CONTENTS

Average mark :

Ex. No : 1 Date :	**Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.**

AIM:

To Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute ping.

COMMANDS :

1. Tcpdump:

Display traffic between 2 hosts:

To display all traffic between two hosts (represented by variables host1 and host2):

#tcpdump host host1 and host2

Display traffic from a source or destination host only:

To display traffic from only a source (src) or destination (dst) host:

tcpdump src host

tcpdump dst host

Display traffic for a specific protocol

Provide the protocol as an argument to display only traffic for a specific protocol, example tcp, udp, icmp, arp

tcpdump protocol

For example to display traffic only for the tcp traffic :

tcpdump tcp

Filtering based on source or destination port

To filter based on a source or destination port:

tcpdump src port ftp

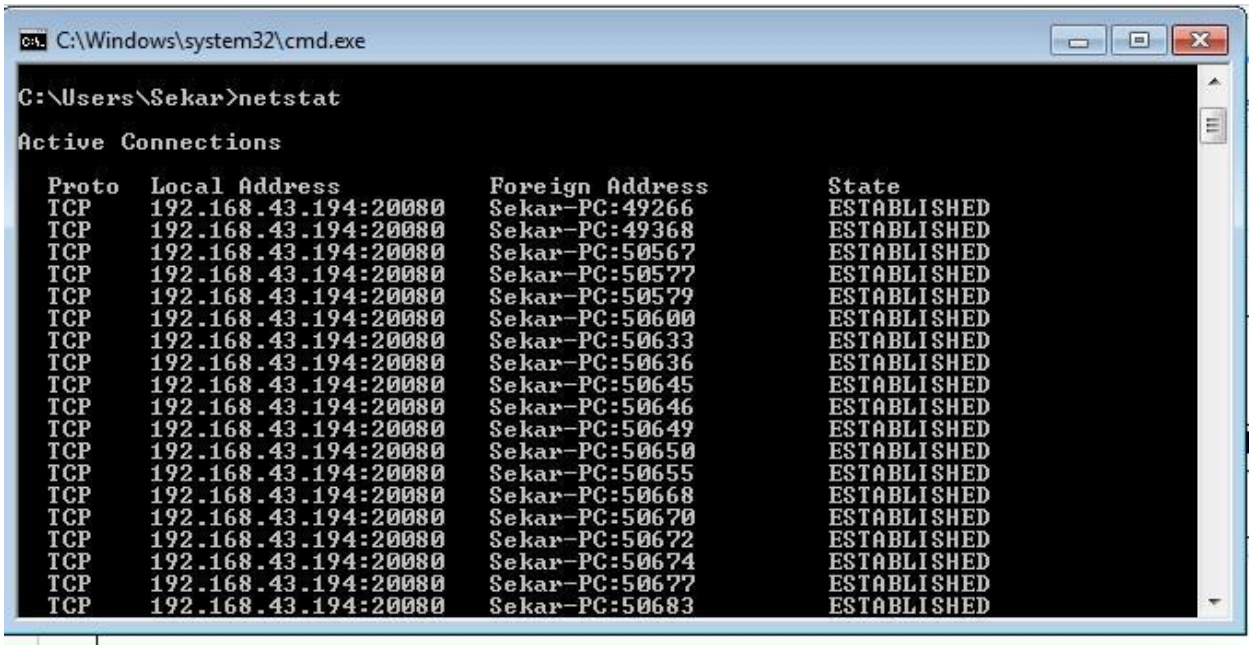
tcpdump dst port http

2. **Netstat**

Netstat is a common command line TCP/IP networking available in most versions of Windows, Linux, UNIX and other operating systems. Netstat provides information and statistics about protocols in use and current TCP/IP network connections. The Windows help screen (analogous to a Linux or UNIX for netstat reads as follows:

displays protocol statistics and current TCP/IP network connections.

#netstat



3. **ipconfig**

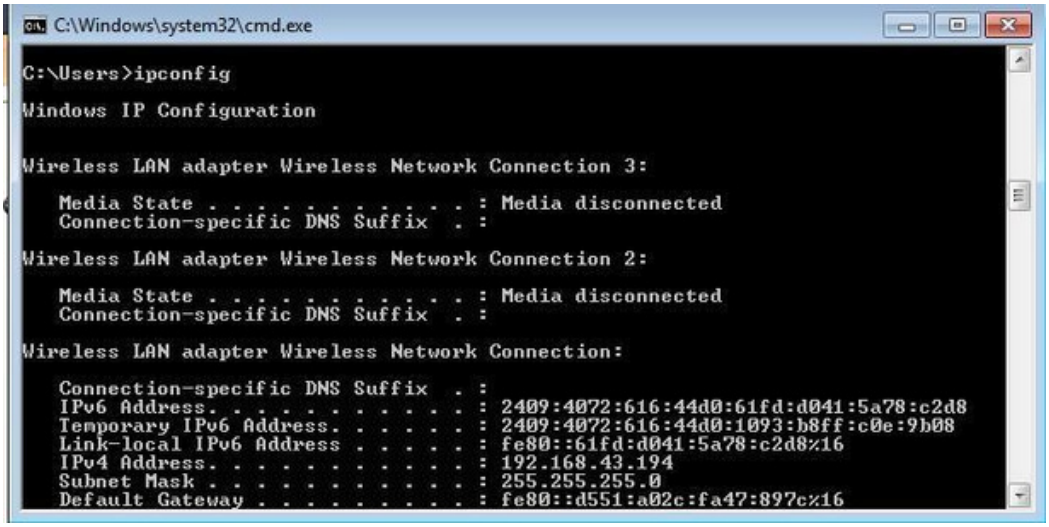
In Windows, ipconfig is a console application designed to run from the Windows command prompt. This utility allows you to get the IP address information of a Windows computer.

Using ipconfig

From the command prompt, type ipconfig to run the utility with default options. The output of the default command contains the IP address, network mask, and gateway for all physical and virtual

network adapter.

#ipconfig



4. nslookup

The nslookup (which stands for name server lookup) command is a network utility program used to obtain information about internet servers. It finds name server information for domains by querying the Domain Name System. The nslookup command is a powerful tool for diagnosing DNS problems. You know you're experiencing a DNS problem when you can access a resource by specifying its IP address but not its
DNS name.
#nslookup

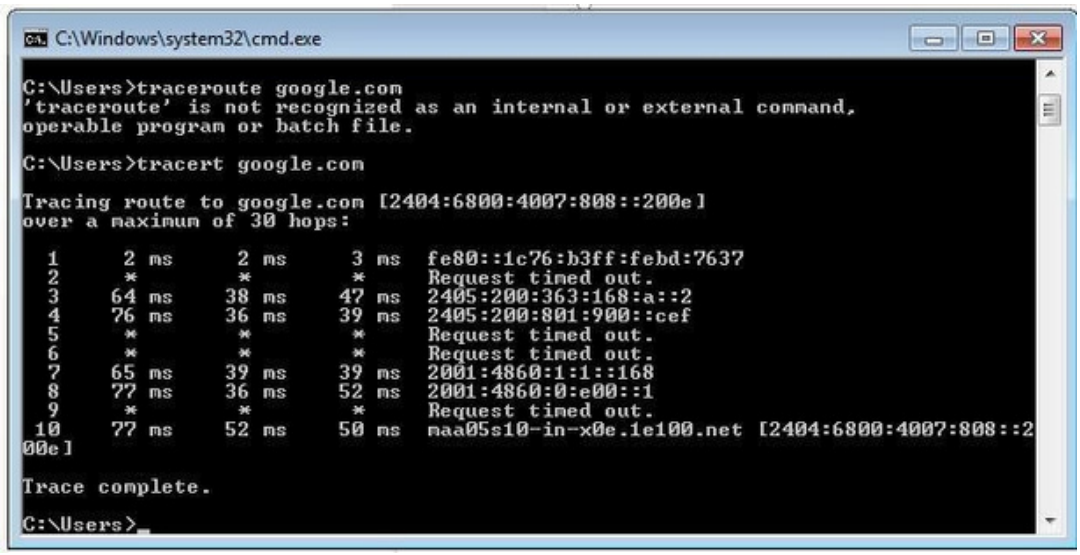
5. Trace route:

Traceroute uses Internet Control Message Protocol (ICMP) echo packets with variable time to live (TTL) values. The response time of each hop is calculated. To guarantee accuracy, each hop is queried multiple times (usually three times) to better measure the response of that particular hop. Traceroute is a network diagnostic tool used to track the pathway taken by a packet on an IP network from source to destination. Traceroute also records the time taken for each hop the packet makes during its route to the destination. Traceroute uses Internet Control Message Protocol (ICMP) echo packets with variable time to live (TTL) values. The response time of each

hop is calculated. To guarantee accuracy, each hop is queried multiple times (usually three times) to better measure the response of that particular hop. Traceroute sends packets with TTL values that gradually increase from packet to packet, starting with TTL value of one. Routers decrement TTL values of packets by one when routing and discard packets whose TTL value has reached zero, returning the ICMP error
message ICMP Time Exceeded. For the first set of packets, the first router receives the packet, decrements the TTL value and drops the packet because it then has TTL value zero. The router sends an ICMP Time Exceeded message back to the source. The next set of packets are given a TTL value of two, so the first router forwards the packets, but the second router drops them and replies with ICMP Time Exceeded.

Proceeding in this way, traceroute uses the returned ICMP Time Exceeded messages to build a list of routers that packets traverse, until the destination is reached and returns an ICMP Echo Reply message. With the tracert command shown above, we're asking tracert to show us the path from the local computer all the way to the network device with the hostname
www.google.com.

#tracert google.com



6. Ping:

The ping command sends an echo request to a host available on the network. Using this command, you can check if your remote host is responding well or not. Tracking and isolating hardware and software problems. Determining the status of the network and various foreign hosts. The ping command is usually used as a simple way to verify that a computer can communicate over the network with another computer or network device. The ping command operates by sending Internet Control Message Protocol (ICMP) Echo Request messages to the destination computer and waiting for a response

ping172.16.6.2

RESULT:

Thus the various networks commands like tcpdump, netstat, ifconfig, nslookup and traceroute ping are executed successfully

Ex. No : 2 Date :	**Write a HTTP web client program to download a web page using TCP sockets**

AIM:

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

ALGORITHM:

Client:

1. Start.
2. Create socket and establish the connection with the
3. server. Read the image to be uploaded from the disk
4. Send the image read to the server
5. Terminate the connection
6. Stop.

Server:

1. Start
2. Create socket, bind IP address and port number with the created socket and make server a listening server.
3. Accept the connection request from the client
4. Receive the image sent by the client.
5. Display the image.
6. Close the connection.
7. Stop

PROGRAM

Client

```
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 Client {
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();
      }
}
```

SERVER

```
import java.net.*;
import java.io.*;
import java.awt.image.*;
import javax.imageio.*;
import javax.swing.*;

class Server {
      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

When you run the client code, following output screen would appear on client side.

RESULT:

Thus the socket program for HTTP for web page upload and download was developed and executed successfully.

Ex. No :3 Date :	Applications using TCP sockets like: Echo client and echo server

AIM:

To write a java program for application using TCP Sockets Link.

Echo client and echo server

ALGORITHM:

Client:

1. Start
2. Create the TCP socket
3. Establish connection with the server
4. Get the message to be echoed from the user
5. Send the message to the server
6. Receive the message echoed by the server
7. Display the message received from the server
8. Terminate the connection
9. Stop

Server:

1. Start
2. Create TCP socket, make it a listening socket
3. Accept the connection request sent by the client for connection establishment
4. Receive the message sent by the client
5. Display the received message
6. Send the received message to the client from which it receives
7. Close the connection when client initiates termination and server becomes a listening server, waiting for clients.
8. Stop.

PROGRAM

EServer.java

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

public class EServer {
public static void main(String args[]) {
ServerSocket s = null;
String line;
DataInputStream is;
PrintStream ps;
Socket c = null;
try{
s = new ServerSocket(9000);
} catch (IOException e) {

System.out.println(e);

}
try{

c = s.accept();
                    is = new DataInputStream(c.getInputStream());

ps = new PrintStream(c.getOutputStream());
while (true) {
line = is.readLine();
ps.println(line);
}
} catch (IOException e) {
System.out.println(e);
}
}


}
```

EClient.java

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

public class EClient {
public static void main(String arg[]) {
Socket c = null;
String line;
DataInputStream is, is1;
PrintStream os;
try{
InetAddress ia = InetAddress.getLocalHost();
c = new Socket(ia, 9000);
} catch (IOException e) {
System.out.println(e);

}
try{

os = new PrintStream(c.getOutputStream());
is = new DataInputStream(System.in);
is1 = new DataInputStream(c.getInputStream());
while (true) {
System.out.println("Client:");
line = is.readLine();
os.println(line);System.out.println("Server:" + is1.readLine());

}
} catch (IOException e) {
                System.out.println("Socket Closed!");
}
}


}
```

OUTPUT

Server

```
C:\Program Files\Java\jdk1.5.0\bin>javac EServer.java
C:\Program Files\Java\jdk1.5.0\bin>java EServer
C:\Program Files\Java\jdk1.5.0\bin>Client
C:\Program  Files\Java\jdk1.5.0\bin>javac  EClient.java
C:\Program Files\Java\jdk1.5.0\bin>java EClient
Client: Hai Server
Server:Hai Server
Client: Hello
Server:Hello
Client:end
Server:end
Client:ds
Socket Closed!
```

RESULT:

Thus the java application program using TCP Sockets was developed and executed successfully.

Ex. No : 4 Date :	**Simulation of DNS using UDP Sockets**

AIM

To write a java program for DNS application

ALGORITHM

Server

1.Start
2.Create UDP datagram socket
3.Create a table that maps host name and IP address
4.Receive the host name from the client
5.Retrieve the client‘s IP address from the received datagram
6.Get the IP address mapped for the host name from the table.
7.Display the host name and corresponding IP address
8.Send the IP address for the requested host name to the client
9.Stop.

Client

1.Start
2.Create UDP datagram socket.
3.Get the host name from the client
4.Send the host name to the server
5.Wait for the reply from the server
6.Receive the reply datagram and read the IP address for the requested host name
7.Display the IP address.
8.Stop.

PROGRAM

DNS Server.java

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

public class udpdnsserver {
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();
```

```
            }
      }
}
```

UDP DNS Client java

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

public class udpdnsclient {
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

Server

```
javac udpdnsserver.java
java udpdnsserver
Press Ctrl + C to Quit
Request for host yahoo.com
Request for host cricinfo.com
Request for host youtube.com
```

Client

```
>javac udpdnsclient.java
>java udpdnsclient
Enter the hostname : yahoo.com
IP Address: 68.180.206.184
>java udpdnsclient
Enter the hostname : cricinfo.com
IP Address: 80.168.92.140
>java udpdnsclient
Enter the hostname : youtube.com
IP Address: Host Not Found
```

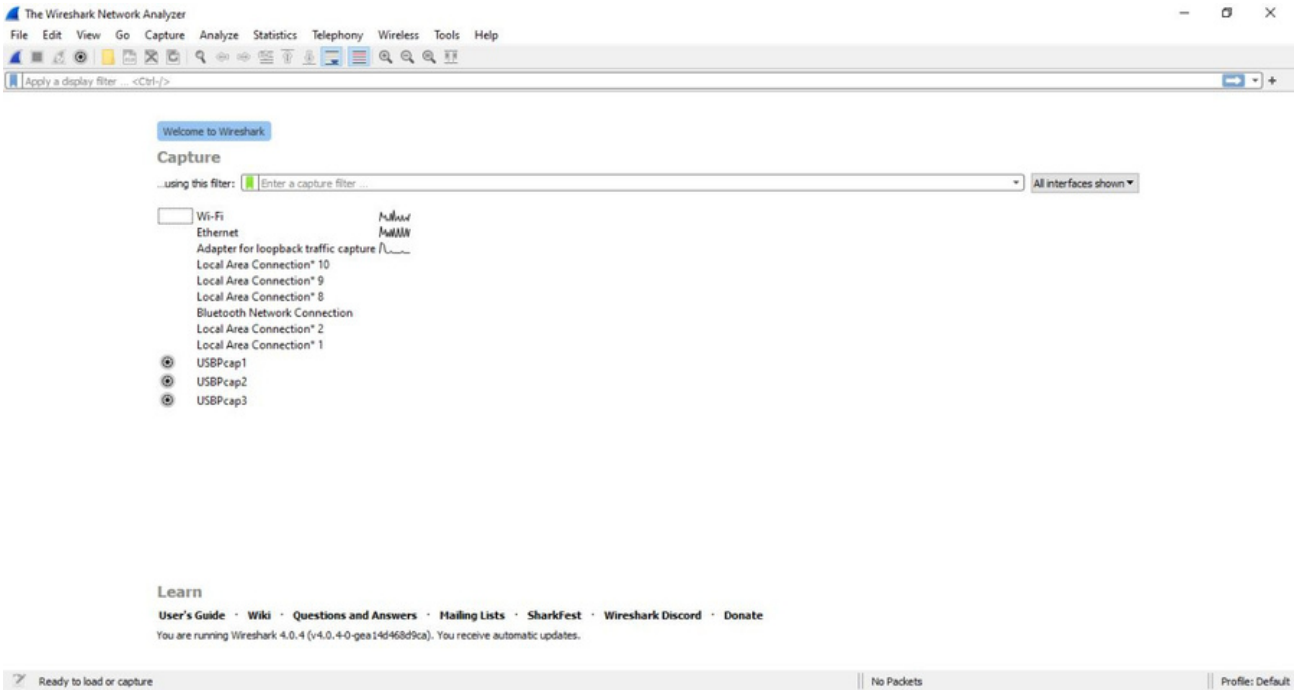
RESULT:

Thus the java application program using UDP Sockets to implement DNS was developed and executed successfully

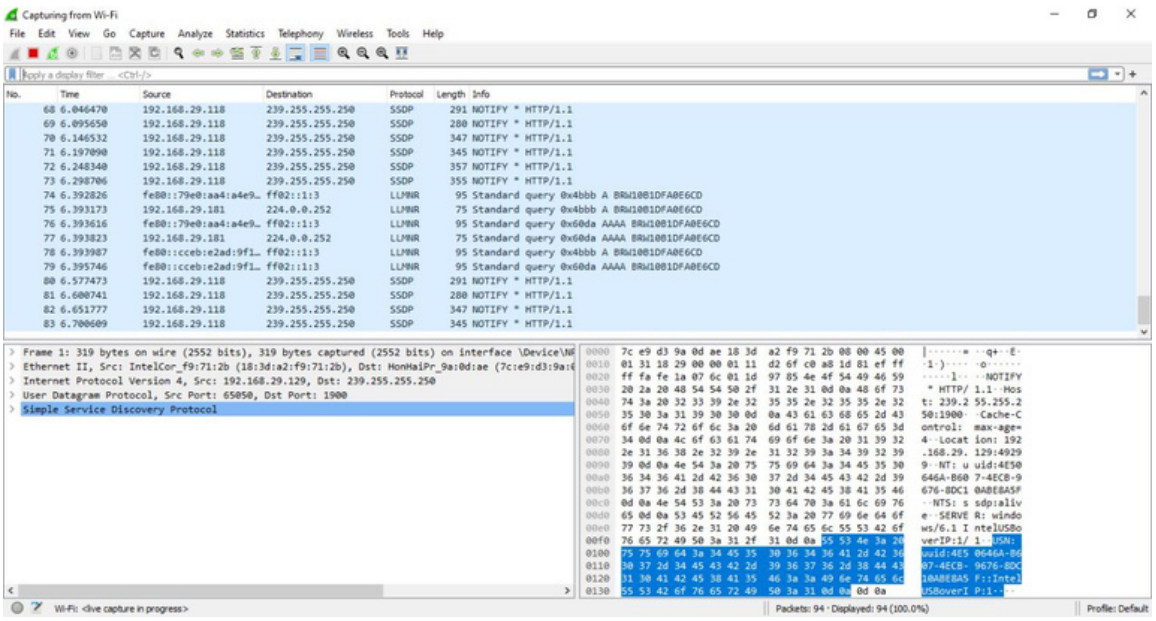
Ex. No : 5 Date :	**Use a tool like Wireshark to capture packets and examine the packets**

Wireshark is a network protocol analyzer, or an application that captures packets from a network connection, such as from your computer to your home office or the internet. Packet is the name given to a discrete unit of data in a typical Ethernet network.

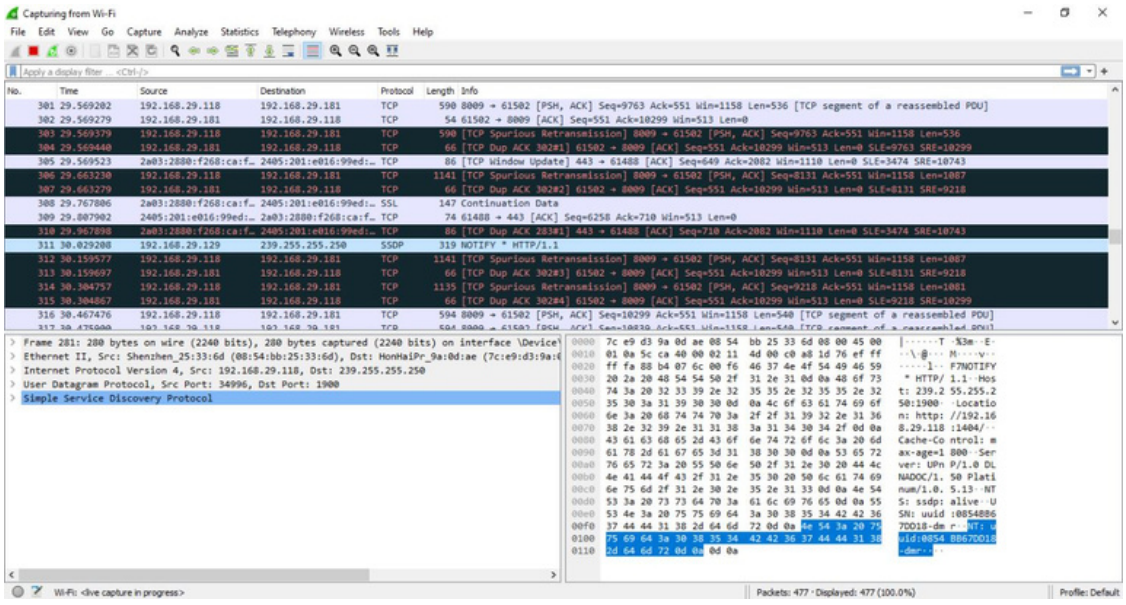
1. **Packet Capture**: Wireshark listens to a network connection in real time and then grabs entire streams of traffic – quite possibly tens of thousands of packets at a time.
2. **Filtering**: Wireshark is capable of slicing and dicing all of this random live data using filters. By applying a filter, you can obtain just the information you need to see.
3. **Visualization**: Wireshark, like any good packet sniffer, allows you to dive right into the very middle of a network packet. It also allows you to visualize entire conversations and network streams.



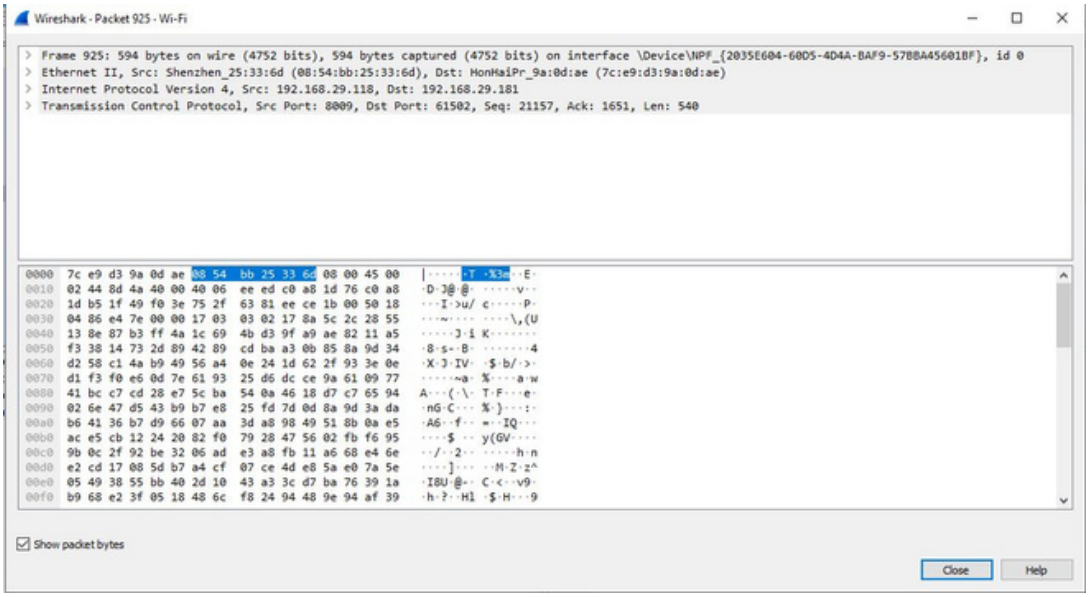
Wireshark Network Analyzer Interface



Viewing a packet capture in Wireshark



Drilling down into a packet to identify a network problem using Wireshark



The last window called the packet contents window, which displays the content in ASCII and hexadecimal format.

Ex. No : 6 Date :	**Simulating ARP /RARP protocols**

AIM:

To write a java program for simulating ARP and RARP protocols using TCP.

ALGORITHM:

Client

1.Start the program
2.Create socket and establish connection with the server.
3.Get the IP address to be converted into MAC address from the user.
4.Send this IP address to server.
5.Receive the MAC address for the IP address from the server.
6.Display the received MAC address
7.Terminate the connection

Server

1.Start the program
2.Create the socket, bind the socket created with IP address and port number and make it a listening socket.
3.Accept the connection request when it is requested by the client.
4.Server maintains the table in which IP and corresponding MAC addresses are stored.
5.Receive the IP address sent by the client.
6.Retrieve the corresponding MAC address for the IP address and send it to the client.
7.Close the connection with the client and now the server becomes a listening server waiting for the connection request from other clients
8.Stop

PROGRAM

Client:

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

class Clientarp {
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 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);
}
}

}
```

Server:

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

class Serverarp {
public static void main(String args[]) {
try{
ServerSocket obj = new ServerSocket(139);
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);

        }
    }}}
```

Output:

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

(b)Program for Reverse Address Resolution Protocol (RARP) using UDP

ALGORITHM:

Client

1.Start the program
2.Create datagram socket
3.Get the MAC address to be converted into IP address from the user.
4.Send this MAC address to server using UDP datagram.
5.Receive the datagram from the server and display the corresponding IP address. 6.Stop

Server

1.Start the program.

2.Server maintains the table in which IP and corresponding MAC addresses are stored.

3.Create the datagram socket

4.Receive the datagram sent by the client and read the MAC address sent.

5.Retrieve the IP address for the received MAC address from the table.

6.Display the corresponding IP address.

7.Stop

PROGRAM:

Client:

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

class Clientrarp12 {
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);
```

```
            }
        }
}
```

Server:

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

class Serverrarp12 {
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();
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);
}



        }}
```

Output:

```
I:\ex>java Serverrarp12
I:\ex>java Clientrarp12
Enter the Physical address (MAC): 6A:08:AA:C2
The Logical Address is(IP): 165.165.80.80
```

RESULT :

Thus the program for implementing to display simulating ARP and RARP protocols was executed successfully and output is verified.

Ex. No : 7 Date :	Network simulator (NS) and Simulation of Congestion Control Algorithms using NS

AIM:

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

PROGRAM:

```
#include <wifi_lte/wifi_lte_rtable.h>
struct r_hist_entry *elm, *elm2;
int num_later = 1;
elm = STAILQ_FIRST(&r_hist_);
while (elm != NULL && num_later <= num_dup_acks_)
{
    num_later;
    elm = STAILQ_NEXT(elm, linfo_);
}
if (elm != NULL)
{
    elm = findDataPacketInRecvHistory(STAILQ_NEXT(elm, linfo_));
    if (elm != NULL)
    {
        elm2 = STAILQ_NEXT(elm, linfo_);
        while (elm2 != NULL)
        {
            if (elm2->seq_num_ < seq_num && elm2->t_recv_ < time)
        {
        STAILQ_REMOVE(&r_hist_, elm2, r_hist_entry, linfo_);
        delete elm2;
         }
         else
            elm = elm2;
         elm2 = STAILQ_NEXT(elm, linfo_);
        }
```

```
void DCCPTFRCAgent::removeAcksRecvHistory(){
struct r_hist_entry *elm1 = STAILQ_FIRST(&r_hist_);
struct r_hist_entry *elm2;

int num_later = 1;
while (elm1 != NULL && num_later <= num_dup_acks_){
 num_later;
 elm1 = STAILQ_NEXT(elm1, linfo_);
}

 if(elm1 == NULL)
       return;

elm2 = STAILQ_NEXT(elm1, linfo_);
while(elm2 != NULL){
        if (elm2->type_ == DCCP_ACK){
             STAILQ_REMOVE(&r_hist_,elm2,r_hist_entry,linfo_);
             delete elm2;
         } else {
             elm1 = elm2;
         }
          elm2 = STAILQ_NEXT(elm1, linfo_);
}
}


inline r_hist_entry *DCCPTFRCAgent::findDataPacketInRecvHistory(r_hist_entry *start){
while(start != NULL && start->type_ == DCCP_ACK)
          start = STAILQ_NEXT(start,linfo_);
return start;
}
```

RESULT:

Thus we have Studied Network simulator (NS) and Simulation of CongestionControl Algorithms using NS.

Ex. No : 8 Date :	TCP/UDP performance using Simulation tool.

AIM :

To simulate the performance of TCP/UDP using NS2.

TCP PERFORMANCE ALGORITHM

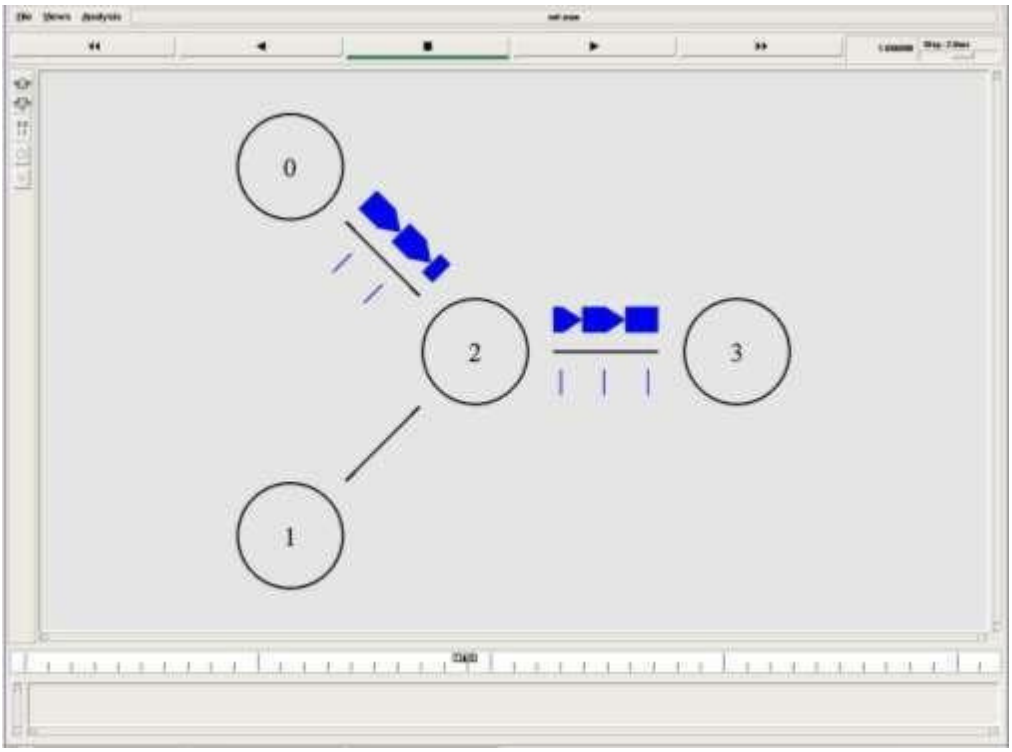
1. Create a Simulator object.
2. Set routing as dynamic.
3. Open the trace and nam trace files.
4. Define the finish procedure.
5. Create nodes and the links between them.
6. Create the agents and attach them to the nodes.
7. Create the applications and attach them to the tcp
8. agent. Connect tcp and tcp sink.
9. Run the simulation.

PROGRAM:

```
set ns [new Simulator]
$ns color 0 Blue
$ns color 1 Red
$ns color 2 Yellow set n0 [$ns node] set n1 [$ns node] set n2 [$ns node] set n3 [$ns node]
set f [open tcpout.tr w]
$ns trace-all $f
set nf [open tcpout.nam w]
$ns namtrace-all $nf
$ns duplex-link $n0 $n2 5Mb 2ms DropTail
$ns duplex-link $n1 $n2 5Mb 2ms DropTail
$ns duplex-link $n2 $n3 1.5Mb 10ms DropTail
$ns duplex-link-op $n0 $n2 orient right-up
$ns duplex-link-op $n1 $n2 orient right-down
$ns duplex-link-op $n2 $n3 orient right
$ns duplex-link-op $n2 $n3 queuePos 0.5 set tcp [new Agent/TCP]
```

```
$tcp set class_ 1
set sink [new Agent/TCPSink]
$ns attach-agent $n1 $tcp
$ns attach-agent $n3 $sink
$ns connect $tcp $sink
set ftp [new Application/FTP]
$ftp attach-agent $tcp
$ns at 1.2 "$ftp start"
$ns at 1.35 "$ns detach-agent $n1 $tcp ; $ns detach-agent $n3 $sink"
$ns at 3.0 "finish" proc finish {} {
global ns f nf
$ns flush-trace close $f
close $nf
puts "Running nam.."
  exec xgraph tcpout.tr -geometry 600x800 & exec nam tcpout.nam &
exit 0
}
$ns run
```

OUTPUT :



UDP Performance

ALGORITHM :

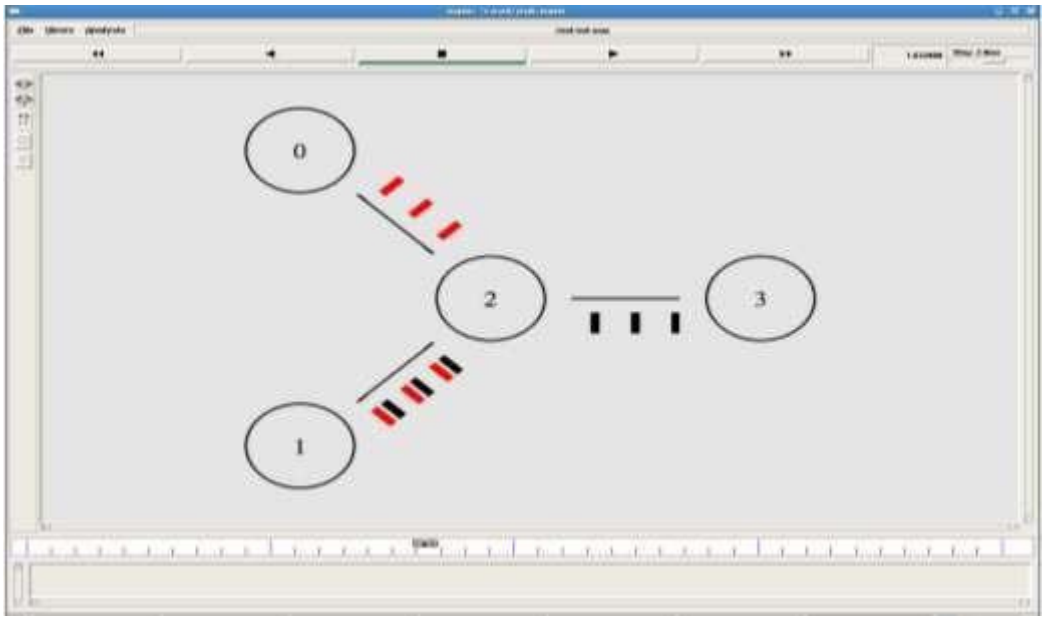
1. Create a Simulator object.
2. Set routing as dynamic.
3. Open the trace and nam trace files.
4. Define the finish procedure.
5. Create nodes and the links between them.
6. Create the agents and attach them to the nodes.
7. Create the applications and attach them to the UDP
8. agent. Connect udp and null agents.
9. Run the simulation.

PROGRAM:

```
set ns [new Simulator]
$ns color 0 Blue
$ns color 1 Red
$ns color 2 Yellow set n0 [$ns node] set n1 [$ns node] set n2 [$ns node] set n3 [$ns node]
set f [open udpout.tr w]
$ns trace-all $f
set nf [open udpout.nam w]
$ns namtrace-all $nf
$ns duplex-link $n0 $n2 5Mb 2ms DropTail
$ns duplex-link $n1 $n2 5Mb 2ms DropTail
$ns duplex-link $n2 $n3 1.5Mb 10ms DropTail
$ns duplex-link-op $n0 $n2 orient right-up
$ns duplex-link-op $n1 $n2 orient right-down
$ns duplex-link-op $n2 $n3 orient right
$ns duplex-link-op $n2 $n3 queuePos 0.5 set udp0 [new Agent/UDP]
$ns attach-agent $n0 $udp0
set cbr0 [new Application/Traffic/CBR]
$cbr0 attach-agent $udp0 set udp1 [new Agent/UDP]
$ns attach-agent $n3 $udp1
$udp1 set class_ 0
set cbr1 [new Application/Traffic/CBR]
$cbr1 attach-agent $udp1 set null0 [new Agent/Null]
$ns attach-agent $n1 $null0 set null1 [new Agent/Null]
```

```
$ns attach-agent $n1 $null1
$ns connect $udp0 $null0
$ns connect $udp1 $null1
$ns at 1.0 "$cbr0 start"
$ns at 1.1 "$cbr1 start"
puts [$cbr0 set packetSize_] puts [$cbr0 set interval_]
$ns at 3.0 "finish" proc finish {} {
global ns f nf
$ns flush-trace close $f
close $nf
   puts "Running nam.." exec nam udpout.nam & exit 0
}
$ns run
```

OUTPUT:



RESULT :

Thus the study of TCP/UDP performance is done successfully.

Ex. No :9 Date :	Simulation of Distance Vector/ Link State Routing algorithm.

AIM :

To simulate the Distance vector and link state routing protocols using NS2.

ALGORITHM:

1. Create a Simulator object.
2. Set routing as dynamic.
3. Open the trace and nam trace files.
4. Define the finish procedure.
5. Create nodes and the links between them.
6. Create the agents and attach them to the nodes.
7. Create the applications and attach them to the udp
8. agent. Connect udp and null..
9. At 1 sec the link between node 1 and 2 is broken.
10. At 2 sec the link is up again.
11. Run the simulation.

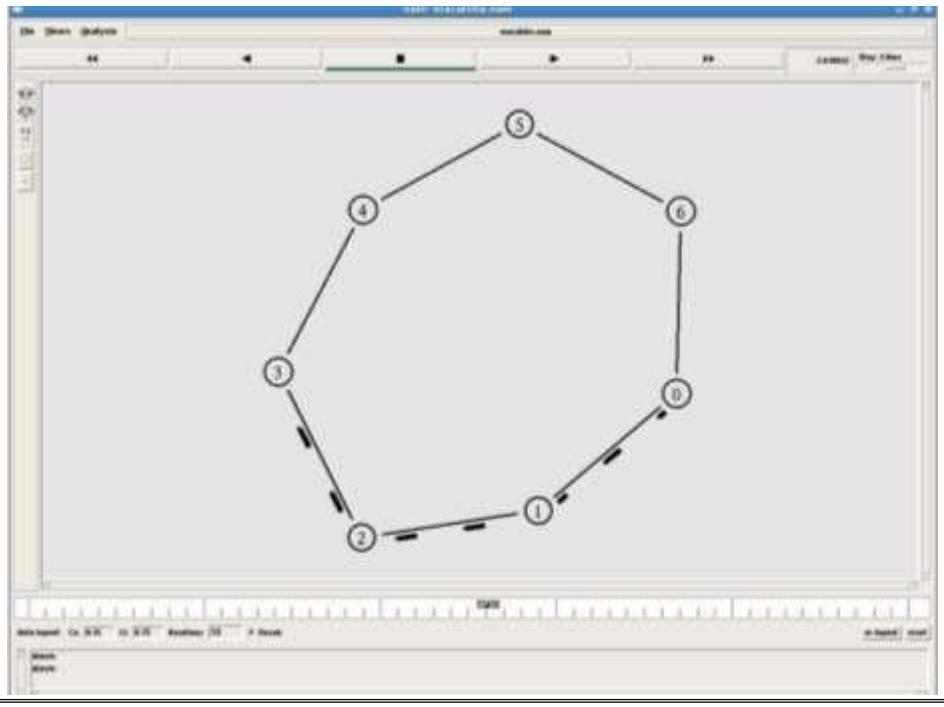
LINK STATE ROUTING PROTOCOL

PROGRAM :

```
set ns [new Simulator]
$ns rtproto LS
set nf [open linkstate.nam w]
$ns namtrace-all $nf
set f0 [open linkstate.tr w]
$ns trace-all $f0 proc finish {} {
    global ns f0 nf
    $ns flush-trace
    close $f0
    close $nf
    exec nam linkstate.nam & exit 0
```

```
}
for {set i 0} {$i <7} {incr i}
{ set n($i) [$ns node]
}
for {set i 0} {$i <7} {incr i} {
    $ns duplex-link $n($i) $n([expr ($i+1)%7]) 1Mb 10ms DropTail
}
set udp0 [new Agent/UDP]
$ns attach-agent $n(0) $udp0
set cbr0 [new Application/Traffic/CBR]
$cbr0 set packetSize_ 500
$cbr0 set interval_ 0.005
$cbr0 attach-agent $udp0 set null0 [new Agent/Null]
$ns attach-agent $n(3) $null0
$ns connect $udp0 $null0
$ns at 0.5 "$cbr0 start"
$ns rtmodel-at 1.0 down $n(1) $n(2)
$ns rtmodel-at 2.0 up $n(1) $n(2)
$ns at 4.5 "$cbr0 stop"
$ns at 5.0 "finish"
$ns run
```

OUTPUT :



DISTANCE VECTOR ROUTING

ALGORITHM:

1. Create a simulator object
2. Set routing protocol to Distance Vector routing
3. Trace packets on all links onto NAM trace and text trace file
4. Define finish procedure to close files, flush tracing and run NAM
5. Create eight nodes
6. Specify the link characteristics between nodes
7. Describe their layout topology as a octagon
8. Add UDP agent for node n1
9. Create CBR traffic on top of UDP and set traffic parameters.
10. Add a sink agent to node n4
11. Connect source and the sink
12. Schedule events as follows:
    a. Start traffic flow at 0.5
    b. Down the link n3-n4 at 1.0
    c. Up the link n3-n4 at 2.0
    d. Stop traffic at 3.0
    e. Call finish procedure at 5.0
13. Start the scheduler
14. Observe the traffic route when link is up and down
15. View the simulated events and trace file analyze it
16. Stop

PROGRAM :

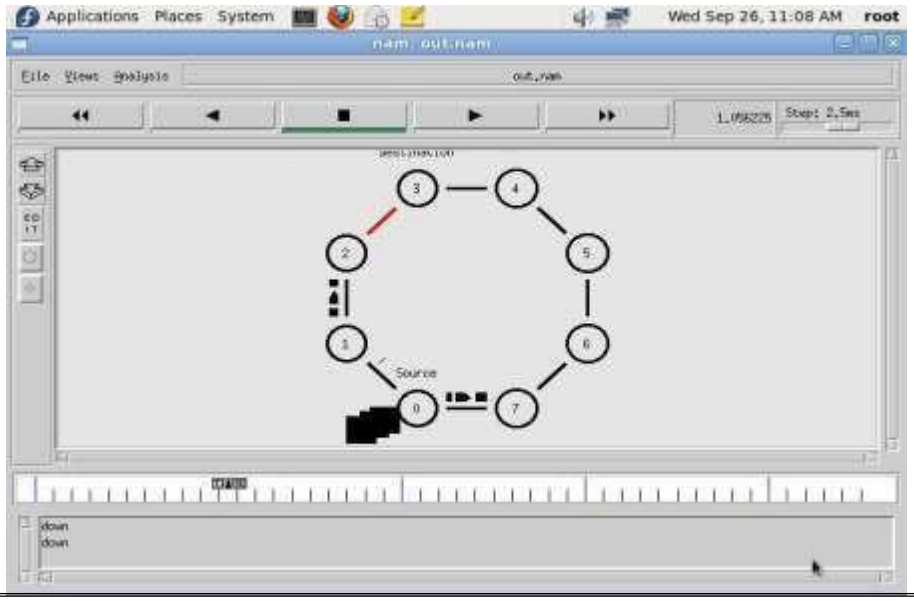
```
#Distance vector routing protocol – distvect.tcl
#Create a simulator object
set ns [new Simulator]
#Use distance vector routing
$ns rtproto DV
#Open the nam trace file set nf [open out.nam w]
$ns namtrace-all $nf # Open tracefile
```

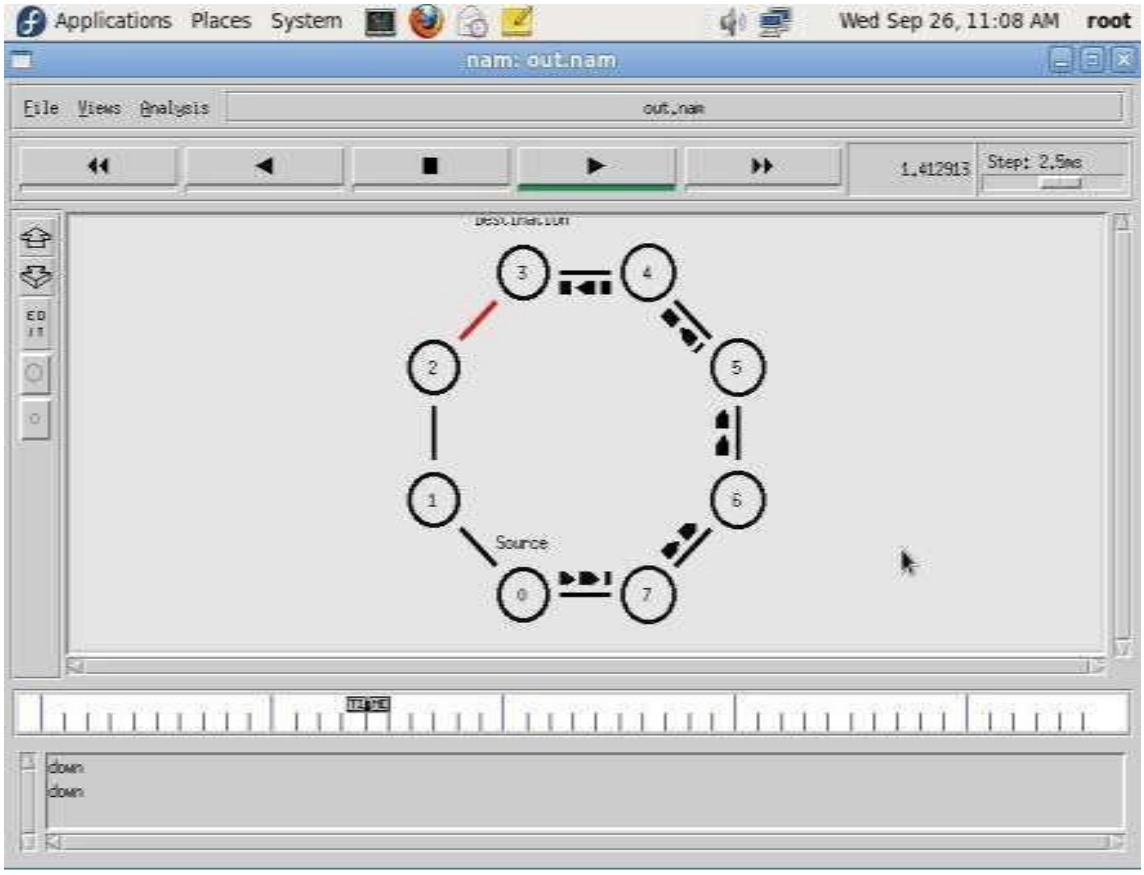
```
set nt [open trace.tr w]
$ns trace-all $nt
#Define 'finish' procedure
proc finish {}
{
global ns nf
$ns flush-trace
#Close the trace file
close $nf
#Execute nam on the trace file
exec nam -a out.nam &
exit 0
}
# Create 8 nodes
set n1 [$ns node]
set n2 [$ns node]
set n3 [$ns node]
set n4 [$ns node]
set n5 [$ns node]
set n6 [$ns node]
set n7 [$ns node]
set n8 [$ns node]
# Specify link characterestics
$ns duplex-link $n1 $n2 1Mb 10ms DropTail
$ns duplex-link $n2 $n3 1Mb 10ms DropTail
$ns duplex-link $n3 $n4 1Mb 10ms DropTail
$ns duplex-link $n4 $n5 1Mb 10ms DropTail
$ns duplex-link $n5 $n6 1Mb 10ms DropTail
$ns duplex-link $n6 $n7 1Mb 10ms DropTail
$ns duplex-link $n7 $n8 1Mb 10ms DropTail
$ns duplex-link $n8 $n1 1Mb 10ms DropTail
#specify layout as a octagon
$ns duplex-link-op $n1 $n2 orient left-up
$ns duplex-link-op $n2 $n3 orient up
$ns duplex-link-op $n3 $n4 orient right-up $ns
duplex-link-op $n4 $n5 orient right
$ns duplex-link-op $n5 $n6 orient right-down
$ns duplex-link-op $n6 $n7 orient down
$ns duplex-link-op $n7 $n8 orient left-down
```

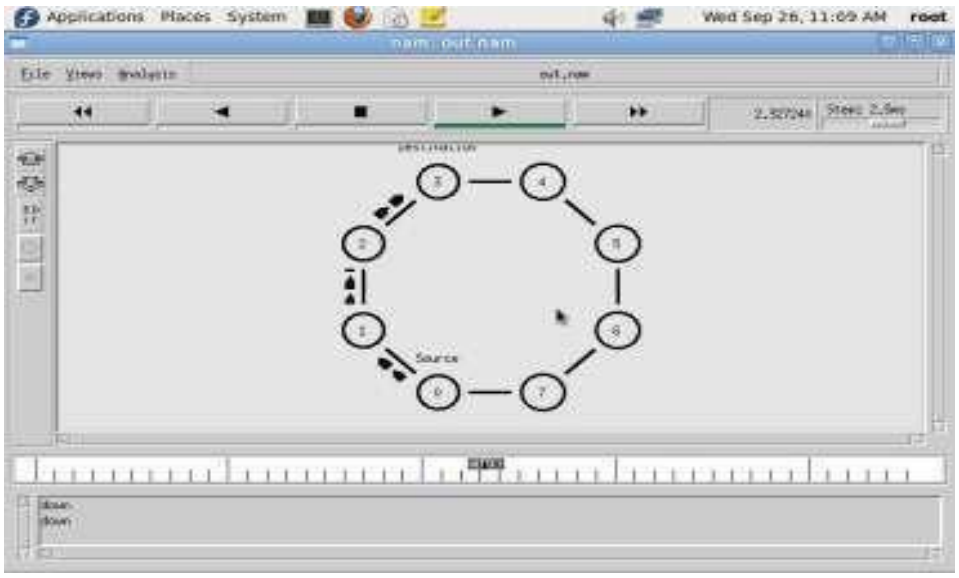
```
$ns duplex-link-op $n8 $n1 orient left
#Create a UDP agent and attach it to node n1 set udp0 [new Agent/UDP]
$ns attach-agent $n1 $udp0
#Create a CBR traffic source and attach it to udp0
set cbr0 [new Application/Traffic/CBR]
$cbr0 set packetSize_ 500
$cbr0 set interval_ 0.005
$cbr0 attach-agent $udp0
#Create a Null agent (a traffic sink) and attach it to node n4 set null0 [new Agent/Null]
$ns attach-agent $n4 $null0
#Connect the traffic source with the traffic sink
$ns connect $udp0 $null0
#Schedule events for the CBR agent and the network dynamics
$ns at 0.0 "$n1 label Source"
$ns at 0.0 "$n4 label Destination"
$ns at 0.5 "$cbr0 start"
$ns rtmodel-at 1.0 down $n3 $n4
$ns rtmodel-at 2.0 up $n3 $n4
$ns at 4.5 "$cbr0 stop"
#Call the finish procedure after 5 seconds of simulation time
$ns at 5.0 "finish" #Run the simulation
$ns run
```

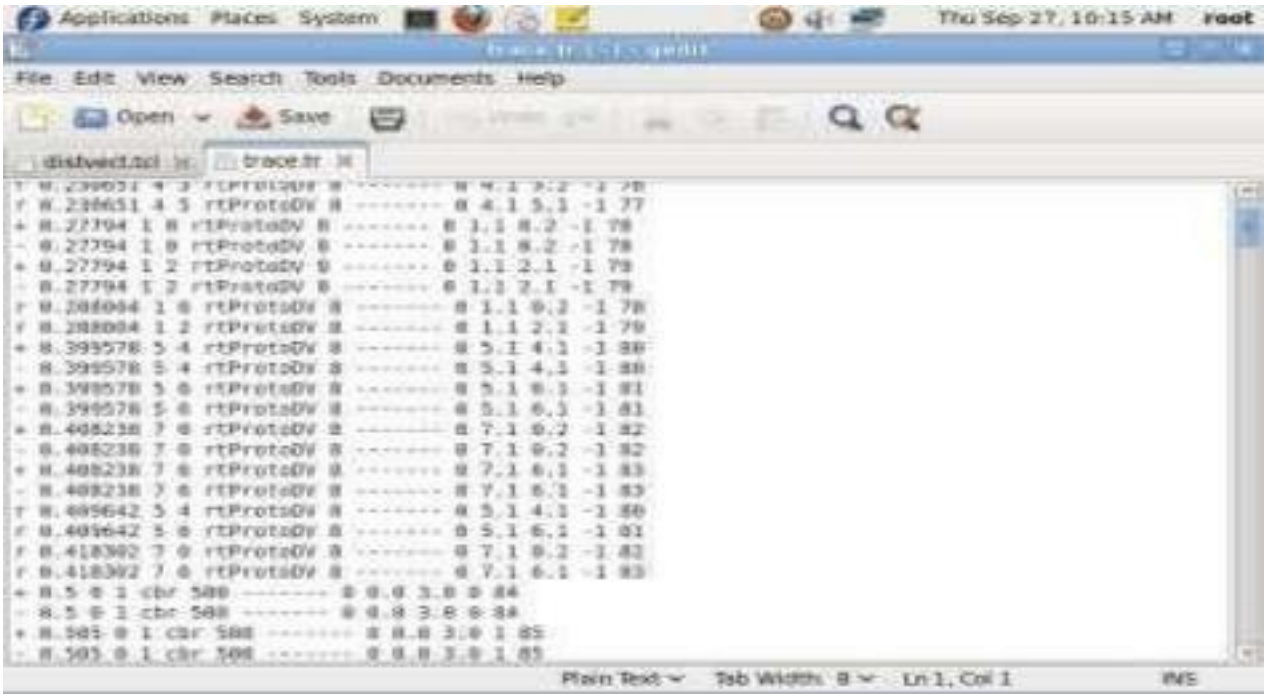
OUTPUT :

$ ns distvect.tcl




Applications Places System
Wed Sep 26, 11:08 AM root
nam: out.nam
File Views Analysis
out.nam
1.412913
Step: 2.5ms
3
4
2
5
1
6
Source
0
7
down
down


Applications Places System
Wed Sep 26, 11:09 AM root
nam: out.nam
File Views Analysis
out.nam
Source



RESULT :

Thus the simulation for Distance vector and link state routing protocols was done using NS2.

Ex. No :10 Date :	Simulation of ErrorDetection Code (like CRC)

AIM :

To implement error checking code using java.

ALGORITHM:

1. Start the Program
2. Given a bit string, append 0S to the end of it (the number of 0s is the same as the degree of the generator polynomial) let B(x) be the polynomial corresponding to B
3. Divide B(x) by some agreed on polynomial G(x) (generator polynomial) and determine the remainder R(x). This division is to be done using Modulo 2 Division.
4. Define T(x) = B(x) –R(x)
5. (T(x)/G(x) => remainder 0)
6. Transmit T, the bit string corresponding to T(x).
7. Let T‘ represent the bit stream the receiver gets and T‘(x) the associated polynomial. The receiver divides T1(x) by G(x). If there is a 0 remainder, the receiver concludes T = T‘ and no error occurred otherwise, the receiver concludes an error occurred and requires a retransmission
8. Stop the Program

PROGRAM:

```
import java.io.*;

class crc_gen {
    public static void main(String args[]) throws IOException {
            BufferedReader br = new BufferedReader(new InputStreamReader(System.in));
        int[] data;
        int[] div;
        int[] divisor;
```

```
int[] rem;
int[] crc;
int data_bits, divisor_bits, tot_length;
System.out.println("Enter number of data bits : ");
data_bits = Integer.parseInt(br.readLine());
data = new int[data_bits];
System.out.println("Enter data bits : ");
for (int i = 0; i < data_bits; i++)
        data[i] = Integer.parseInt(br.readLine());
System.out.println("Enter number of bits in divisor : ");
divisor_bits = Integer.parseInt(br.readLine());
divisor = new int[divisor_bits];
System.out.println("Enter Divisor bits : ");
for (int i = 0; i < divisor_bits; i++)
       divisor[i] = Integer.parseInt(br.readLine());
System.out.print("Data bits are : ");
for (int i = 0; i < data_bits; i++)
       System.out.print(data[i]);
System.out.println();
System.out.print("divisor bits are : ");
for (int i = 0; i < divisor_bits; i++)
       System.out.print(divisor[i]);
System.out.println();
tot_length = data_bits + divisor_bits - 1;
div = new int[tot_length];
rem = new int[tot_length];
crc = new int[tot_length];
/* CRC GENERATION */
for (int i = 0; i < data.length; i++)
        div[i] = data[i];
System.out.print("Dividend (after appending 0's) are : ");
for (int i = 0; i < div.length; i++)
        System.out.print(div[i]);
System.out.println();
for (int j = 0; j < div.length; j++) {
       rem[j] = div[j];
}
rem = divide(div, divisor, rem);
for (int i = 0; i < div.length; i++) {
```

```
// append dividend and remainder crc[i]=(div[i]^rem[i]);
}
System.out.println();
System.out.println("CRC code : ");
for (int i = 0; i < crc.length; i++)
System.out.print(crc[i]);
/* ERROR DETECTION */
System.out.println();
System.out.println("Enter CRC code of " + tot_length + " bits : ");
for (int i = 0; i < crc.length; i++)
        crc[i] = Integer.parseInt(br.readLine());
System.out.print("crc bits are : ");
for (int i = 0; i < crc.length; i++)
         System.out.print(crc[i]);
System.out.println();
for (int j = 0; j < crc.length; j++) {
        rem[j] = crc[j];
}
rem = divide(crc, divisor, rem);
for (int i = 0; i < rem.length; i++) {
          if (rem[i] != 0) {
                System.out.println("Error"); break;
           }
            if (i == rem.length - 1)
                  System.out.println("No Error");
 }
System.out.println("THANK YOU )");

static int[] divide(int div[], int divisor[], int rem[]) {
int cur = 0;
while (true) {
for (int i = 0; i < divisor.length; i++)
       rem[cur + i] = (rem[cur + i] ^ divisor[i]);
while (rem[cur] == 0 && cur != rem.length - 1)
cur++;
if ((rem.length - cur) < divisor.length)
break;
```

```
        }
        return rem;
    }
}
```

OUTPUT :

```
Enter number of data bits :
7
Enter data bits :
1
0
1
1
0
0
1
Enter number of bits in divisor :
3
Enter Divisor bits :
1
0
1
Dividend (after appending 0's) are : 101100100
CRC code :
101100111
Enter CRC code of 9 bits : 1
0
1
1
0
0
1
```

0
1
crc bits are : 101100101 Error
THANK YOU)
BUILD SUCCESSFUL (total time: 1 minute 34
seconds)

RESULT:

Thus the above program for error checking code using was executed successfully.