124.129";

else return "No Info about this Address";
```

```
}
}
```

iii.DNSClient

```
import java.rmi.*;
public class DNSClient {
public static void main(String args[])throws Exception
{ try {
String dnsServerURL="rmi://"+args[0]+"/DNSServer";
DNSServerIntf dnsServerIntf= (DNSServerIntf)Naming.lookup(dnsServerURL);
System.out.println("The website name is "+args[1]);
String s1=args[1];
System.out.println("the site is at "+dnsServerIntf.DNS(s1));
}
catch(Exception e) {
System.out.println("Exception:" +e); } } }
```

iv.DNSServer

```
import java.rmi.*;
import java.rmi.server.*;
public class DNSServer{
public static void main(String args[])throws Exception
{ try {
DNSServerImpl dnsServerImpl=new DNSServerImpl();
Naming.rebind("DNSServer",dnsServerImpl); }
catch(Exception e)
{
System.out.println("Exception:" +e);
}
```

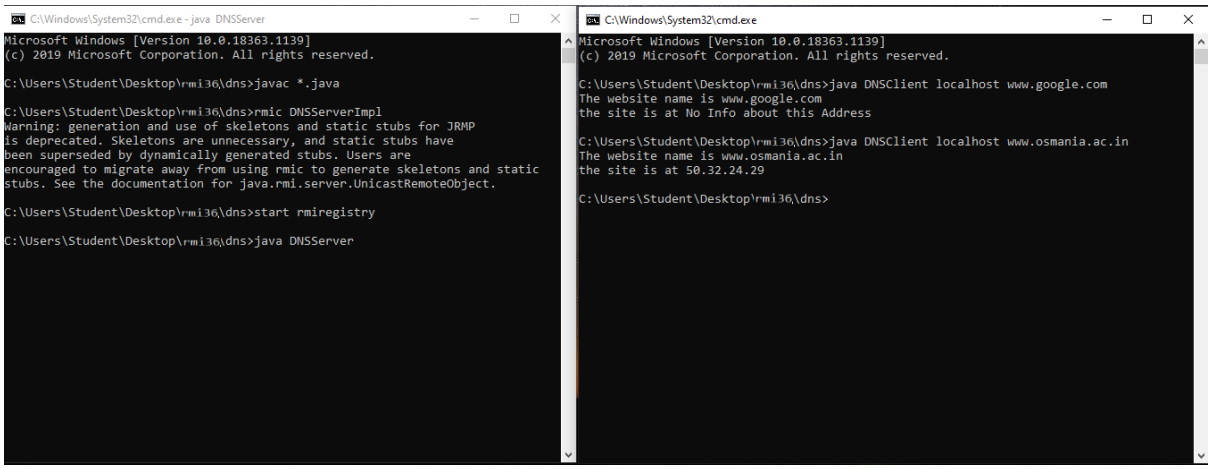
}

}

Exectuion Steps

C: javac *.java
C: rmic DNSServerImpl
C: start rmiregistry
C: java DNSServer
C: java DNSClient localhost www.google.com

Output:



9. Write a Program to implement ECHO SERVER using RPC.

Aim: To Implement Echo Server using RPC.

Program:

i.Echos.x

```
program ECHOSERVER_PROGRAM

{

    version ECHOSERVER_VERSION

    {

        string ECHO(string)=1;

    }=1;

}=0x21234589;
```

Execution command

Command : $ rpcgen -a echos.x

$ ls

ii.Echos_client.c

```
#include "echos.h"

Void echoserver_program_1(char *host)

{

    CLIENT *clnt;

    char * *result_1;
```

```
	char * echo_1_arg;
#ifndef DEBUG
 clnt = clnt_create (host, ECHOSERVER_PROGRAM, ECHOSERVER_VERSION, "udp");
	if (clnt == NULL) {
		clnt_pcreateerror (host);
		exit (1);
	}
#endif  /* DEBUG */
	 echo_1_arg=(char *)malloc(20);
	printf("\n Enter a message:");
	scanf("%s",echo_1_arg);
	result_1 = echo_1(&echo_1_arg, clnt);
	if (result_1 == (char **) NULL) {
		clnt_perror (clnt, "call failed");
	}
	else
		printf("\n The message returned is %s",*result_1);
#ifndef DEBUG
	clnt_destroy (clnt);
#endif   /* DEBUG */
}
int
main (int argc, char *argv[])
```

```
{
	char *host;
	if (argc < 2) {
		printf ("usage: %s server_host\n", argv[0]);
		exit (1);
	}
	host = argv[1];
	echoserver_program_1 (host);
exit (0);}
```

iii.Echos_server.c

```
#include "echos.h"
char **
echo_1_svc(char **argp, struct svc_req *rqstp)
{
	static char * result;
	/ * insert server code here
	 */
	result=*argp;
	return &result;
}
```

Execution Steps:

$ cc echos_client.c echos_clnt.c -o client

$ cc echos_server.c echos_svc.c -o server

Output:

```
Telnet 10.2.0.3
[cse1836@csed echorpc]$ cc echos_client.c echos_clnt.c -o client
[cse1836@csed echorpc]$ cc echos_server.c echos_svc.c -o server
[cse1836@csed echorpc]$ ./server &
[9] 18442
[cse1836@csed echorpc]$ ./client 10.2.0.3

 Enter a message:Hello

 The message returned is Hello
[cse1836@csed echorpc]$
```

10. Write a Program to find GCD using RPC.

Aim: To Find GCD using RPC.

Program:

i.gcd.x

```
struct num

{

long a;

long b;

};

program gcd_prog{

 version gcd_vers{

long gcd_fn(num)=1;

}=1;

}=0x30000001;
```

Execution Steps:

$rpcgen gcd.x

Generate server stub program

$rpcgen -Ss gcd.x>gcd_server.c
Client stub
$rpcgen –Sc gcd.x>gcd_client.c
$ ls

ii.gcd_client code:

```
#include "gcd.h"

void gcd_prog_1(char *host,num number)
{
	CLIENT *clnt;
	long  *result_1;
	num  gcd_fn_1_arg;
	gcd_fn_1_arg.a=number.a;
	gcd_fn_1_arg.b=number.b;
#ifndef DEBUG
	clnt = clnt_create (host, gcd_prog, gcd_vers, "udp");
	if (clnt == NULL) {
		clnt_pcreateerror (host);
		exit (1);
	}

#endif  /* DEBUG */

	result_1 = gcd_fn_1(&gcd_fn_1_arg, clnt);
	if (result_1 == (long *) NULL) {
		clnt_perror (clnt, "call failed");
	}
printf("gcd is %d",*result_1);
#ifndef DEBUG
	clnt_destroy (clnt);
#endif   /* DEBUG */
}
Int main (int argc, char *argv[])
{
	char *host;
num n;
	if (argc < 2) {
		printf ("usage: %s server_host\n", argv[0]);
		exit (1);

	}
	host = argv[1];
n.a=atol(argv[2]);
n.b=atol(argv[3]);

gcd_prog_1 (host,n);
exit (0);
}
```

iii.gcd_server code:

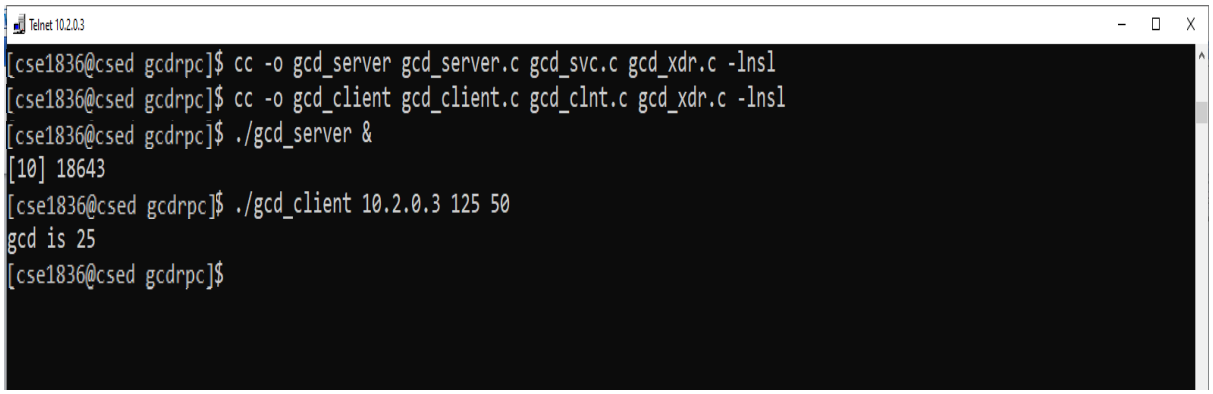
```
int gcd(int a ,int b){
	if (b==0)
```

```
        return a;
        return gcd(b,a%b);}

#include "gcd.h"

long * gcd_fn_1_svc(num *argp, struct svc_req *rqstp)
{
        static long  result;

        /*
         * insert server code here
         */

result=gcd((*argp).a,(*argp).b);

        return &result;
}
```

Execution Steps:

$ cc -o gcd_server gcd_server.c gcd_svc.c gcd_xdr.c -lnsl
$ cc -o gcd_client gcd_client.c gcd_clnt.c gcd_xdr.c -lnsl

Output:



11. Write a Program to perform NFS.

Aim: To perform Client Server File sharing using NFS.

Program:

Setting Up NFS Server And Client On Linux

NFS, stands for **N**etwork **F**ile **S**ystem, is a server-client protocol used for sharing files between linux/unix to unix/linux systems. NFS enables you to mount a remote share locally. You can then directly access any of the files on that remote share.

Scenario

In this how-to, I will be using two systems which are running with RHEL. The same steps are applicable for Scientific Linux 7 distributions.

Here are my testing nodes details.

```
NFS Server IP Address: 10.2.0.5

NFS Client IP Address: 10.2.4.30
```

Server Side Configuration

Install NFS packages in your Server system by using the following command:

```
yum install nfs-utils nfs-utils-lib
```

Enable and start NFS services:

```
systemctl enable rpcbind

systemctl enable nfs-server

systemctl enable nfs-lock

systemctl enable nfs-idmap

systemctl start rpcbind

systemctl start nfs-server

systemctl start nfs-lock

systemctl start nfs-idmap
```

Now, let us create some shared directories in server.

Create a shared directory named **'/var/newshare'** in server and let the client users to read and write files in that directory.

```
mkdir /var/newshare

chmod 777 /var/newshare/
```

Export shared directory on NFS Server:

Edit file **/etc/exports**,

```
vi /etc/exports
```

Add the following line:

```
/var/newshare/     10.2.4.1/(rw,sync,no_root_squash,no_all_squash)
```

where,

```
/var/newshare - shared directory

10.2.4.1/24 - IP address range of clients

rw - Writable permission to shared folder

sync - Synchronize shared directory

no_root_squash - Enable root privilege

no_all_squash - Enable user's authority
```

Restart the NFS service:

```
Service nfs restart
```

Client Side Configuration

Install NFS packages in your client system by using the following command:

```
yum install nfs-utils nfs-utils-lib
```

Enable and start NFS services:

```
systemctl enable rpcbind

systemctl enable nfs-server

systemctl enable nfs-lock

systemctl enable nfs-idmap
```

```
systemctl start rpcbind

systemctl start nfs-server

systemctl start nfs-lock

systemctl start nfs-idmap
```

Mount NFS shares On clients

Create a mount point to mount the shared folder **'var/newshare'** which we've created before in the server.

```
mkdir /var/new1
```

Mount the share from server to client as shown below

```
mount -t nfs 10.2.0.5:/var/newshare/ /var/new/
```

Sample Output:

```
mount.nfs: Connection timed out
```

Probably, it will show a **connection timed out error** which means that the firewall is blocking our NFS server. To access NFS shares from remote clients, we must allow the following nfs ports in the NFS server iptables/firewall.

If you don't know which ports to allow through firewall, run the following command:

You should allow the above ports.

To do that, go to the NFS server, and run the following commands:

```
firewall-cmd --permanent --add-port=111/tcp

firewall-cmd --permanent --add-port=54302/tcp

firewall-cmd --permanent --add-port=20048/tcp

firewall-cmd --permanent --add-port=2049/tcp

firewall-cmd --permanent --add-port=46666/tcp

firewall-cmd --permanent --add-port=42955/tcp

firewall-cmd --permanent --add-port=875/tcp
```

Restart firewalld service to take effect the changes:

```
firewall-cmd --reload
```

Again mount the share in client system with command:

```
mount -t nfs 10.2.0.5:/var/newshare/ /var/new/
```

Now the NFS share will mount without any connection timed out error.

Verifying NFS Shares On Clients

Verify the share from the server is mounted or not using 'mount' command.

```
mount
```

Sample output:

```
File  Edit  View  Search  Terminal  Help
[root@localhost Desktop]# mount
/dev/mapper/VolGroup-lv_root on / type ext4 (rw)
proc on /proc type proc (rw)
sysfs on /sys type sysfs (rw)
devpts on /dev/pts type devpts (rw,gid=5,mode=620)
tmpfs on /dev/shm type tmpfs (rw,rootcontext="system_u:object_r:t
/dev/sda7 on /boot type ext4 (rw)
/dev/mapper/VolGroup-lv_home on /home type ext4 (rw)
none on /proc/sys/fs/binfmt_misc type binfmt_misc (rw)
/tmp on /tmp type none (rw,bind)
/var/tmp on /var/tmp type none (rw,bind)
/home on /home type none (rw,bind)
/etc/named on /var/named/chroot/etc/named type none (rw,bind)
/var/named on /var/named/chroot/var/named type none (rw,bind)
/etc/named.conf on /var/named/chroot/etc/named.conf type none (rw
/etc/named.rfc1912.zones on /var/named/chroot/etc/named.rfc1912.z
(rw,bind)
/etc/rndc.key on /var/named/chroot/etc/rndc.key type none (rw,bin
/usr/lib64/bind on /var/named/chroot/usr/lib64/bind type none (rw
/etc/named.iscdlv.key on /var/named/chroot/etc/named.iscdlv.key t
nd)
sunrpc on /var/lib/nfs/rpc_pipefs type rpc_pipefs (rw)
nfsd on /proc/fs/nfsd type nfsd (rw)
10.2.0.5:/var/unixmen_share/ on /var/nfs_share17 type nfs (rw,addr=10.2.0.5)
10.2.0.5:/var/nfs_share1/ on /var/nfsshare type nfs (rw,addr=10.2.0.5)
10.2.0.5:/var/nfs_share1/ on /var/newshare type nfs (rw,addr=10.2.0.5)
gvfs-fuse-daemon on /root/.gvfs type fuse.gvfs-fuse-daemon (rw,nosuid,nodev)
10.2.0.5:/var/newshare on /var/new1 type nfs (rw,addr=10.2.0.5)
[root@localhost Desktop]#
```