

EX. No:1 DATE:	1. Implementation of Stop and Wait Protocol and Sliding Window Protocol
---------------------------------	--

Aim:

To write a java program to perform sliding window.

Algorithm:

- 1.Start the program.
- 2.Get the frame size from the user
- 3.To create the frame based on the user request.
- 4.To send frames to server from the client side.
- 5.If your frames reach the server it will send ACK signal to client otherwise it will send NACK signal to client.
- 6.Stop the program

Program:

server.java

```
import java.net.*;
import java.io.*;
import java.rmi.*;
public class server
{
    public static void main(String a[])throws Exception
    {
        ServerSocket ser=new ServerSocket(10);
        Socket s=ser.accept();
        DataInputStream in=new DataInputStream(System.in);
        DataInputStream in1=new DataInputStream(s.getInputStream());
        String sbuff[]=new String[8];
        PrintStream p;
        int sptr=0,sws=8,nf,ano,i;
        String ch;
        do
        {
            p=new PrintStream(s.getOutputStream());
            System.out.print("Enter the no. of frames : ");
            nf=Integer.parseInt(in.readLine());
            p.println(nf);
            if(nf<=sws-1)
            {
                System.out.println("Enter "+nf+" Messages to be send\n");
                for(i=1;i<=nf;i++)
                {
                    sbuff[sptr]=in.readLine();
                    p.println(sbuff[sptr]);
                    sptr=++sptr%8;
                }
                sws-=nf;
                System.out.print("Acknowledgment received");
                ano=Integer.parseInt(in1.readLine());
                System.out.println(" for "+ano+" frames");
                sws+=nf;
            }
            else
```

```

{
System.out.println("The no. of frames exceeds window size");
break;
}
System.out.print("\nDo you wants to send some more frames : ");
ch=in.readLine(); p.println(ch);
}
while(ch.equals("yes"));
s.close();
}
}

```

client.java

```

import java.net.*;
import java.io.*;
class client
{
public static void main(String a[])throws Exception
{
Socket s=new Socket(InetAddress.getLocalHost(),10);
DataInputStream in=new DataInputStream(s.getInputStream());
PrintStream p=new PrintStream(s.getOutputStream());
int i=0,rptr=-1,nf,rws=8;
String rbuf[]=new String[8];
String ch; System.out.println();
do
{
nf=Integer.parseInt(in.readLine());
if(nf<=rws-1)
{
for(i=1;i<=nf;i++)
{
rpتر=++rpتر%8;
rbuf[rptr]=in.readLine();
System.out.println("The received Frame " +rpتر+" is : "+rbuf[rptr]);
}
rws-=nf;
System.out.println("\nAcknowledgment sent\n");
p.println(rpتر+1); rws+=nf; }
else
break;
ch=in.readLine();
}
while(ch.equals("yes"));
}
}

```

Output:

```

C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>cd/

C:\>e:

E:\>cd LAB

E:\LAB>javac server.java
Note: server.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.

E:\LAB>java server
Enter the no. of frames : 2
Enter 2 Messages to be send

god
bless
Acknowledgment received for 2 frames

Do you wants to send some more frames : n

E:\LAB>

```

```

C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>cd/

C:\>e:

E:\>cd LAB

E:\LAB>javac client.java
Note: client.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.

E:\LAB>java client

The received Frame 0 is : god
The received Frame 1 is : bless

Acknowledgment sent

E:\LAB>

```

DESCRIPTION	MARK ALLOCATION
AIM & ALGORITHM	/20
PROGRAM	/40
EXECUTION	/30
VIVA	/10
TOTAL	/100

Result:

Thus the program for implementing the number of frames using stop and wait protocol was executed successfully and verified with different sample inputs.

EX. No: 2 DATE:	Socket Programming and Client – Server model
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Aim

To implement socket programming date and time display from client to server using TCP Sockets

Algorithm:**SERVER**

1. Create a server socket and bind it to port.
2. Listen for new connection and when a connection arrives, accept it.
3. Send server's date and time to the client.
4. Read client's IP address sent by the client.
5. Display the client details.
6. Repeat steps 2-5 until the server is terminated.
7. Close all streams.
8. Close the server socket.
9. Stop.

CLIENT

1. Create a client socket and connect it to the server's port number.
2. Retrieve its own IP address using built-in function.
3. Send its address to the server.
4. Display the date & time sent by the server.
5. Close the input and output streams.
6. Close the client socket.
7. Stop

Program:**tcpserver.java**

```
import java.net.*;
import java.io.*;
import java.util.*;
class tcpserver
{
    public static void main(String arg[])
    {
        ServerSocket ss = null;
        Socket cs;
        PrintStream ps;
        BufferedReader dis;
        String inet;
        try
        {
            ss = new ServerSocket(4444);
            System.out.println("Press Ctrl+C to quit");
            while(true)
            {
                cs = ss.accept();
                ps = new PrintStream(cs.getOutputStream());
                Date d = new Date();
                ps.println(d);
                dis = new BufferedReader(new InputStreamReader(cs.getInputStream()));
                inet = dis.readLine();
                System.out.println("Client System/IP address is :"+ inet);
                ps.close();
                dis.close();
            }
        }
    }
}
```

```

catch(IOException e)
{ System.out.println("The exception is : " + e);
}
}
}

```

tcpclient.java

```

import java.net.*;
import java.io.*;
class tcpclient
{
public static void main (String args[])
{
Socket soc;
BufferedReader dis;
String sdate;
PrintStream ps;
try
{
InetAddress ia = InetAddress.getLocalHost();
if (args.length == 0)
soc = new Socket(InetAddress.getLocalHost(),4444);
else soc = new Socket(InetAddress.getByName(args[0]),4444);
dis = new BufferedReader(new InputStreamReader(soc.getInputStream()));
sdate=dis.readLine();
System.out.println("The date/time on server is : " +sdate);
ps = new PrintStream(soc.getOutputStream());
ps.println(ia);
ps.close();}
catch(IOException e)
{
System.out.println("THE EXCEPTION is : " + e);
}
}
}

```

Output:

```

C:\Windows\system32\cmd.exe - java tcpserver
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>cd/
C:\>e:
E:\>cd LAB
E:\LAB>javac tcpserver.java
E:\LAB>java tcpserver
Press Ctrl+C to quit
Client System/IP address is :Priya-PC/192.168.1.101

```

```

C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>cd/
C:\>e:
E:\>cd LAB
E:\LAB>javac tcpclient.java
E:\LAB>java tcpclient
The date/time on server is : Mon Dec 04 20:34:49 IST 2017
E:\LAB>

```

DESCRIPTION	MARK ALLOCATION
AIM & ALGORITHM	/20
PROGRAM	/40
EXECUTION	/30
VIVA	/10
TOTAL	/100

Result:

Thus the program for implementing to display date and time from client to server using TCP Sockets was executed successfully and output verified using various samples.

EX. No: 3
DATE:

ARP /RARP protocols.

Aim:

To write a java program for simulating arp/rarp protocols

Algorithm:**server**

1. Create a server socket and bind it to port.
2. Listen for new connection and when a connection arrives, accept it.
3. Send server's date and time to the client.
4. Read client's IP address sent by the client.
5. Display the client details.
6. Repeat steps 2-5 until the server is terminated.
7. Close all streams.
8. Close the server socket.
9. Stop.

Client

1. Create a client socket and connect it to the server's port number.
2. Retrieve its own IP address using built-in function.
3. Send its address to the server.
4. Display the date & time sent by the server.
5. Close the input and output streams.
6. Close the client socket.
7. Stop.

Program

Program for Address Resolutuion Protocol (ARP) using TCP

arpserver.java

```
import java.io.*;
import java.net.*;
import java.util.*;
class arpserver
{
    public static void main(String args[])
    {
        try
        {
            ServerSocket obj=new ServerSocket(200);
            Socket obj1=obj.accept();
            while(true)
            {
                DataInputStream din=new DataInputStream(obj1.getInputStream());
                DataOutputStream dout=new DataOutputStream(obj1.getOutputStream());
                String str=din.readLine();
                String ip[]={"165.165.80.80","165.165.79.1"};
                String mac[]={"6A:08:AA:C2","8A:BC:E3:FA"};
                for(int i=0;i<ip.length;i++)
                {
                    if(str.equals(ip[i]))
                    {
                        dout.writeBytes(mac[i]+"\\n");
                        break;
                    }
                }
            }
            obj.close();
        }
    }
}
```

```

catch(Exception e)
{
System.out.println(e);
}
}
}

```

arpclient.java

```

import java.io.*;
import java.net.*;
import java.util.*;
class arpclient
{
public static void main(String args[])
{
try
{
BufferedReader in=new BufferedReader(new InputStreamReader(System.in));
Socket clsct=new Socket("127.0.0.1",200);
DataInputStream din=new DataInputStream(clsct.getInputStream());
DataOutputStream dout=new DataOutputStream(clsct.getOutputStream());
System.out.println("Enter the Logical address(IP):");
String str1=in.readLine();
dout.writeBytes(str1+'\n');
String str=din.readLine();
System.out.println("The Physical Address is: "+str);
clsct.close();
}
catch (Exception e)
{
System.out.println(e);
}
}
}

```

Output:


```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>cd/

C:\>e:

E:\>cd LAB

E:\LAB>javac arpsvr.java
Note: arpsvr.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.

E:\LAB>java arpsvr
java.lang.NullPointerException

E:\LAB>
```

```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>cd/

C:\>e:

E:\>cd LAB

E:\LAB>javac arpcnt.java
Note: arpcnt.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.

E:\LAB>java arpcnt
Enter the Logical address(IP):
165.165.80.80
The Physical Address is: 6A:08:AA:C2

E:\LAB>
```

Program- RARP: Reverse Address Resolutuion Protocol (RARP) using UDP

rarpserver.java

```
import java.io.*;
import java.net.*;
import java.util.*;
class rarpserver
{
public static void main(String args[])
{
try
{
DatagramSocket server=new DatagramSocket(1309);
while(true)
{
byte[] sendbyte=new byte[1024];
byte[] receivebyte=new byte[1024];
DatagramPacket receiver=new
DatagramPacket(receivebyte,receivebyte.length);
server.receive(receiver);
String str=new String(receiver.getData());
String s=str.trim();
//System.out.println(s);
InetAddress addr=receiver.getAddress();
int port=receiver.getPort();
String ip[]={ "165.165.80.80","165.165.79.1"};
String mac[]={ "6A:08:AA:C2","8A:BC:E3:FA"};
for(int i=0;i<ip.length;i++)
{
if(s.equals(mac[i]))
{
sendbyte=ip[i].getBytes();
DatagramPacket sender=new
DatagramPacket(sendbyte,sendbyte.length,addr,port);
server.send(sender);
break;
}
}
break;
}
}
catch(Exception e)
{
System.out.println(e);
}
}
```

rarpclient.java

```
import java.io.*;
import java.net.*;
import java.util.*;
```

```

class rarpclient
{
public static void main(String args[])
{
try
{
DatagramSocket client=new DatagramSocket();
InetAddress addr=InetAddress.getByName("127.0.0.1");
byte[] sendbyte=new byte[1024];
byte[] receivebyte=new byte[1024];
BufferedReader in=new BufferedReader(new InputStreamReader(System.in));
System.out.println("Enter the Physical address (MAC):");
String str=in.readLine();
sendbyte=str.getBytes();
DatagramPacket sender=new DatagramPacket(sendbyte,sendbyte.length,addr,1309);
client.send(sender);
DatagramPacket receiver=new DatagramPacket(receivebyte,receivebyte.length);
client.receive(receiver);
String s=new String(receiver.getData());
System.out.println("The Logical Address is(IP): "+s.trim());
client.close();
}
catch(Exception e)
{
System.out.println(e);
}
}
}

```

Output:

```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

G:\Users\Priya>cd/

G:\>e:

E:\>cd LAB

E:\LAB>javac rarpserver.java

E:\LAB>java rarpserver

E:\LAB>
```

```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

G:\Users\Priya>cd/

G:\>e:

E:\>cd LAB

E:\LAB>javac rarpclient.java

E:\LAB>java rarpclient
Enter the Physical address (MAC):
6A:08:AA:C2
The Logical Address is(IP): 165.165.80.80

E:\LAB>
```

DESCRIPTION	MARK ALLOCATION
AIM & ALGORITHM	/20
PROGRAM	/40
EXECUTION	/30
VIVA	/10
TOTAL	/100

Result :

Thus the program for implementing to display simulating ARP /RARP protocols.

EX. No:4 DATE:	PING and TRACEROUTE commands
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Aim:

To Write The java program for simulating ping and traceroute commands

Algorithm:

- 1.Start the program.
- 2.Get the frame size from the user
- 3.To create the frame based on the user request.
- 4.To send frames to server from the client side.
- 5.If your frames reach the server it will send ACK signal to client otherwise it will send NACK signal to client.
- 6.Stop the program

Program

pingserver.java

```
import java.io.*;
import java.net.*;
import java.util.*;
import java.text.*;
class pingserver
{
public static void main(String args[])throws Exception
{
ServerSocket ss=new ServerSocket(5555);
Socket s=ss.accept();
int c=0;
while(c<4)
{
DataInputStream dis=new DataInputStream(s.getInputStream());
PrintStream out=new PrintStream(s.getOutputStream());
String str=dis.readLine();
out.println("Reply from"+InetAddress.getLocalHost()+";Length"+str.length());
c++;
}
s.close();
}
}
```

pingclient.java

```
import java.io.*;
import java.net.*;
import java.util.Calendar;
class pingclient
{
public static void main(String args[])throws Exception
{
String str;
int c=0;
long t1,t2;
Socket s=new Socket("127.0.0.1",5555);
DataInputStream dis=new DataInputStream(s.getInputStream());
PrintStream out=new PrintStream(s.getOutputStream());
while(c<4)
{
t1=System.currentTimeMillis();
str="Welcome to network programming world";
out.println(str);
```

```
System.out.println(dis.readLine());  
t2=System.currentTimeMillis();  
System.out.println(";TTL="+t2-t1+"ms");  
c++;  
}  
s.close();  
}  
}
```

Output:

```

C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>e:
E:\>cd LAB
E:\LAB>javac pingserver.java
Note: pingserver.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
E:\LAB>java pingserver
E:\LAB>
E:\LAB>

```

```

C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>e:
E:\>cd LAB
E:\LAB>javac pingclient.java
Note: pingclient.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
E:\LAB>java pingclient
Reply fromPriya-PC/192.168.1.102;Length36
;TTL=156ms
Reply fromPriya-PC/192.168.1.102;Length36
;TTL=0ms
Reply fromPriya-PC/192.168.1.102;Length36
;TTL=0ms
Reply fromPriya-PC/192.168.1.102;Length36
;TTL=0ms
E:\LAB>
E:\LAB>

```

DESCRIPTION	MARK ALLOCATION
AIM & ALGORITHM	/20
PROGRAM	/40
EXECUTION	/30
VIVA	/10
TOTAL	/100

Result:

Thus the program was implementing to simulating ping and traceroute commands

EX. No:5 DATE:	HTTP for web page upload and download.
-------------------	---

Aim:

To write a java program for socket for HTTP for web page upload and download .

Algorithm

- 1.Start the program.
- 2.Get the frame size from the user
- 3.To create the frame based on the user request.
- 4.To send frames to server from the client side.
- 5.If your frames reach the server it will send ACK signal to client otherwise it will send NACK signal to client.
- 6.Stop the program

Program :**cli.java**

```
import javax.swing.*;
import java.net.*;
import java.awt.image.*;
import javax.imageio.*;
import java.io.*;
import java.awt.image.BufferedImage;
import java.io.ByteArrayOutputStream;
import java.io.File;
import java.io.IOException;
import javax.imageio.ImageIO;

public class cli
{
    public static void main(String args[]) throws Exception
    {
        Socket soc;
        BufferedImage img = null;
        soc=new Socket("localhost",4000);
        System.out.println("Client is running. ");
        try
        {
            System.out.println("Reading image from disk. ");
            img = ImageIO.read(new File("digital_image_processing.jpg"));
            ByteArrayOutputStream baos = new ByteArrayOutputStream();
            ImageIO.write(img, "jpg", baos);
            baos.flush();
            byte[] bytes = baos.toByteArray();
            baos.close();
            System.out.println("Sending image to server. ");
            OutputStream out = soc.getOutputStream();
            DataOutputStream dos = new DataOutputStream(out);
            dos.writeInt(bytes.length);
            dos.write(bytes, 0, bytes.length);
            System.out.println("Image sent to server. ");
            dos.close();
            out.close();
        }catch (Exception e) {
            System.out.println("Exception: " + e.getMessage());
            soc.close();
        }
        soc.close();
    }
}
```

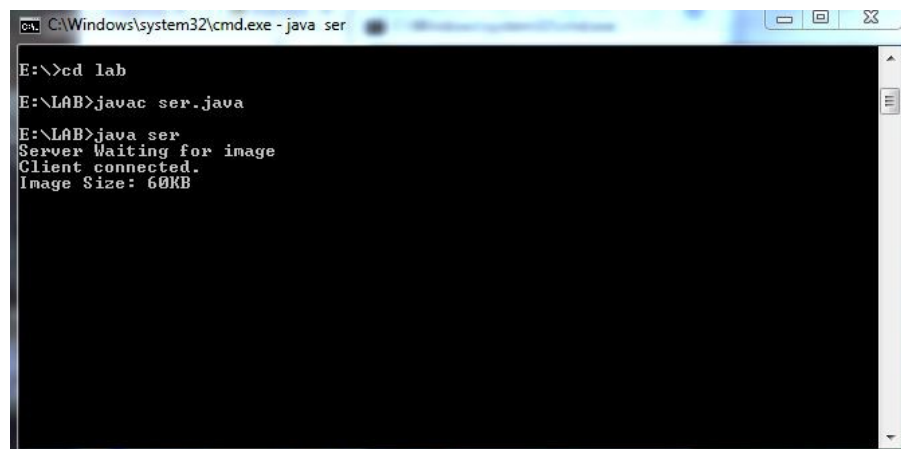


```
}
```

ser.java

```
import java.net.*;
import java.io.*;
import java.awt.image.*;
import javax.imageio.*;
import javax.swing.*;
class ser
{
    public static void main(String args[]) throws Exception{
        ServerSocket server=null;
        Socket socket;
        server=new ServerSocket(4000);
        System.out.println("Server Waiting for image");
        socket=server.accept();
        System.out.println("Client connected.");
        InputStream in = socket.getInputStream();
        DataInputStream dis = new DataInputStream(in);
        int len = dis.readInt();
        System.out.println("Image Size: " + len/1024 + "KB");
        byte[] data = new byte[len];
        dis.readFully(data);
        dis.close();
        in.close();
        InputStream ian = new ByteArrayInputStream(data);
        BufferedImage bImage = ImageIO.read(ian);
        JFrame f = new JFrame("Server");
        ImageIcon icon = new ImageIcon(bImage);
        JLabel l = new JLabel();
        l.setIcon(icon);
        f.add(l);
        f.pack();
        f.setVisible(true);
    }
}
```

Output:



```
C:\Windows\system32\cmd.exe - java ser
E:\>cd lab
E:\LAB>javac ser.java
E:\LAB>java ser
Server Waiting for image
Client connected.
Image Size: 60KB
```

```

C:\Windows\system32\cmd.exe
E:\LAB>
E:\LAB>java cli
Client is running.
Reading image from disk.
Sending image to server.
Image sent to server.
E:\LAB>

```



DESCRIPTION	MARK ALLOCATION
AIM & ALGORITHM	/20
PROGRAM	/40
EXECUTION	/30
VIVA	/10
TOTAL	/100

Result

Thus the program was implementing to socket for HTTP for web page upload and download.

EX. No:6 DATE:	RPC (Remote Procedure Call)
-------------------	-----------------------------

Aim:

To write a java program to implement RPC (remote procedure call)

Algorithm :

- 1.Start the program.
- 2.Get the frame size from the user
- 3.To create the frame based on the user request.
- 4.To send frames to server from the client side.
- 5.If your frames reach the server it will send ACK signal to client otherwise it will send NACK signal to client.
- 6.Stop the program

Program:**rpcclient.java**

```
import java.io.*;
import java.net.*;
import java.util.*;
class rpcclient
{
public static void main(String args[])
{
try
{
BufferedReader in=new BufferedReader(new InputStreamReader(System.in));
Socket clsct=new Socket("127.0.0.1",139);
DataInputStream din=new DataInputStream(clsct.getInputStream());
DataOutputStream dout=new DataOutputStream(clsct.getOutputStream());
System.out.println("Enter String");
String str=in.readLine();
dout.writeBytes(str+"\n");
clsct.close();
}
catch (Exception e)
{
System.out.println(e);
}
}
}
```

rpcserver.java

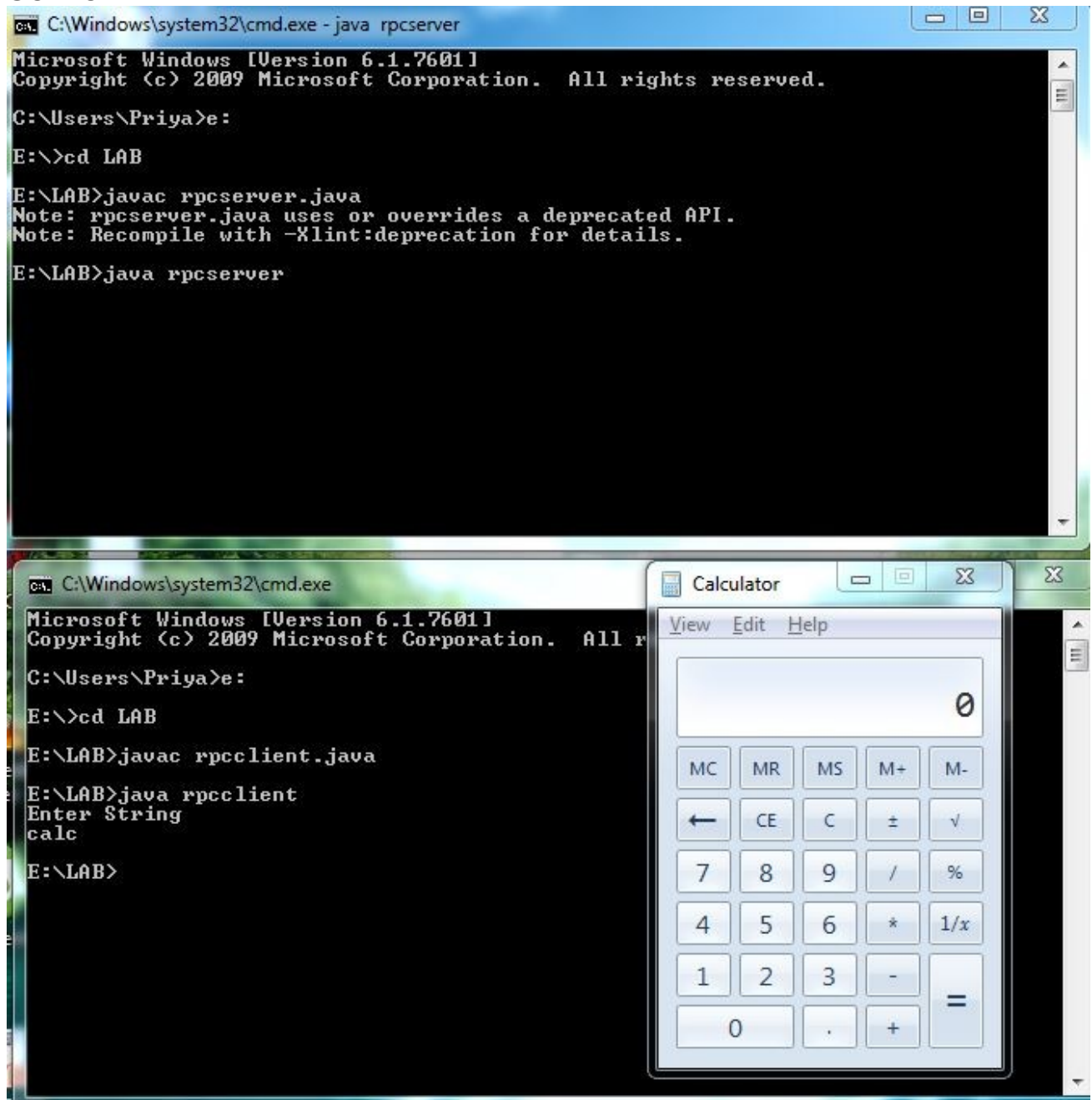
```
import java.io.*;
import java.net.*;
import java.util.*;
class rpcserver
{
public static void main(String args[])
{
try
{
ServerSocket obj=new ServerSocket(139);
while(true)
{
Socket obj1=obj.accept();
DataInputStream din=new DataInputStream(obj1.getInputStream());
DataOutputStream dout=new DataOutputStream(obj1.getOutputStream());
```

```

String str=din.readLine();
Process p=Runtime.getRuntime().exec(str);
}
}
catch(Exception e)
{
System.out.println(e);
}
}
}

```

OUTPUT



DESCRIPTION	MARK ALLOCATION
AIM & ALGORITHM	/20
PROGRAM	/40
EXECUTION	/30
VIVA	/10
TOTAL	/100

Result :

Thus the program was implemented to implement RPC (remote procedure call)

EX. No:7 DATE:	Subnetting
-------------------	-------------------

Aim:

Write a program to implement subnetting and find the subnet masks.

Algorithm :

- 1.Start the program.
- 2.Get the frame size from the user
- 3.To create the frame based on the user request.
- 4.To send frames to server from the client side.
- 5.If your frames reach the server it will send ACK signal to client otherwise it will send NACK signal to client.
- 6.Stop the program

Program

```

import java.util.Scanner;
class subnet
{
public static void main(String args[])
{
Scanner sc = new Scanner(System.in);
System.out.print("Enter the ip address:");
String ip = sc.nextLine();
String split_ip[] = ip.split("\\.");
String split_bip[] = new String[4];
String bip = "";
for(int i=0;i<4;i++)
{
split_bip[i] = appendZeros(Integer.toBinaryString(Integer.parseInt(split_ip[i])));
bip += split_bip[i];
}
System.out.println("IP in binary is "+bip);
System.out.print("Enter the number of addresses: ");
int n = sc.nextInt();
int bits = (int)Math.ceil(Math.log(n)/Math.log(2));
System.out.println("Number of bits required for address = "+bits);
int mask = 32-bits;
System.out.println("The subnet mask is = "+mask);
int fbip[] = new int[32];
for(int i=0; i<32;i++)
fbip[i] = (int)bip.charAt(i)-48;
for(int i=31;i>31-bits;i--)
fbip[i] &= 0;
String fip[] = {"", "", "", ""};
for(int i=0;i<32;i++)
fip[i/8] = new String(fip[i/8]+fbip[i]);
System.out.print("First address is = ");
for(int i=0;i<4;i++)
{
System.out.print(Integer.parseInt(fip[i],2));
if(i!=3)
System.out.print(".");
}
System.out.println();
int lbip[] = new int[32];
for(int i=0; i<32;i++) lbip[i] = (int)bip.charAt(i)-48;
for(int i=31;i>31-bits;i--)
lbip[i] |= 1;
String lip[] = {"", "", "", ""};
for(int i=0;i<32;i++)
lip[i/8] = new String(lip[i/8]+lbip[i]);

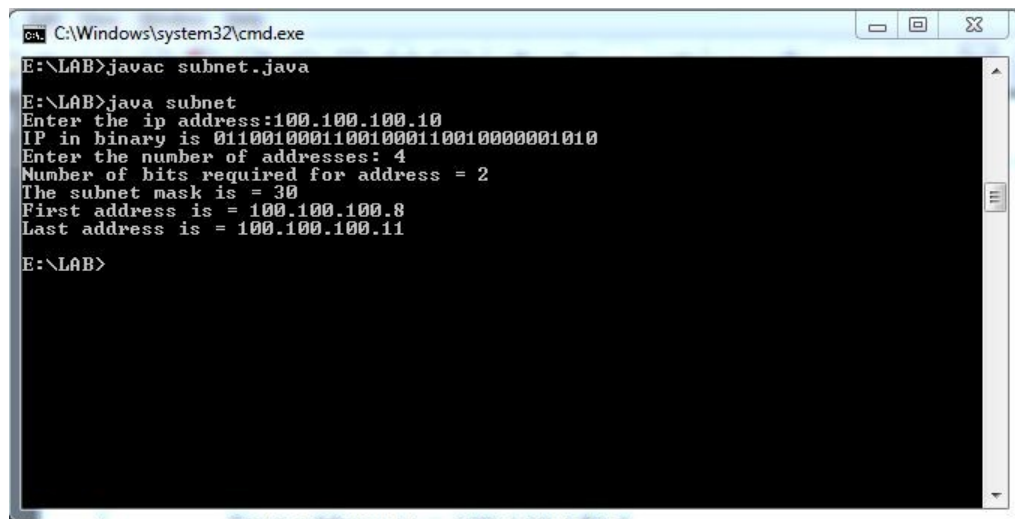
```

```

System.out.print("Last address is = ");
for(int i=0;i<4;i++)
{
System.out.print(Integer.parseInt(lip[i],2));
if(i!=3)
System.out.print(".");
}
System.out.println();
}
static String appendZeros(String s)
{
String temp = new String("00000000");
return temp.substring(s.length()+ s;
}
}

```

Output:



```

C:\Windows\system32\cmd.exe
E:\LAB>javac subnet.java
E:\LAB>java subnet
Enter the ip address:100.100.100.10
IP in binary is 01100100011001000110010000001010
Enter the number of addresses: 4
Number of bits required for address = 2
The subnet mask is = 30
First address is = 100.100.100.8
Last address is = 100.100.100.11
E:\LAB>

```

DESCRIPTION	MARK ALLOCATION
AIM & ALGORITHM	/20
PROGRAM	/40
EXECUTION	/30
VIVA	/10
TOTAL	/100

Result :

Thus the Program was displayed implement subnetting and find the subnet masks.

EX. No:8	Applications using TCP Sockets
DATE:	

Aim

To write a java program for application using TCP Sockets Links

Algorithm

- 1.Start the program.
- 2.Get the frame size from the user
- 3.To create the frame based on the user request.
- 4.To send frames to server from the client side.
- 5.If your frames reach the server it will send ACK signal to client otherwise it will send NACK signal to client.
- 6.Stop the program

Program :

a. Echo client and echo server

echoclient.java

```
import java.io.*;
import java.net.*;
import java.util.*;
public class echoclient
{
    public static void main(String args[])throws Exception
    {
        Socket c=null;
        DataInputStream usr_inp=null;
        DataInputStream din=new DataInputStream(System.in);
        DataOutputStream dout=null;
        try
        {
            c=new Socket("127.0.0.1",5678);
            usr_inp=new DataInputStream(c.getInputStream());
            dout=new DataOutputStream(c.getOutputStream());
        }
        catch(IOException e)
        {
        }
        if(c!=null || usr_inp!=null || dout!=null)
        {
            String unip;
            while((unip=din.readLine())!=null)
            {
                dout.writeBytes(""+unip);
                dout.writeBytes("\n");
                System.out.println("\n the echoed message");
                System.out.println(usr_inp.readLine());
                System.out.println("\n enter your message");
            }
            System.exit(0);
        }
        din.close();
        usr_inp.close();
        c.close();    }    }
```

echoserver.java

```
import java.io.*;
import java.net.*;
public class echoserver
{
    public static void main(String args[])throws Exception
    {
        ServerSocket m=null;
```



```

Socket c=null;
DataInputStream usr_inp=null;
DataInputStream din=new DataInputStream(System.in);
DataOutputStream dout=null;
try
{
m=new ServerSocket(5678);
c=m.accept();
usr_inp=new DataInputStream(c.getInputStream());
dout=new DataOutputStream(c.getOutputStream());
}
catch(IOException e)
{}
if(c!=null || usr_inp!=null)
{
String unip;
while(true)
{
System.out.println("\nMessage from Client...");
String m1=(usr_inp.readLine());
System.out.println(m1);
dout.writeBytes(""+m1);
dout.writeBytes("\n");
}
}
dout.close();
usr_inp.close();
c.close();
}
}

```

Output :

```
C:\Windows\system32\cmd.exe - java echoserver
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>e:
E:\>cd LAB
E:\LAB>javac echoserver.java
Note: echoserver.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
E:\LAB>java echoserver

Message from Client...
hi

Message from Client...
computer

Message from Client...
```

```
C:\Windows\system32\cmd.exe - java echoclient
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>e:
E:\>cd LAB
E:\LAB>javac echoclient.java
Note: echoclient.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
E:\LAB>java echoclient
hi

the echoed message
hi

enter your message
computer

the echoed message
computer

enter your message
```

b. Chat

talkclient.java

```
import java.io.*;
import java.net.*;
public class talkclient
```

```

{
public static void main(String args[])throws Exception
{
Socket c=null;
DataInputStream usr_inp=null;
DataInputStream din=new DataInputStream(System.in);
DataOutputStream dout=null;
Try
{
c=new Socket("127.0.0.1",1234);
usr_inp=new DataInputStream(c.getInputStream());
dout=new DataOutputStream(c.getOutputStream());
}
catch(IOException e)
{}
if(c!=null || usr_inp!=null || dout!=null)
{
String unip;
System.out.println("\nEnter the message for server:");
while((unip=din.readLine())!=null)
{
dout.writeBytes(""+unip);
dout.writeBytes("\n");
System.out.println("reply");
System.out.println(usr_inp.readLine());
System.out.println("\n enter your message:");
}
System.exit(0);
}
din.close();
usr_inp.close();
c.close();
}
}

```

talkserver.java

```

import java.io.*;
import java.net.*;
public class talkserver
{
public static void main(String args[])throws Exception
{
ServerSocket m=null;
Socket c=null;
DataInputStream usr_inp=null;
DataInputStream din=new DataInputStream(System.in);
DataOutputStream dout=null;
try
{
m=new ServerSocket(1234);
c=m.accept();
usr_inp=new DataInputStream(c.getInputStream());
dout=new DataOutputStream(c.getOutputStream());
}
catch(IOException e)
{}
}

```

```
if(c!=null||usr_inp!=null)
{
String unip;
while(true)
{
System.out.println("\nmessage from client:");
String m1=usr_inp.readLine();
System.out.println(m1);
System.out.println("enter your message:");
unip=din.readLine();
dout.writeBytes(""+unip);
dout.writeBytes("\n");
}
}
dout.close();
usr_inp.close();
c.close();
}
}
```

Output:

```
C:\Windows\system32\cmd.exe - java talkclient
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>e:

E:\>cd LAB

E:\LAB>javac talkclient.java
Note: talkclient.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.

E:\LAB>java talkclient

Enter the message for server:
chat Box
reply
yep

    enter your message:
```

```
C:\Windows\system32\cmd.exe - java talkserver
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>e:

E:\>cd LAB

E:\LAB>javac talkserver.java
Note: talkserver.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.

E:\LAB>java talkserver

message from client:
chat Box
enter your message:
yep

message from client:
```

C. File Transfer

fileclient.java

```
import java.io.*;
import java.net.*;
import java.util.*;
```

```

class fileclient
{ public static void main(String args[])
{
try
{
BufferedReader in=new BufferedReader(new InputStreamReader(System.in));
Socket clsct=new Socket("127.0.0.1",141);
DataInputStream din=new DataInputStream(clsct.getInputStream());
DataOutputStream dout=new DataOutputStream(clsct.getOutputStream());
System.out.println("Enter the file name:");
String str=in.readLine();
dout.writeBytes(str+"\n");
System.out.println("Enter the new file name:");
String str2=in.readLine();
String str1,ss;
FileWriter f=new FileWriter(str2);
char buffer[];
while(true)
{ str1=din.readLine();
if(str1.equals("-1")) break;
System.out.println(str1);
buffer=new char[str1.length()];
str1.getChars(0,str1.length(),buffer,0);
f.write(buffer);
}
f.close();
clsct.close();
}
catch (Exception e)
{
System.out.println(e);
}
}
}

```

fileserver.java

```

import java.io.*;
import java.net.*;
import java.util.*;
class fileserver
{ public static void main(String args[])
{
try
{
ServerSocket obj=new ServerSocket(141);
while(true)
{
Socket obj1=obj.accept();
DataInputStream din=new DataInputStream(obj1.getInputStream());
DataOutputStream dout=new DataOutputStream(obj1.getOutputStream());
String str=din.readLine();
FileReader f=new FileReader(str);
BufferedReader b=new BufferedReader(f);
String s;
while((s=b.readLine())!=null)

```

```

{ System.out.println(s);
dout.writeBytes(s+"\n");
}
f.close();
dout.writeBytes("-1\n");
}
}
catch(Exception e)
{
System.out.println(e);}
}
}

```

Output:



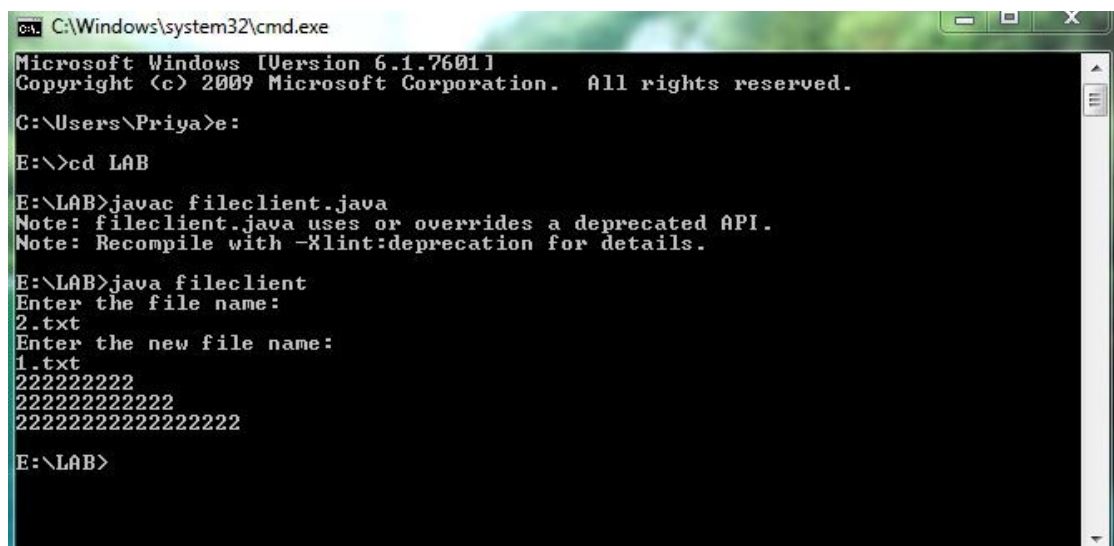
```

C:\Windows\system32\cmd.exe - java fileserver
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>e:
E:\>cd LAB
E:\LAB>javac fileserver.java
Note: fileserver.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.

E:\LAB>java fileserver
222222222
2222222222222
2222222222222222

```



```

C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>e:
E:\>cd LAB
E:\LAB>javac fileclient.java
Note: fileclient.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.

E:\LAB>java fileclient
Enter the file name:
2.txt
Enter the new file name:
1.txt
222222222
2222222222222
2222222222222222
E:\LAB>

```

DESCRIPTION	MARK ALLOCATION
AIM & ALGORITHM	/20
PROGRAM	/40
EXECUTION	/30
VIVA	/10
TOTAL	/100

Result:

Thus the java program to implement the TCP Sockets Links was executed successfully.

EX. No:9 DATE:	Applications using TCP and UDP Sockets
-------------------	--

a.DNS

Aim

To write a java program for DNS application program

Algorithm

- 1.Start the program.
- 2.Get the frame size from the user
- 3.To create the frame based on the user request.
- 4.To send frames to server from the client side.
- 5.If your frames reach the server it will send ACK signal to client otherwise it will send NACK signal to client.
- 6.Stop the program

Program

dnsserver.java

```
import java.io.*;
import java.net.*;
public class dnsserver
{
    private static int indexOf(String[] array, String str)
    {
        str = str.trim();
        for (int i=0; i < array.length; i++)
        {
            if (array[i].equals(str)) return i;
        }
        return -1;
    }
    public static void main(String arg[])throws IOException
    {
        String[] hosts = {"yahoo.com", "gmail.com","cricinfo.com", "facebook.com"};
        String[] ip = {"68.180.206.184", "209.85.148.19","80.168.92.140", "69.63.189.16"};
        System.out.println("Press Ctrl + C to Quit");
        while (true)
        {
            DatagramSocket serversocket=new DatagramSocket(1362);
            byte[] senddata = new byte[1021];
            byte[] receivedata = new byte[1021];
            DatagramPacket recvpack = new DatagramPacket
            (receivedata, receivedata.length);
            serversocket.receive(recvpack);
            String sen = new String(recvpack.getData());
            InetAddress ipaddress = recvpack.getAddress();
            int port = recvpack.getPort();
            String capsent;
            System.out.println("Request for host " + sen);
            if(indexOf (hosts, sen) != -1)
            capsent = ip[indexOf (hosts, sen)];
            else capsent = "Host Not Found";
            senddata = capsent.getBytes();
            DatagramPacket pack = new DatagramPacket
            (senddata, senddata.length,ipaddress,port);
            serversocket.send(pack);
            serversocket.close();
        }
    }
}
```

dnsclient.java

```

import java.io.*;
import java.net.*;
public class dnsclient
{
    public static void main(String args[])throws IOException
    {
        BufferedReader br = new BufferedReader(new InputStreamReader(System.in));
        DatagramSocket clientsocket = new DatagramSocket();
        InetAddress ipaddress;
        if (args.length == 0)
            ipaddress = InetAddress.getLocalHost();
        else
            ipaddress = InetAddress.getByName(args[0]);
        byte[] senddata = new byte[1024];
        byte[] receivedata = new byte[1024];
        int portaddr = 1362;
        System.out.print("Enter the hostname : ");
        String sentence = br.readLine();
        Senddata = sentence.getBytes();
        DatagramPacket pack = new DatagramPacket(senddata,senddata.length, ipaddress,portaddr);
        clientsocket.send(pack);
        DatagramPacket recvpack =new DatagramPacket(receivedata,receivedata.length);
        clientsocket.receive(recvpack);
        String modified = new String(recvpack.getData());
        System.out.println("IP Address: " + modified);
        clientsocket.close();
    }
}

```

Output

```
C:\Windows\system32\cmd.exe - java dnsserver
E:\>javac dnsserver.java
javac: file not found: dnsserver.java
Usage: javac <options> <source files>
use -help for a list of possible options
E:\>cd lab
E:\LAB>javac dnsserver.java
E:\LAB>java dnsserver
Press Ctrl + C to Quit
Request for host gmail.com
```

```
C:\Windows\system32\cmd.exe
Senddata = sentence.getBytes();
^
  symbol:   variable Senddata
  location: class dnsclient
1 error
E:\LAB>javac dnsclient.java
E:\LAB>java dnsclient
Enter the hostname : gmail.com
IP Address: 209.85.148.19
E:\LAB>
```

b. SNMP

Aim

To write a java program for SNMP application program

Algorithm

- 1.Start the program.
- 2.Get the frame size from the user
- 3.To create the frame based on the user request.
- 4.To send frames to server from the client side.
- 5.If your frames reach the server it will send ACK signal to client otherwise it will send NACK signal to client.
- 6.Stop the program

Program

```
import java.io.IOException;
import org.snmp4j.CommunityTarget;
import org.snmp4j.PDU;
import org.snmp4j.Snmp;
import org.snmp4j.Target;
import org.snmp4j.TransportMapping;
import org.snmp4j.event.ResponseEvent;
import org.snmp4j.mp.SnmpConstants;
import org.snmp4j.smi.Address;
import org.snmp4j.smi.GenericAddress;
import org.snmp4j.smi.OID;
import org.snmp4j.smi.OctetString;
import org.snmp4j.smi.VariableBinding;
import org.snmp4j.transport.DefaultUdpTransportMapping;

public class snmpmanager {
    Snmp snmp = null;
    String address = null;
    * Constructor
    * @param
    Add
    public snmpmanager(String add)
    {
        address = add;
        public static void main(String[] args) throws IOException {
            /**
            * Port 161 is used for Read and Other operations
            * Port 162 is used for the trap generation
            */
            SNMPManager client = new SNMPManager("udp:127.0.0.1/161");
            client.start();
            /**
            * OID - .1.3.6.1.2.1.1.1.0 => SysDec
            * OID - .1.3.6.1.2.1.1.5.0 => SysName
            * => MIB explorer will be usefull here, as discussed in previous article
            */
            String sysDescr = client.getAsString(new OID(".1.3.6.1.2.1.1.1.0"));
            System.out.println(sysDescr);
        }
        /**
        * get any answers because the communication is asynchronous
        * and the listen() method listens for answers.
        * @throws IOException
        */
        private void start() throws IOException {
```

```

TransportMapping transport = new DefaultUdpTransportMapping();
snmp = new
Snmpp(transport);
// Do not forget this line!
transport.listen();
}
/**
 * Method which takes a single OID and returns the response from the agent as a String.
 * @param oid
 * @return
 * @throws IOException
 */
public String getAsString(OID oid) throws IOException {
    ResponseEvent event = get(new OID[] { oid });
    return event.getResponse().get(0).getVariable().toString();
}
/**
 * This method is capable of handling multiple OIDs
 * @param oids
 * @return
 * @throws IOException
 */
public ResponseEvent get(OID oids[]) throws IOException {
    PDU pdu = new PDU();
    for (OID oid : oids) {
        pdu.add(new VariableBinding(oid));
    }
    pdu.setType(PDU.GET);
    ResponseEvent event = snmp.send(pdu, getTarget(), null);
    if(event != null) {
        return event;
    }
    throw new RuntimeException("GET timed out");
}
/**
 * This method returns a Target, which contains information about
 * where the data should be fetched and how.
 * @return
 */
private Target getTarget() {
    Address targetAddress = GenericAddress.parse(address);
    CommunityTarget target = new CommunityTarget();
    target.setCommunity(new OctetString("public"));
    target.setAddress(targetAddress);
    target.setRetries(2);
    target.setTimeout(1500);
    target.setVersion(SnmpConstants.version2c);
    return target;
}
}

```

Program

```
import java.io.*;
import java.net.*;
import java.util.*;
class ca
```

C. File Transfer

ca.java

```

{
public static void main(String args[])
{
try
{
BufferedReader in=new BufferedReader(new InputStreamReader(System.in));
Socket clsct=new Socket("127.0.0.4",142);
DataInputStream din=new DataInputStream(clsct.getInputStream());
DataOutputStream dout=new DataOutputStream(clsct.getOutputStream());
System.out.println("Enter the file name:");
String str=in.readLine();
dout.writeBytes(str+"\n");
System.out.println("Enter the new file name:");
String str2=in.readLine();
String str1,ss;
FileWriter f=new FileWriter(str2);
char buffer[];
while(true)
{ str1=din.readLine();
if(str1.equals("-1")) break;
System.out.println(str1);
buffer=new char[str1.length()];
str1.getChars(0,str1.length(),buffer,0);
f.write(buffer);
}
f.close();
clsct.close();
}
catch (Exception e)
{
System.out.println(e);
}
}
}

```

sa.java

```

import java.io.*;
import java.net.*;
import java.util.*;
class sa
{
public static void main(String args[])
{
try
{
ServerSocket obj=new ServerSocket(142);
while(true)
{
Socket obj1=obj.accept();
DataInputStream din=new DataInputStream(obj1.getInputStream());
DataOutputStream dout=new DataOutputStream(obj1.getOutputStream());
String str=din.readLine();
FileReader f=new FileReader(str);
BufferedReader b=new BufferedReader(f);
String s;

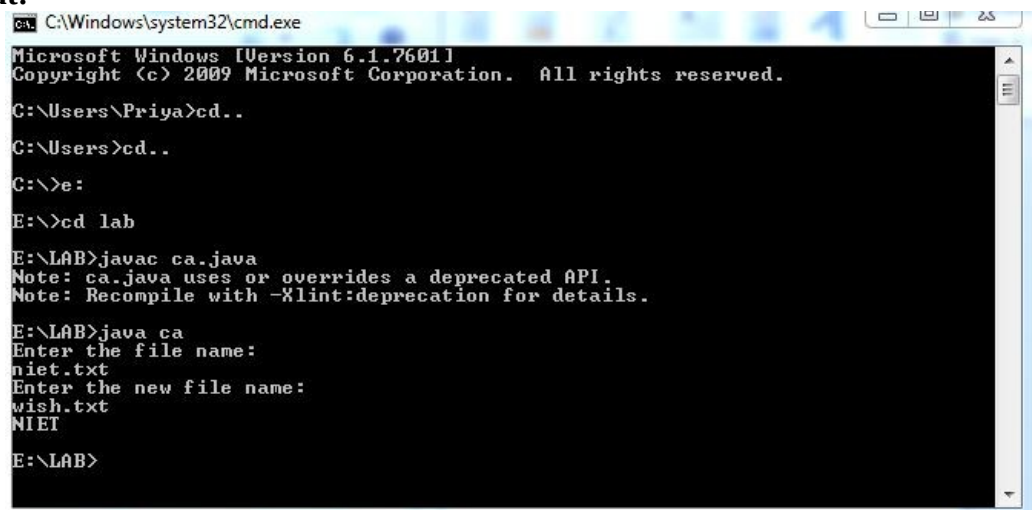
```

```

while((s=b.readLine())!=null)
{
    System.out.println(s);
    dout.writeBytes(s+"\n");
}
f.close();
dout.writeBytes("-1\n");
}
}
catch(Exception e)
{
    System.out.println(e);
}
}
}

```

Output:



```

C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>cd..
C:\Users>cd..
C:\>e:
E:\>cd lab
E:\LAB>javac ca.java
Note: ca.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
E:\LAB>java ca
Enter the file name:
niet.txt
Enter the new file name:
wish.txt
NIET
E:\LAB>

```



```

C:\Windows\system32\cmd.exe - java sa
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Priya>cd..
C:\Users>cd..
C:\>e:
E:\>cd lab
E:\LAB>javac sa.java
Note: sa.java uses or overrides a deprecated API.
Note: Recompile with -Xlint:deprecation for details.
E:\LAB>java sa
NIET

```


DESCRIPTION	MARK ALLOCATION
AIM & ALGORITHM	/20
PROGRAM	/40
EXECUTION	/30
VIVA	/10
TOTAL	/100

Result:

Thus the program was displayed application using file transfer.

EX. No:10 DATE:	Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
----------------------------------	---

Aim:

To Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS

NET WORK SIMULATOR (NS2)

Ns overview

- □ Ns programming: A Quick start

- □ Case study I: A simple Wireless network
- □ Case study II: Create a new agent in Ns

Ns overview

- □ Ns Status
- □ Periodical release (ns-2.26, Feb 2003)
- □ Platform support
- □ FreeBSD, Linux, Solaris, Windows and Mac

Ns unfunctionalities

Routing, Transportation, Traffic sources, Queuing disciplines, QoS

Wireless

Ad hoc routing, mobile IP, sensor-MAC Tracing, visualization and various utilities
NS(Network Simulators)

Most of the commercial simulators are GUI driven, while some network simulators are CLI driven. The network model / configuration describes the state of the network (nodes, routers, switches, links) and the events (data transmissions, packet error etc.). An important output of simulations are the trace files. Trace files log every packet, every event that occurred in the simulation and are used for analysis. Network simulators can also provide other tools to facilitate visual analysis of trends and potential trouble spots.

Most network simulators use discrete event simulation, in which a list of pending "events" is stored, and those events are processed in order, with some events triggering future events—such as the event of the arrival of a packet at one node triggering the event of the arrival of that packet at a downstream node.

Simulation of networks is a very complex task. For example, if congestion is high, then estimation of the average occupancy is challenging because of high variance. To estimate the likelihood of a buffer overflow in a network, the time required for an accurate answer can be extremely large. Specialized techniques such as "control variates" and "importance sampling" have been developed to speed simulation.

Examples of network simulators

There are many both free/open-source and proprietary network simulators. Examples of notable network simulation software are, ordered after how often they are mentioned in research papers:

1. ns (open source)
2. OPNET (proprietary software)
3. NetSim (proprietary software)

Uses of network simulators

Network simulators serve a variety of needs. Compared to the cost and time involved in setting up an entire test bed containing multiple networked computers, routers and data links, network simulators are relatively fast and inexpensive. They allow engineers, researchers to test scenarios that might be particularly difficult or expensive to emulate using real hardware - for instance, simulating a scenario with several nodes or experimenting with a new protocol in the network.

Network simulators are particularly useful in allowing researchers to test new networking protocols or changes to existing protocols in a controlled and reproducible environment. A typical network simulator encompasses a wide range of networking technologies and can help the users to build complex networks from basic building blocks such as a variety of nodes and links. With the help of simulators, one can design hierarchical networks using various types of nodes like computers, hubs, bridges, routers, switches, links, mobile units etc.

Various types of Wide Area Network (WAN) technologies like TCP, ATM, IP etc. and Local Area Network (LAN) technologies like Ethernet, token rings etc., can all be simulated with a typical simulator and the user can test, analyze various standard results apart from devising some novel

protocol or strategy for routing etc. Network simulators are also widely used to simulate battlefield networks in Network-centric warfare

There are a wide variety of network simulators, ranging from the very simple to the very complex. Minimally, a network simulator must enable a user to represent a network topology, specifying the nodes on the network, the links between those nodes and the traffic between the nodes. More complicated systems may allow the user to specify everything about the protocols used to handle traffic in a network. Graphical applications allow users to easily visualize the workings of their simulated environment. Text-based applications may provide a less intuitive interface, but may permit more advanced forms of customization.

Packet loss

Packet Loss occurs when one or more packets of data travelling across a computer network fail to reach their destination. Packet loss is distinguished as one of the three main error types encountered in digital communications; the other two being bit error and spurious packets caused due to noise. Packets can be lost in a network because they may be dropped when a queue in the network node overflows. The amount of packet loss during the steady state is another important property of a congestion control scheme. The larger the value of packet loss, the more difficult it is for transport layer protocols to maintain high bandwidths, the sensitivity to loss of individual packets, as well as to frequency and patterns of loss among longer packet sequences is strongly dependent on the application itself.

Throughput

This is the main performance measure characteristic, and most widely used. in communication networks, such as Ethernet or packet radio, throughput or network throughput is the average rate of successful message delivery over a communication channel. The throughput is usually measured in bits per second (bit/s or bps), and sometimes in data packets per second or data packets per time slot. This measure how soon the receiver is able to get a certain amount of data send by the sender. It is determined as the ratio of the total data received to the end to end delay. Throughput is an important factor which directly impacts the network performance

Delay

Delay is the time elapsed while a packet travels from one point e.g., source premise or network ingress to destination premise or network degrees. The larger the value of delay, the more difficult it is for transport layer protocols to maintain highband widths. We will calculate end to end delay

Queue Length

A queuing system in networks can be described as packets arriving for service, waiting for service if it is not immediate, and if having waited for service, leaving the system after being served. Thus queue length is very important characteristic to determine that how well the active queue management of the congestion control algorithm has been working.

Result

Thus the study of Network simulator (NS2) was studied

EX. No:11 DATE:	Perform a case study about the different routing algorithms to select the Network path with its optimum and economical during data transfer.
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i. Link State routing

Aim:

To study the link state routing

Link State routing

Routing is the process of selecting best paths in a network. In the past, the term routing was also used to mean forwarding network traffic among networks. However this latter function is much

better described as simply forwarding. Routing is performed for many kinds of networks, including the telephone network (circuit switching), electronic data networks (such as the Internet), and transportation networks. This article is concerned primarily with routing in electronic data networks using packet switching technology.

In packet switching networks, routing directs packet forwarding (the transit of logically addressed network packets from their source toward their ultimate destination) through intermediate nodes. Intermediate nodes are typically network hardware devices such as routers, bridges, gateways, firewalls, or switches. General-purpose computers can also forward packets and perform routing, though they are not specialized hardware and may suffer from limited performance. The routing process usually directs forwarding on the basis of routing tables which maintain a record of the routes to various network destinations. Thus, constructing routing tables, which are held in the router's memory, is very important for efficient routing. Most routing algorithms use only one network path at a time. Multipath routing techniques enable the use of multiple alternative paths.

In case of overlapping/equal routes, the following elements are considered in order to decide which routes get installed into the routing table (sorted by priority):

1. *Prefix-Length*: where longer subnet masks are preferred (independent of whether it is within a routing protocol or over different routing protocol)
2. *Metric*: where a lower metric/cost is preferred (only valid within one and the same routing protocol)
3. *Administrative distance*: where a lower distance is preferred (only valid between different routing protocols)

Routing, in a more narrow sense of the term, is often contrasted with bridging in its assumption that network addresses are structured and that similar addresses imply proximity within the network. Structured addresses allow a single routing table entry to represent the route to a group of devices. In large networks, structured addressing (routing, in the narrow sense) outperforms unstructured addressing (bridging). Routing has become the dominant form of addressing on the Internet. Bridging is still widely used within localized environments.

ii. Flooding

Flooding is a simple routing algorithm in which every incoming packet is sent through every outgoing link except the one it arrived on. Flooding is used in bridging and in systems such as Usenet and peer-to-peer file sharing and as part of some routing protocols, including OSPF, DVMRP, and those used in ad-hoc wireless networks. There are generally two types of flooding available, Uncontrolled Flooding and Controlled Flooding. Uncontrolled Flooding is the fatal law of flooding. All nodes have neighbours and route packets indefinitely. More than two neighbours creates a broadcast storm.

Controlled Flooding has its own two algorithms to make it reliable, SNCF (Sequence Number Controlled Flooding) and RPF (Reverse Path Flooding). In SNCF, the node attaches its own address and sequence number to the packet, since every node has a memory of addresses and sequence numbers. If it receives a packet in memory, it drops it immediately while in RPF, the node will only send the packet forward. If it is received from the next node, it sends it back to the sender.

Algorithm

There are several variants of flooding algorithm. Most work roughly as follows:

1. Each node acts as both a transmitter and a receiver.
 2. Each node tries to forward every message to every one of its neighbours except the source node.
- This results in every message eventually being delivered to all reachable parts of the network. Algorithms may need to be more complex than this, since, in some case, precautions have to be taken to avoid wasted duplicate deliveries and infinite loops, and to allow messages to eventually expire from the system. A variant of flooding called *selective flooding* partially addresses these issues by only sending packets to routers in the same direction. In selective flooding the routers don't send every incoming packet on every line but only on those lines which are going approximately in the right direction.

Advantages

- If a packet can be delivered, it will (probably multiple times).
- Since flooding naturally utilizes every path through the network, it will also use the shortest path.
- This algorithm is very simple to implement.

Disadvantages

- Flooding can be costly in terms of wasted bandwidth. While a message may only have one destination it has to be sent to every host. In the case of a ping flood or a denial of service attack, it can be harmful to the reliability of a computer network.
- Messages can become duplicated in the network further increasing the load on the networks bandwidth as well as requiring an increase in processing complexity to disregard duplicate messages.
- Duplicate packets may circulate forever, unless certain precautions are taken:
- Use a hop count or a time to live count and include it with each packet. This value should take into account the number of nodes that a packet may have to pass through on the way to its destination.
- Have each node keep track of every packet seen and only forward each packet once
- Enforce a network topology without loops
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iii . Distance vector

In computer communication theory relating to packet-switched networks, a **distancevector routing protocol** is one of the two major classes of routing protocols, the other major class being the link-state protocol. Distance-vector routing protocols use the Bellman–Ford algorithm, Ford–Fulkerson algorithm, or DUAL FSM (in the case of Cisco Systems's protocols) to calculate paths.

A distance-vector routing protocol requires that a router informs its neighbors of topology changes periodically. Compared to link-state protocols, which require a router to inform all the nodes in a network of topology changes, distance-vector routing protocols have less computational complexity and message overhead.

The term *distance vector* refers to the fact that the protocol manipulates *vectors* (arrays) of distances to other nodes in the network. The vector distance algorithm was the original ARPANET routing algorithm and was also used in the internet under the name of RIP (Routing Information Protocol).

Examples of distance-vector routing protocols include RIPv1 and RIPv2 and IGRP.

Method

Routers using distance-vector protocol do not have knowledge of the entire path to a destination. Instead they use two methods:

1. Direction in which router or exit interface a packet should be forwarded.
2. Distance from its destination

Distance-vector protocols are based on calculating the direction and distance to any link in a network. "Direction" usually means the next hop address and the exit interface. "Distance" is a measure of the cost to reach a certain node. The least cost route between any two nodes is the route with minimum distance. Each node maintains a vector (table) of minimum distance to every node. The cost of reaching a destination is calculated using various route metrics. RIP uses the hop count of the destination whereas IGRP takes into account other information such as node delay and available bandwidth.

Updates are performed periodically in a distance-vector protocol where all or part of a router's routing table is sent to all its neighbors that are configured to use the same distance-vector routing protocol. RIP supports cross-platform distance vector routing whereas IGRP is a Cisco Systems proprietary distance vector routing protocol. Once a router has this information it is able to amend its own routing table to reflect the changes and then inform its neighbors of the changes. This process has been described as *'routing by rumor'* because routers are relying on the information they receive from other routers and cannot determine if the information is actually valid and true. There

are a number of features which can be used to help with instability and inaccurate routing information.

EGP and BGP are not pure distance-vector routing protocols because a distance-vector protocol calculates routes based only on link costs whereas in BGP, for example, the local route preference value takes priority over the link cost.

Count-to-infinity problem

The Bellman–Ford algorithm does not prevent routing loops from happening and suffers from the **count-to-infinity problem**. The core of the count-to-infinity problem is that if A tells B that it has a path somewhere, there is no way for B to know if the path has B as a part of it. To see the problem clearly, imagine a subnet connected like A–B–C–D–E–F, and let the metric between the routers be "number of jumps". Now suppose that A is taken offline. In the vector-update-process B notices that the route to A, which was distance 1, is down – B does not receive the vector update from A. The problem is, B also gets an update from C, and C is still not aware of the fact that A is down – so it tells B that A is only two jumps from C (C to B to A), which is false. This slowly propagates through the network until it reaches infinity (in which case the algorithm corrects itself, due to the relaxation property of Bellman–Ford).

Result:

Thus The Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer.was complicated .