1. Develop client server-based TCP applications using UNIX socket programming functions.

AIM:

To run the program of top_echoserver and top_echoclient.

THEORY:

The echo server **receives data from its client and echoes it back**. The EchoClient example creates a socket, thereby getting a connection to the echo server.

PROGRAM:

Top_echoserver.c:

```
/*Required Headers*/


#include <sys/types.h>

#include <sys/socket.h>

#include <netdb.h>

#include <stdio.h>

#include<string.h>


int main()

{


   char str[100];
```

```
int listen_fd, comm_fd;

struct sockaddr_in servaddr;


listen_fd = socket(AF_INET, SOCK_STREAM, 0);

bzero( &servaddr, sizeof(servaddr));


servaddr.sin_family = AF_INET; servaddr.sin_addr.s_addr
= htons(INADDR_ANY); servaddr.sin_port =
htons(22000);


bind(listen_fd, (struct sockaddr *) &servaddr, sizeof(servaddr));

listen(listen_fd, 10);

comm_fd = accept(listen_fd, (struct sockaddr*) NULL, NULL);


while(1)
{


   bzero( str, 100);

   read(comm_fd,str,100);
```

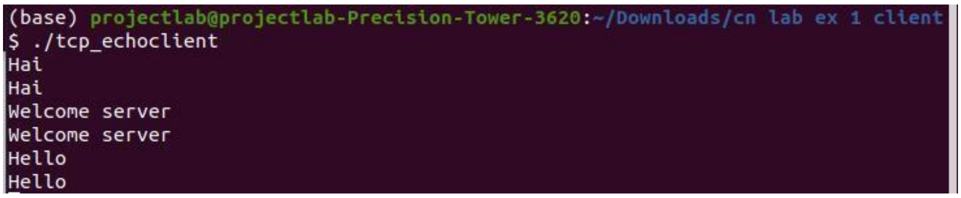
```
        printf("Echoing back - %s",str);

        write(comm_fd, str, strlen(str)+1);

    }
}
```

Top_echoclient.c:

```
#include <sys/types.h>
#include <sys/socket.h>
#include <netdb.h>
#include <stdio.h>
#include<string.h>

int main(int argc,char **argv)
{
    int sockfd,n;
    char sendline[100];
    char recvline[100];
    struct sockaddr_in servaddr;


    sockfd=socket(AF_INET,SOCK_STREAM,0);
    bzero(&servaddr,sizeof servaddr);
}


    servaddr.sin_family=AF_INET;
    servaddr.sin_port=htons(22000);


    inet_pton(AF_INET,"127.0.0.1",&(servaddr.sin_addr));


    connect(sockfd,(struct sockaddr *)&servaddr,sizeof(servaddr));


    while(1)
    {
        bzero( sendline, 100);
        bzero( recvline, 100);
        fgets(sendline,100,stdin); /*stdin = 0 , for standard input */


        write(sockfd,sendline,strlen(sendline)+1);
        read(sockfd,recvline,100);
printf("%s",recvline);
    }


}
```

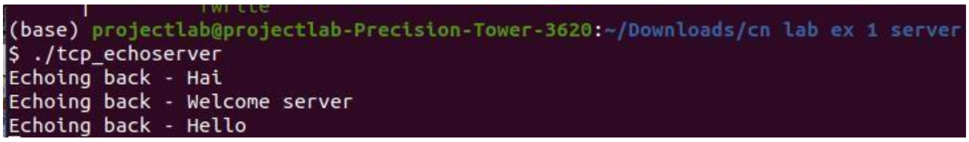
OUTPUT:

top_echoclient.c



```
(base) projectlab@projectlab-Precision-Tower-3620:~/Downloads/cn lab ex 1 client
$ ./tcp_echoclient
Hai
Hai
Welcome server
Welcome server
Hello
Hello
```

Tcp_echoserver.c:



```
(base) projectlab@projectlab-Precision-Tower-3620:~/Downloads/cn lab ex 1 server
$ ./tcp_echoserver
Echoing back - Hai
Echoing back - Welcome server
Echoing back - Hello
```

2. Develop client server-based TCP FILECLIENT AND TCP FILESERVER

AIM:

To run the program of tcp_fileclient and tcp_fileserver.

THEORY:

If we are creating a connection between client and server using TCP then it has few functionality like, TCP is suited for applications that require high reliability, and transmission time is relatively less critical. It is used by other protocols like HTTP, HTTPs, FTP, SMTP, Telnet. TCP rearranges data packets in the order specified. There is absolute guarantee that the data transferred remains intact and arrives in the same order in which it was sent. TCP does Flow Control and requires three packets to set up a socket connection, before any user data can be sent. TCP handles reliability and congestion control. It also does error checking and error recovery.

Erroneous packets are retransmitted from the source to the destination.

PROGRAM:

Tcp_fileclient.c

```
#include <netdb.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/socket.h>
#define MAX 80
#define PORT 8080 #define
SA struct sockaddr void
func(int sockfd)
{
char buff[MAX];
int n;
for (;;) {
bzero(buff, sizeof(buff));
printf("Enter the string : "); n
= 0;
```

```
while ((buff[n++] = getchar()) != '\n')

;

write(sockfd, buff, sizeof(buff));

bzero(buff, sizeof(buff)); read(sockfd,

buff, sizeof(buff)); printf("From

Server : %s", buff);

if ((strncmp(buff, "exit", 4)) == 0) {

printf("Client Exit...\n");

break;

}

}

}



int main()

{

int sockfd, connfd;

struct sockaddr_in servaddr, cli;



// socket create and verification

sockfd = socket(AF_INET, SOCK_STREAM, 0); if

(sockfd == -1) {

printf("socket creation failed...\n");

exit(0);
```

```
}
else
printf("Socket successfully created..\n");
bzero(&servaddr, sizeof(servaddr));


// assign IP, PORT
servaddr.sin_family = AF_INET;
servaddr.sin_addr.s_addr = inet_addr("127.0.0.1");
servaddr.sin_port = htons(PORT);


// connect the client socket to server socket
if (connect(sockfd, (SA*)&servaddr, sizeof(servaddr)) != 0) {
printf("connection with the server failed...\n");
exit(0);
}
else
printf("connected to the server..\n");



// function for chat
func(sockfd);


// close the socket
close(sockfd);
```

```
}
```

Tcp_fileserver.c:

```
#include <stdio.h>
#include <netdb.h>
#include <netinet/in.h>
#include <stdlib.h>
#include <string.h>
#include <sys/socket.h>
#include <sys/types.h>
#define MAX 80
#define PORT 8080 #define
SA struct sockaddr


// Function designed for chat between client and server.
void func(int connfd)
{
char buff[MAX];
int n;
// infinite loop for chat
for (;;) {
bzero(buff, MAX);
// read the message from client and copy it in buffer
read(connfd, buff, sizeof(buff));
// print buffer which contains the client contents
printf("From client: %s\t To client : ", buff);
bzero(buff, MAX);
n = 0;
// copy server message in the buffer
while ((buff[n++] = getchar()) != '\n')
;
// and send that buffer to client
write(connfd, buff, sizeof(buff));


// if msg contains "Exit" then server exit and chat ended. if
(strncmp("exit", buff, 4) == 0) {
printf("Server Exit...\n");
break;
}
}
}


// Driver function
int main()
{
```

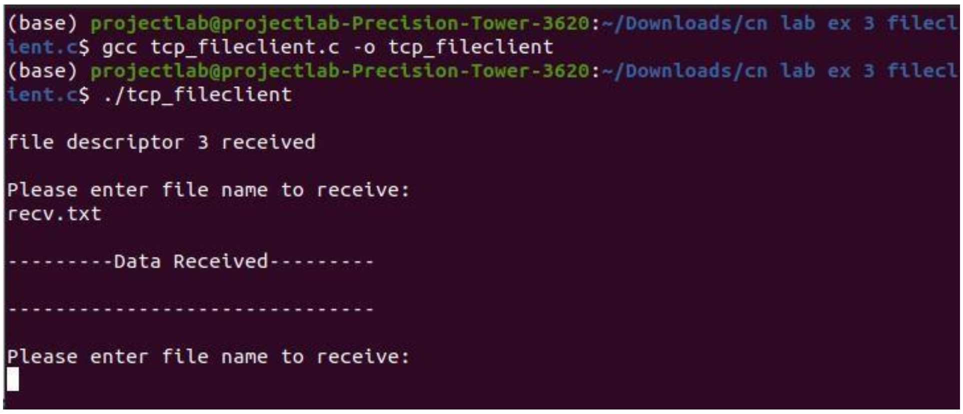
```
int sockfd, connfd, len;
struct sockaddr_in servaddr, cli;


// socket create and verification
sockfd = socket(AF_INET, SOCK_STREAM, 0); if
(sockfd == -1) {
printf("socket creation failed...\n");
exit(0);
}
else
printf("Socket successfully created..\n");
bzero(&servaddr, sizeof(servaddr));
// assign IP, PORT
servaddr.sin_family = AF_INET;
servaddr.sin_addr.s_addr = htonl(INADDR_ANY);
servaddr.sin_port = htons(PORT);
// Binding newly created socket to given IP and verification if
((bind(sockfd, (SA*)&servaddr, sizeof(servaddr))) != 0) {
printf("socket bind failed...\n");
exit(0);
}
else
printf("Socket successfully binded..\n");
```

```
// Now server is ready to listen and verification if
((listen(sockfd, 5)) != 0) {
printf("Listen failed...\n");
exit(0);
}
else
printf("Server listening..\n");
len = sizeof(cli);


// Accept the data packet from client and verification
connfd = accept(sockfd, (SA*)&cli, &len);
if (connfd < 0) {
printf("server accept failed...\n");
exit(0);
}
else
printf("server accept the client...\n");


// Function for chatting between client and server
func(connfd);
```

```
// After chatting close the socket

close(sockfd);

}
```

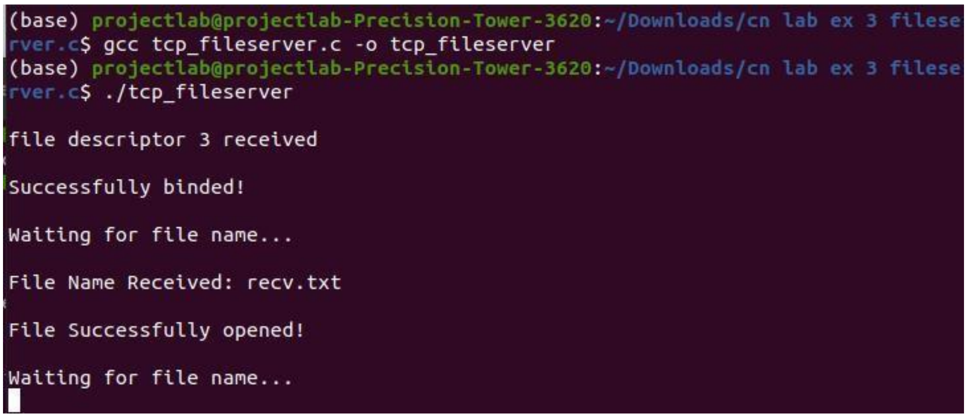
OUTPUT:

Tcp_fileclient.c:



```
(base) projectlab@projectlab-Precision-Tower-3620:~/Downloads/cn lab ex 3 filecl
ient.c$ gcc tcp_fileclient.c -o tcp_fileclient
(base) projectlab@projectlab-Precision-Tower-3620:~/Downloads/cn lab ex 3 filecl
ient.c$ ./tcp_fileclient

file descriptor 3 received

Please enter file name to receive:
recv.txt

---------Data Received---------

-------------------------------

Please enter file name to receive:
```

Tcp_fileserver.c:



```
(base) projectlab@projectlab-Precision-Tower-3620:~/Downloads/cn lab ex 3 filese
rver.c$ gcc tcp_fileserver.c -o tcp_fileserver
(base) projectlab@projectlab-Precision-Tower-3620:~/Downloads/cn lab ex 3 filese
rver.c$ ./tcp_fileserver

file descriptor 3 received

Successfully binded!

Waiting for file name...

File Name Received: recv.txt

File Successfully opened!

Waiting for file name...
```

3. Develop client server based UDP applications using UNIX socket programming functions.

AIM:

To run the program of udp_client and udp_server.

THEORY:

In UDP, the client does not form a connection with the server like in TCP and instead just sends a datagram. Similarly, the server need not accept a connection and just waits for datagrams to arrive. Datagrams upon arrival contain the address of the sender which the server uses to send data to the correct client.

PROGRAM:

udp_server.c:

```
#include<sys/types.h>

#include<sys/socket.h>

#include<stdio.h>

#include<netinet/in.h>
```

```
#define MAX 100
#define SERPORT 1090
#define SA struct sockaddr


void str_echo(FILE*,int,SA*,socklen_t);



int main(int argc,char** argv)
{
 int sockfd;
 struct sockaddr_in servaddr,cliaddr;
 sockfd=socket(AF_INET,SOCK_DGRAM,0);
 bzero(&servaddr,sizeof(servaddr));
 servaddr.sin_family=AF_INET;
 servaddr.sin_addr.s_addr=htonl(0);
 servaddr.sin_port=htons(SERPORT);
 bind(sockfd,(SA*)&servaddr,sizeof(servaddr));
 str_echo(stdin,sockfd,(SA*)&cliaddr,sizeof(cliaddr));
 exit(0);
}



void str_echo(FILE* fp,int sockfd,SA* cliaddr,socklen_t clilen)
{
 char msg[MAX],send[MAX];
 int n;
 while(1)
 {
  if((n=recvfrom(sockfd,msg,MAX,0,cliaddr,&clilen))>0)
  {
    msg[n]='\0';
   printf("Client msg : ");
   fputs(msg,stdout);
   printf("SERVER msg : ");
   fgets(msg,MAX,fp);
   sendto(sockfd,msg,strlen(msg),0,cliaddr,clilen);



  }
  }
}
```

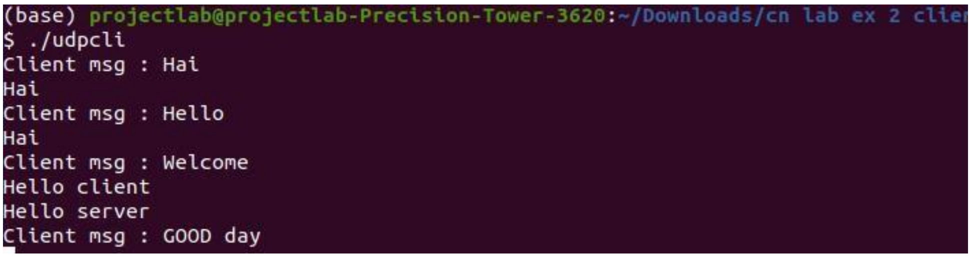
Udp_client.c:

```
#include<sys/types.h>
#include<sys/socket.h>
#include<stdio.h>
#include<netinet/in.h>
```

```
#define MAX 100
#define SERPORT 1090
#define SA struct sockaddr


void str_cli(FILE*,int,SA*,socklen_t);



int main(int argc,char** argv)
{
 int sockfd;
 struct sockaddr_in servaddr;
 sockfd=socket(AF_INET,SOCK_DGRAM,0);
 bzero(&servaddr,sizeof(servaddr));
 servaddr.sin_family=AF_INET;
 servaddr.sin_addr.s_addr=inet_addr("127.0.0.1");
 servaddr.sin_port=htons(SERPORT); printf("Client
 msg : ");
 str_cli(stdin,sockfd,(SA*)&servaddr,sizeof(servaddr));
 exit(0);
}



void str_cli(FILE* fp,int sockfd,SA* seraddr,socklen_t len)
{
 char msg[MAX],rcv[MAX];
 int n;
 while(fgets(msg,MAX,fp)!=NULL)
 {
  sendto(sockfd,msg,MAX,0,seraddr,len);
  if((n=recvfrom(sockfd,rcv,MAX,0,seraddr,&len))>0)
  {
   rcv[n]='\0';
   fputs(rcv,stdout);
  }
  printf("Client msg : ");
}
}
```

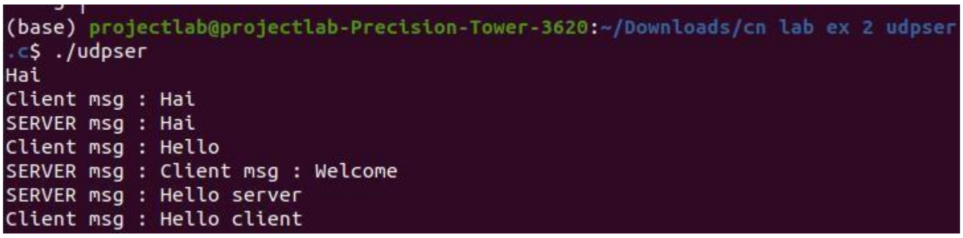
OUTPUT:

Udpclient.c:



```
(base) projectlab@projectlab-Precision-Tower-3620:~/Downloads/cn lab ex 2 clie
$ ./udpcli
Client msg : Hai
Hai
Client msg : Hello
Hai
Client msg : Welcome
Hello client
Hello server
Client msg : GOOD day
```

Udp_server.c:



```
(base) projectlab@projectlab-Precision-Tower-3620:~/Downloads/cn lab ex 2 udpser
.c$ ./udpser
Hai
Client msg : Hai
SERVER msg : Hai
Client msg : Hello
SERVER msg : Client msg : Welcome
SERVER msg : Hello server
Client msg : Hello client
```

4. Develop a program write a program to find the Physical

Address for a given IP address using Simulation.

AIM:

To write a program to find the Physical Address for a given IP address using Simulation.

ALGORITHM:

Step 1: Start the program

Step 2: Generate random numbers to get IP addresses and physical addresses

Step 3: Store the IP address and physical addresses in an array

Step 4: Randomly choose an IP address and identify the corresponding Physical address for that IP address with the help of the array.

Step 5: If a match is found then display the IP address and the corresponding physical address otherwise display that no match was found.

Step 6: Similarly choose a physical address randomly and find the corresponding IP address for that Physical address with the help of the array.

Step 7: If a match is found then display the physical address and the corresponding IP address otherwise display that no match was found.

Step 8: Stop the program.

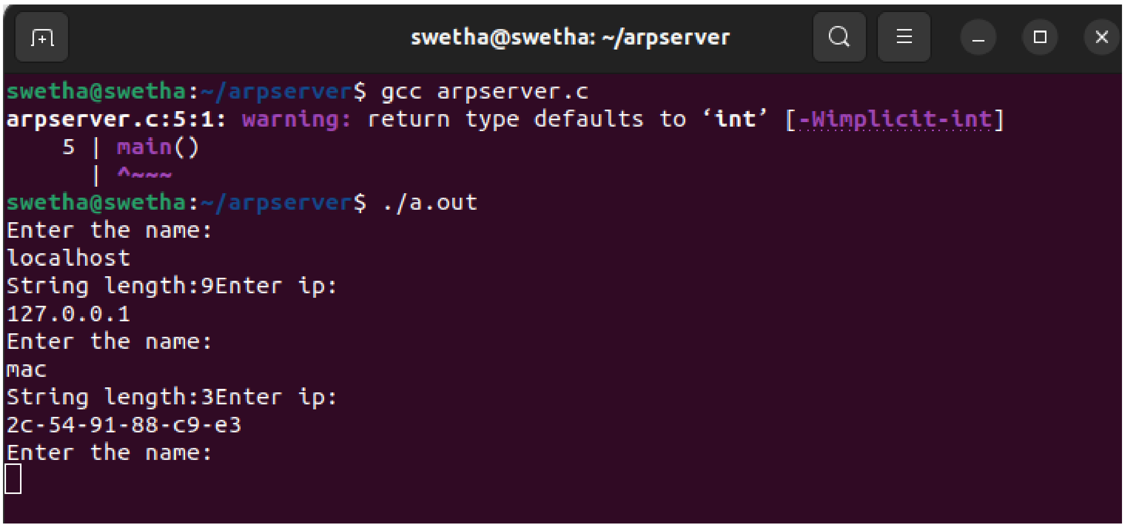
PROGRAM:

```
#include<stdlib.h
>
#include<stdio.h>
#include<conio.h
> void main()
{
struct
{
char *ipa;
char
*pha;
}ipadd[2];
```

```
int i,j,x=10;
char *temp,*temp1,*x1;
char ip[2][15]={"135.237.105.128","225.22.205.221"};
char ph[2][18]={"SYSTEM1","SYSTEM12"};
clrscr();
for(j=0;j<2;j++)
{
srand(x++);
for(i=0;i<4;i++)
{
itoa(rand()%256,temp,10);
printf("\n%s",temp);
strcat(ipadd[j].ipa,temp);
if(i<3)
strcat(ipadd[j].ipa,".");
}
printf("%s",itoa(j+1,x1,10));
temp1=strcat("SYSTEM",x1);
strcpy(ipadd[j].pha,temp1);
printf("\n%s\n",ipadd[j].ipa);
printf("\n%s\n",ipadd[j].pha);
}
for(j=0;j<2;j++)
printf("\n\n%s\n",ipadd[j].ipa);
for(j=0;j<2;j++)
for(i=0;i<2;i++)
if(strcmp(ipadd[i].ipa,ip[j])==0
)
{
printf("\n the physical address of the given ip address %s is",ip[j]);
printf("\n\n%s\n",ph[j]);
}
getch();
for(j=0;j<2;j++)
for(i=0;i<2;i++)
if(strcmp(ipadd[i].pha,ph[j])==0)
{
printf("\n the ip address of the given physical address %s is",ph[j]);
printf("\n\n%s\n",ip[j]);
}
getch();
}
```

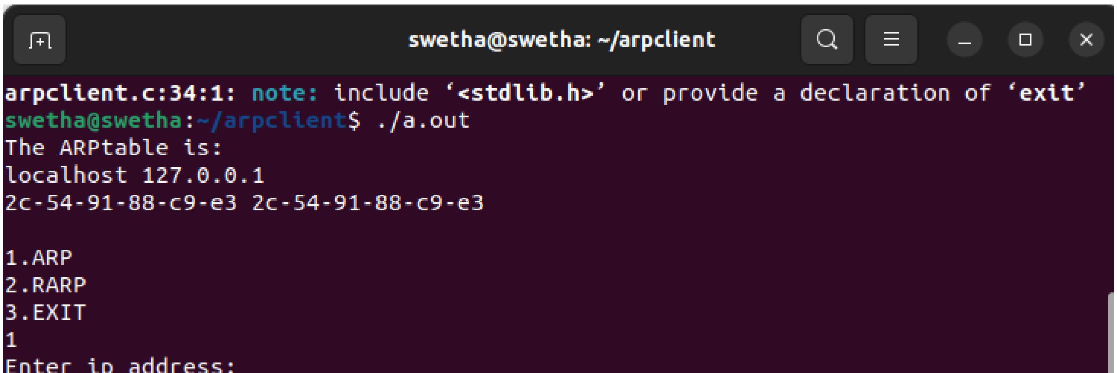
OUTPUT:

ARP/RARP SERVER



```
swetha@swetha:~/arpserver$ gcc arpserver.c
arpserver.c:5:1: warning: return type defaults to ‘int’ [-Wimplicit-int]
    5 | main()
      | ^~~~
swetha@swetha:~/arpserver$ ./a.out
Enter the name:
localhost
String length:9Enter ip:
127.0.0.1
Enter the name:
mac
String length:3Enter ip:
2c-54-91-88-c9-e3
Enter the name:
```

ARP/RARP CLIENT



```
arpclient.c:34:1: note: include ‘<stdlib.h>’ or provide a declaration of ‘exit’
swetha@swetha:~/arpclient$ ./a.out
The ARPtable is:
localhost 127.0.0.1
2c-54-91-88-c9-e3 2c-54-91-88-c9-e3

1.ARP
2.RARP
3.EXIT
1
Enter ip address:
```

5. USER DATAGRAM PROTOCOL

USING NS-2

AIM:

To implement User Datagram Protocol (UDP) using NS-2

ALGORITHM:

Step 1: Start network simulator OTCL editor.

Step 2: Create new simulator using set ns [new Simulator] syntax Step 3: Create procedure to trace all path

proc finish {} {

global ns nf tf

$ns flush-trace close $nf

close $tf

exec nam udp.nam & exit 0 }

Step 4: Connect with TCP and SINK command.

$ns connect $tcp $sink

Step 5: Run and Execute the program.

$ns run

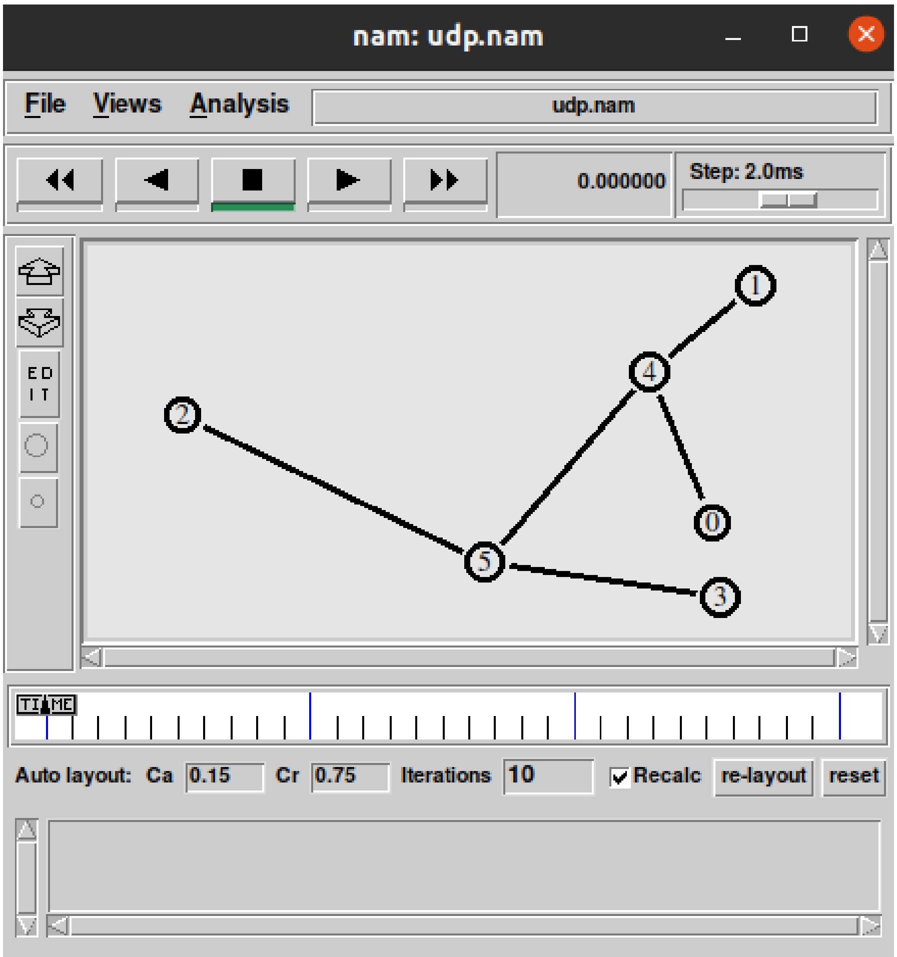
PROGRAM:

```
set ns [new Simulator]

set nf [open udp.nam w]

$ns namtrace-all $nf

set tf [open out.tr w]

$ns      trace-all

$tf  proc  finish

{}  {  global  ns

nf tf
$ns
flush-trace
close $nf
close $tf
exec nam udp.nam &
exit 0
}
set    n0    [$ns
node]   set   n1
[$ns  node]  set
n2  [$ns  node]
set    n3    [$ns
node]   set   n4
[$ns  node]  set
n5 [$ns node]
$ns duplex-link $n0 $n4 1Mb 50ms DropTail
$ns duplex-link $n1 $n4 1Mb 50ms DropTail
$ns duplex-link $n2 $n5 0.1Mb 1ms DropTail
$ns duplex-link $n3 $n5 1Mb 1ms DropTail
$ns duplex-link $n4 $n5 1Mb 50ms DropTail
$ns duplex-link-op $n2 $n5 queuePos 1
set tcp [new Agent/UDP]
$ns attach-agent $n0 $tcp
set sink [new Agent/Null]
$ns attach-agent $n2 $sink
$ns connect $tcp $sink
set ftp [new Application/Traffic/CBR]
$ftp attach-agent $tcp
$ns at 0.0 "$ftp start"
$ns at 2.5 "$ftp stop"
$ns at 3 "finish"
```

```
$ns run set ns [new Simulator]
set nf [open udp.nam w]
$ns     namtrace-all
$nf   set   tf   [open
out.tr w]
$ns     trace-all
$tf  proc  finish
{}  {  global  ns
nf tf
$ns
flush-trace
close $nf
close $tf
exec nam udp.nam &
exit 0
}
set     n0     [$ns
node]     set     n1
[$ns   node]   set
n2   [$ns   node]
set     n3     [$ns
node]     set     n4
[$ns   node]   set
n5 [$ns node]
$ns duplex-link $n0 $n4 1Mb 50ms DropTail
$ns duplex-link $n1 $n4 1Mb 50ms DropTail
$ns duplex-link $n2 $n5 0.1Mb 1ms DropTail
$ns duplex-link $n3 $n5 1Mb 1ms DropTail
$ns duplex-link $n4 $n5 1Mb 50ms DropTail
$ns duplex-link-op $n2 $n5 queuePos 1
set tcp [new Agent/UDP]
```

```
$ns attach-agent $n0 $tcp
set sink [new Agent/Null]
$ns attach-agent $n2 $sink
$ns connect $tcp $sink
set ftp [new Application/Traffic/CBR]
$ftp attach-agent $tcp
$ns at 0.0 "$ftp start"
$ns at 2.5 "$ftp stop"
$ns at 3 "finish"
$ns run
```

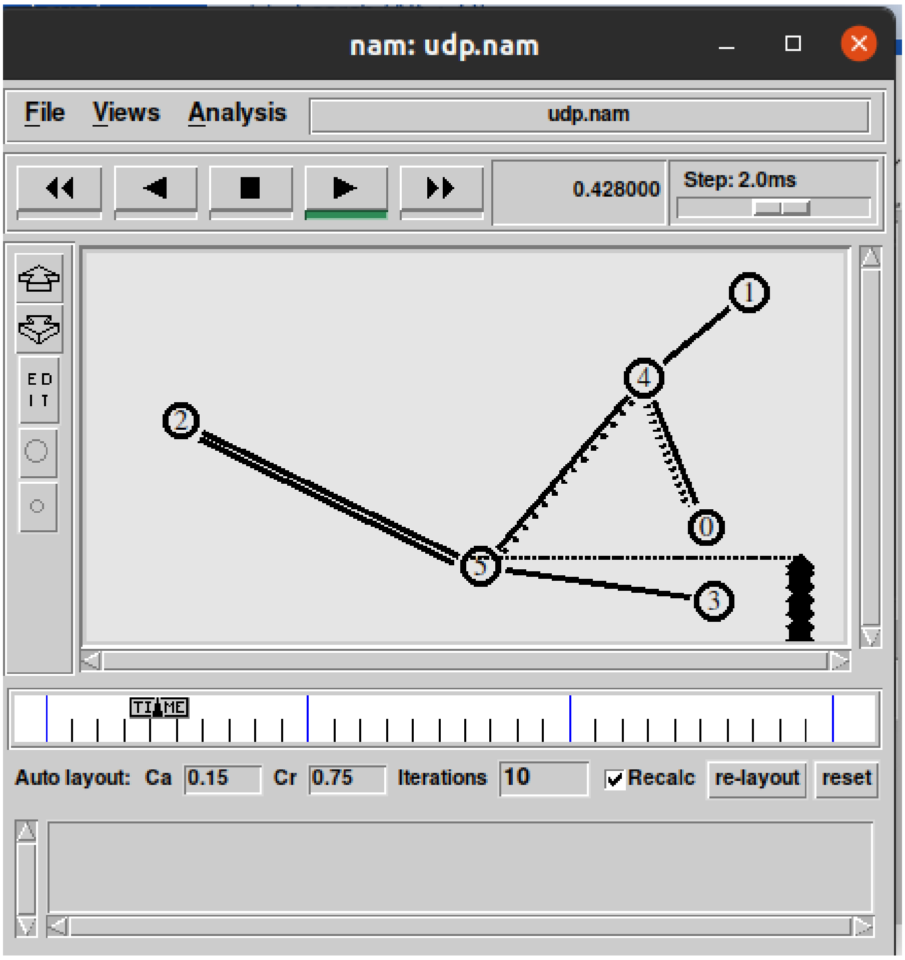
OUTPUT:

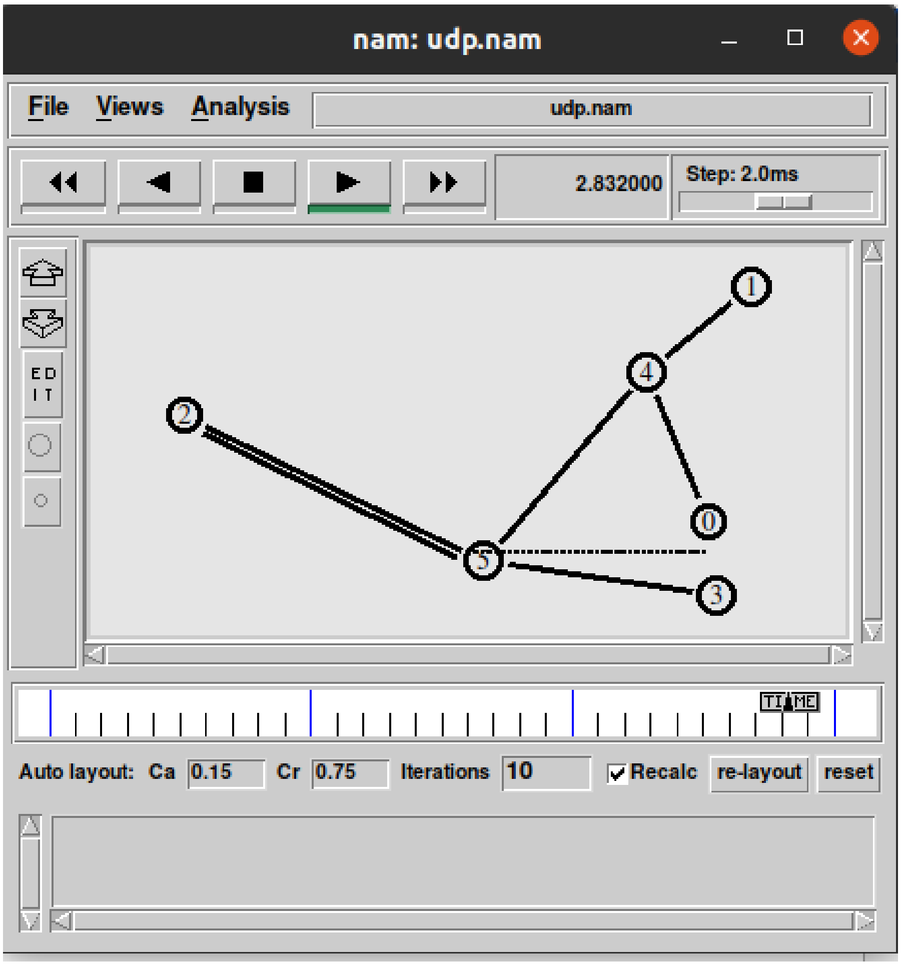


0.000000

Step: 2.0ms

Auto layout: Ca 0.15 Cr 0.75 Iterations 10 ☑ Recalc


nam: udp.nam
File
Views
Analysis
udp.nam
0.428000
Step: 2.0ms
E D
I T
1
4
2
0
5
3
TIME
Auto layout:
Ca
0.15
Cr
0.75
Iterations
10
☑ Recalc
re-layout
reset



2.832000

Step: 2.0ms

Auto layout: Ca 0.15 Cr 0.75 Iterations 10 ☑ Recalc

RESULT:

Thus, the program for implementing UDP was executed using NS-2 and output verified using Network Animator.

6. TRANSMISSION CONTROL PROTOCOL USING NS-2

AIM:

To implement Transmission Control Protocol (TCP) using NS-2.

ALGORITHM:

Step 1: Start network simulator OTCL editor.

Step 2: Create new simulator using set ns [new Simulator] syntax

Step 3: Create procedure to trace all path

```
proc finish {} {
global ns nf tf
$ns flush-trace close $nf
close $tf
exec nam tcp.nam & exit 0}
```

Step 4: Connect with TCP and SINK command.

```
$ns connect $tcp $sink
```

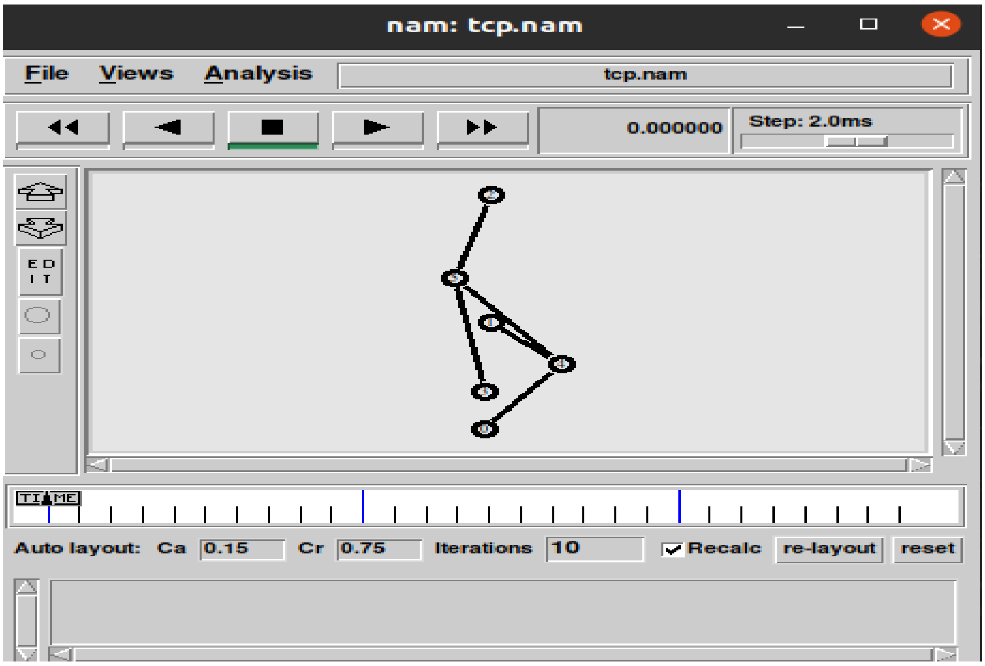
Step 5: Run and Execute the program.

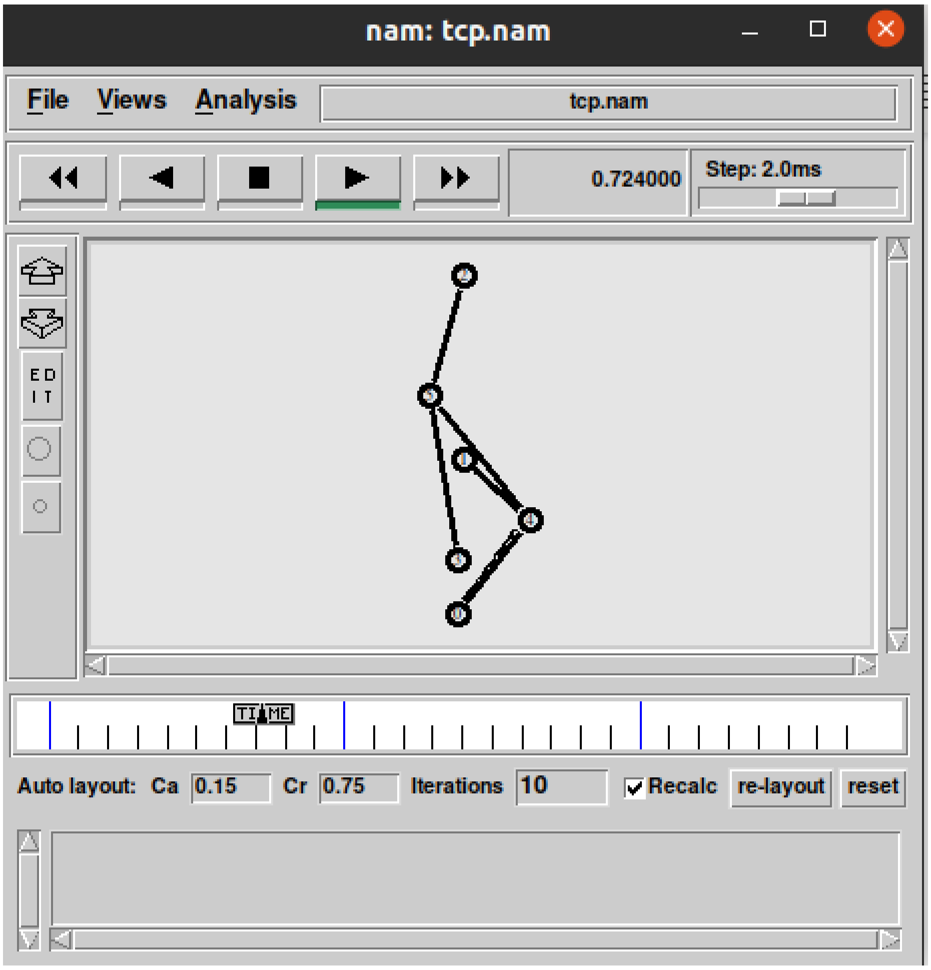
```
$ns run
```

PROGRAM:

```
set ns [new Simulator]

set nf [open tcp.nam w]

$ns namtrace-all $nf

set tf [open out.tr w]

$ns trace-all $tf

proc finish {} {

global ns nf tf

$ns flush-trace

close $nf

close $tf

exec nam tcp.nam &

exit 0

}

set n0 [$ns node]

set n1 [$ns node]

set n2 [$ns node]
set n3 [$ns node]

set n4 [$ns node]

set n5 [$ns node]

$ns duplex-link $n0 $n4 1Mb 50ms DropTail

$ns duplex-link $n1 $n4 1Mb 50ms DropTail

$ns duplex-link $n2 $n5 1Mb 1ms DropTail

$ns duplex-link $n3 $n5 1Mb 1ms DropTail

$ns duplex-link $n4 $n5 1Mb 50ms DropTail

$ns duplex-link-op $n4 $n5 queuePos 0.5

set tcp [new Agent/TCP]

$ns attach-agent $n0 $tcp

set sink [new Agent/TCPSink]

$ns attach-agent $n2 $sink

$ns connect $tcp $sink

set ftp [new Application/FTP]

$ftp attach-agent $tcp

$ns at 0.0 "$ftp start"

$ns at 2.5 "$ftp stop"

$ns at 3 "finish"

$ns run
```

OUTPUT:

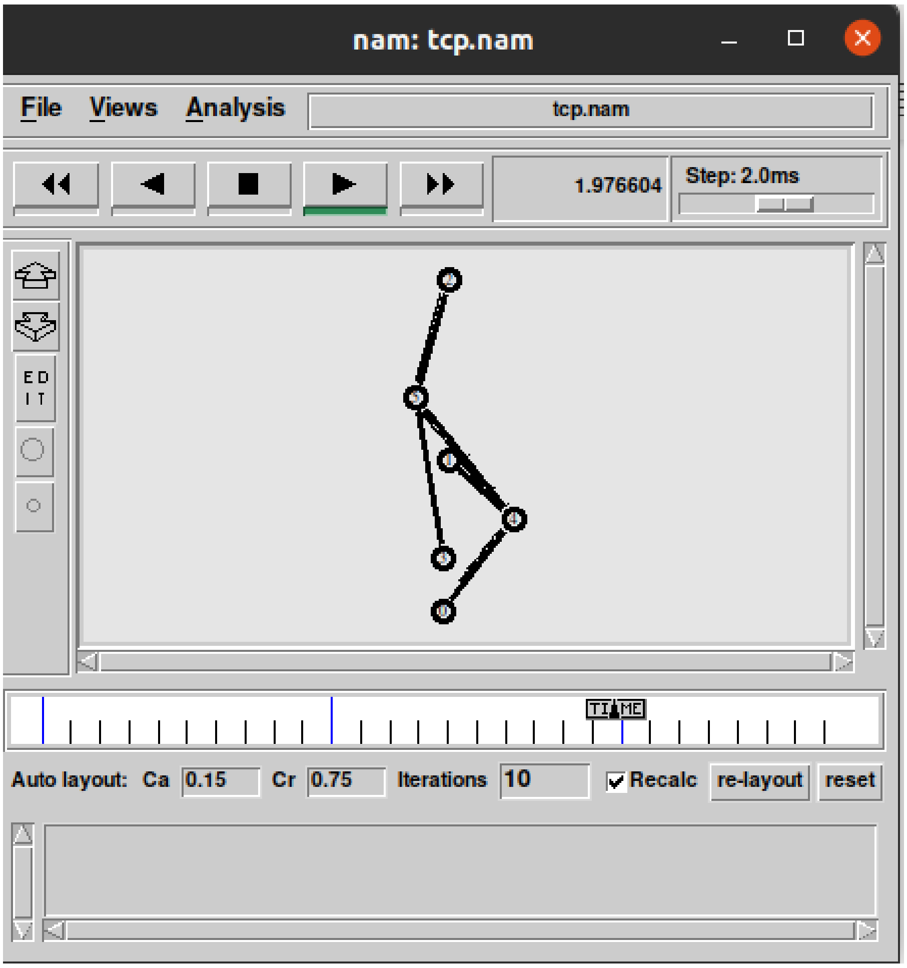

nam: tcp.nam
File
Views
Analysis
tcp.nam
0.000000
Step: 2.0ms
E D I T
TIME
Auto layout:
Ca
0.15
Cr
0.75
Iterations
10
☑ Recalc
re-layout
reset



0.724000

Step: 2.0ms

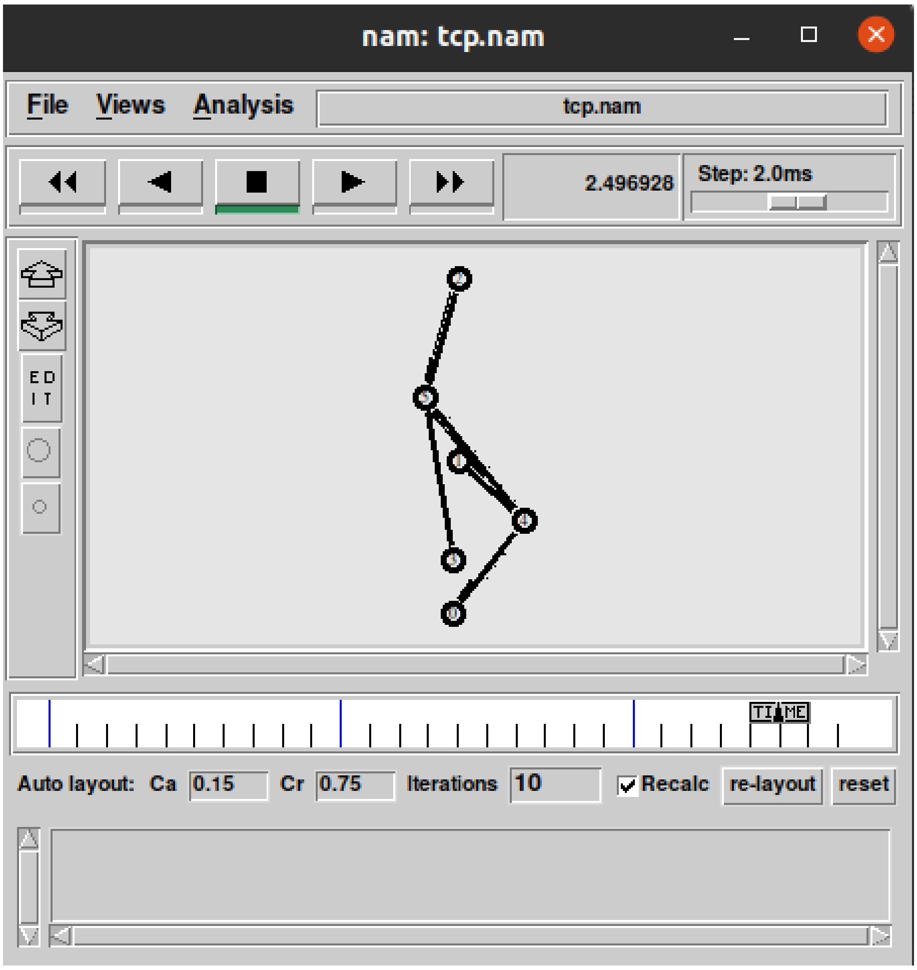
Auto layout: Ca 0.15 Cr 0.75 Iterations 10 ☑ Recalc



1.976604

Step: 2.0ms

Auto layout: Ca 0.15 Cr 0.75 Iterations 10 ☑ Recalc



RESULT:

Thus, the program for implementing TCP was executed using NS-2 and output verified using Network Animator.

7. LINK STATE ROUTING PROTOCOL

AIM:

To simulate a link failure and to observe link state routing protocol in action.

ALGORITHM:

1. Create a simulator object
2. Set routing protocol to link state 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 four nodes
6. Specify the link characteristics between nodes
7. Describe their layout topology as a quad node.
8. Add TCP agent for node n0
9. Create FTP traffic on top of TCP and set traffic parameters.
10. Add a sink agent to node n3
11. Add UDP agent for node n2
12. Create CBR traffic on top of UDP and set traffic parameters.
13. Connect source and the sink
14. Schedule events as follows:

    a. Start traffic flow at 0.0

    b. Down the link n1-n3 at 1.0

    c. Up the link n1-n3 at 2.0

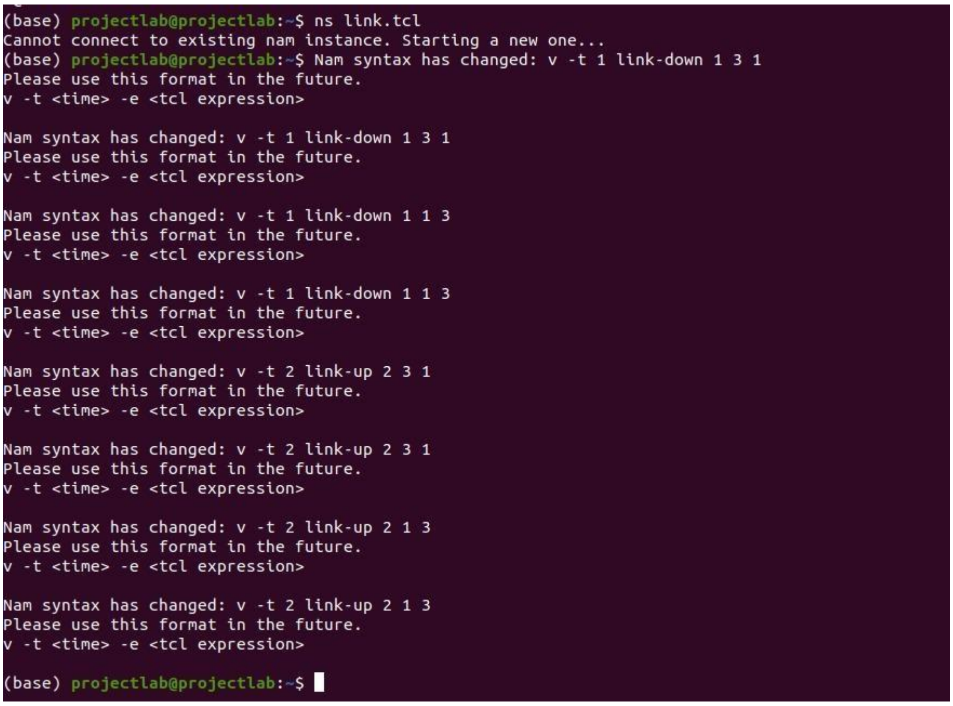
    d. Call finish procedure at 5.0
15. Start the scheduler
16. Observe the traffic route when link is up and down
17. View the simulated events and trace file analyze it
18. Stop

PROGRAM :

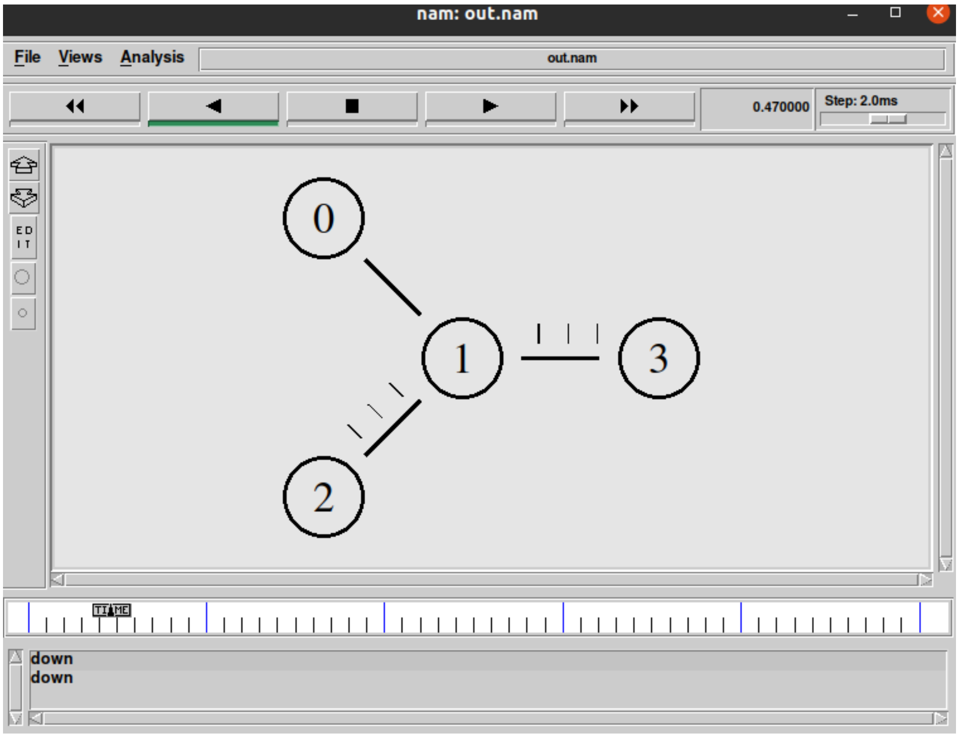
```
set ns [new Simulator]
set nf [open out.nam w]
$ns namtrace-all $nf
set tr [open out.tr w]
$ns trace-all $tr
proc finish {} {
global nf ns tr
$ns flush-trace
close $tr
exec nam out.nam &
            exit 0
}
set      n0      [$ns
node]     set     n1
[$ns    node]    set
n2    [$ns    node]
set      n3      [$ns
node]
$ns duplex-link $n0 $n1 10Mb 10ms DropTail
$ns duplex-link $n1 $n3 10Mb 10ms DropTail
$ns duplex-link $n2 $n1 10Mb 10ms DropTail
$ns duplex-link-op $n0 $n1 orient right-down
$ns duplex-link-op $n1 $n3 orient right
$ns duplex-link-op $n2 $n1 orient right-up
set tcp [new Agent/TCP]
$ns attach-agent $n0 $tcp
set ftp [new
Application/FTP]
```

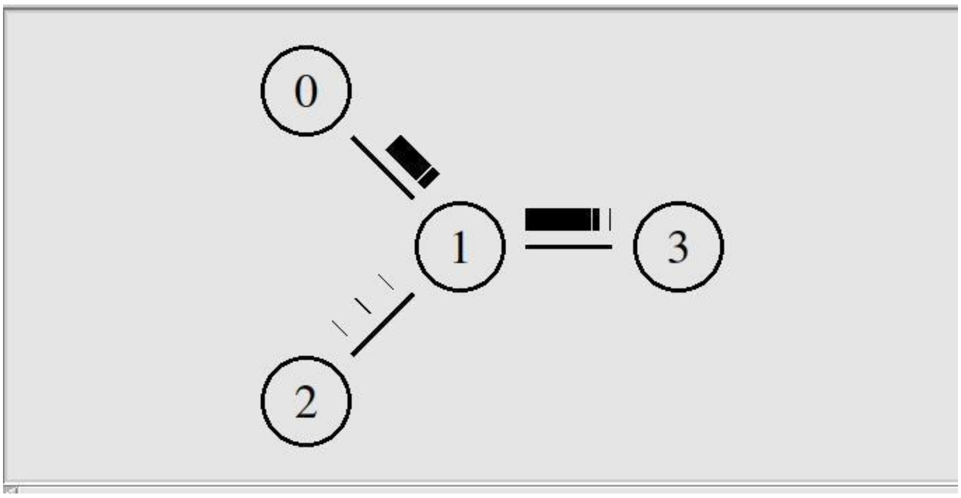
```
$ftp attach-agent $tcp
set sink [new Agent/TCPSink]
$ns attach-agent $n3 $sink
set udp [new Agent/UDP]
$ns attach-agent $n2 $udp
set cbr [new Application/Traffic/CBR]
$cbr attach-agent $udp
set null [new Agent/Null]
$ns attach-agent $n3 $null
$ns connect $tcp $sink
$ns connect $udp $null
$ns rtmodel-at 1.0 down $n1 $n3
$ns rtmodel-at 2.0 up $n1 $n3
$ns rtproto LS
$ns at 0.0 "$ftp start"
$ns at 0.0 "$cbr start"
$ns at 5.0 "finish"
$ns run
```

OUTPUT:



```
(base) projectlab@projectlab:~$ ns link.tcl
Cannot connect to existing nam instance. Starting a new one...
(base) projectlab@projectlab:~$ Nam syntax has changed: v -t 1 link-down 1 3 1
Please use this format in the future.
v -t <time> -e <tcl expression>

Nam syntax has changed: v -t 1 link-down 1 3 1
Please use this format in the future.
v -t <time> -e <tcl expression>

Nam syntax has changed: v -t 1 link-down 1 1 3
Please use this format in the future.
v -t <time> -e <tcl expression>

Nam syntax has changed: v -t 1 link-down 1 1 3
Please use this format in the future.
v -t <time> -e <tcl expression>

Nam syntax has changed: v -t 2 link-up 2 3 1
Please use this format in the future.
v -t <time> -e <tcl expression>

Nam syntax has changed: v -t 2 link-up 2 3 1
Please use this format in the future.
v -t <time> -e <tcl expression>

Nam syntax has changed: v -t 2 link-up 2 1 3
Please use this format in the future.
v -t <time> -e <tcl expression>

Nam syntax has changed: v -t 2 link-up 2 1 3
Please use this format in the future.
v -t <time> -e <tcl expression>

(base) projectlab@projectlab:~$ 
```





8. DISTANCE VECTOR ROUTING PROTOCOL

AIM:

To simulate a link failure and to observe distance vector routing protocol in action.

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 the program.

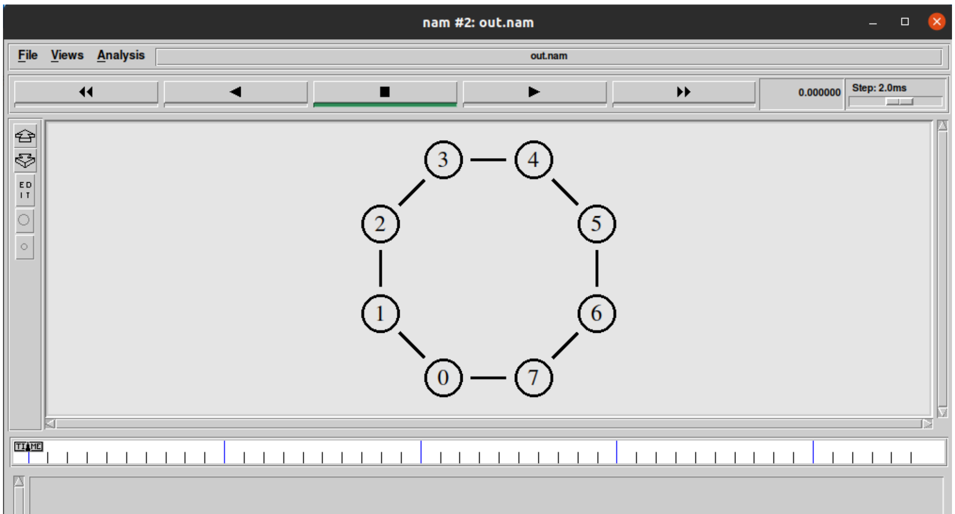
PROGRAM:

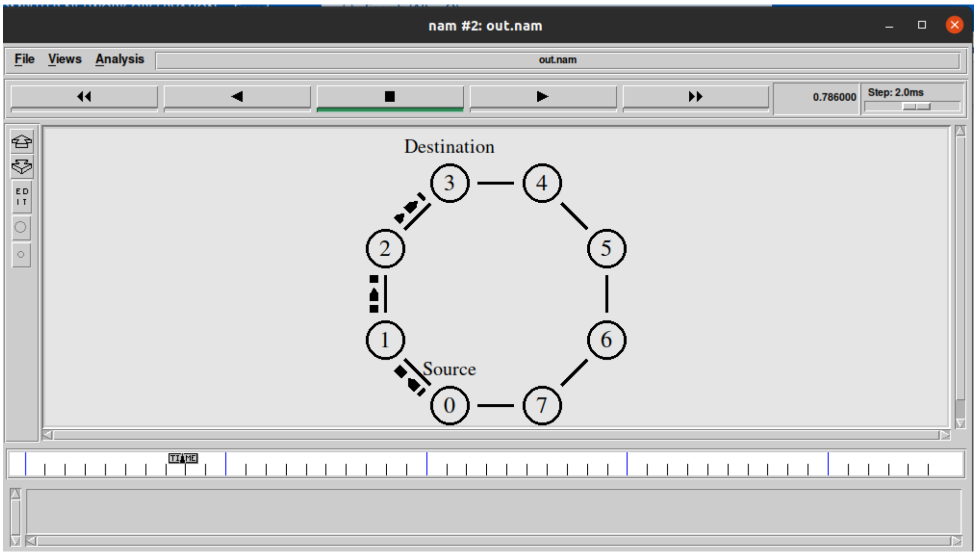
```
set ns [new Simulator]

$ns rtproto DV

set nf [open out.nam w]

$ns namtrace-all $nf

set nt [open trace.tr w]

$ns trace-all $nt
```

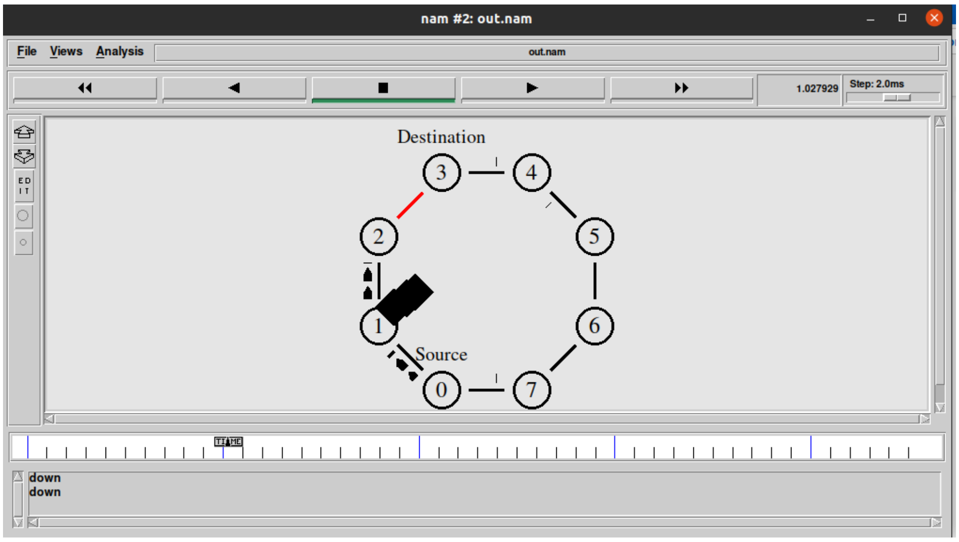
```
proc finish {} {
global ns nf
$ns flush-trace
close $nf



exec nam -a out.nam &
exit 0
}
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]
$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
$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

set udp0 [new Agent/UDP]

$ns attach-agent $n1 $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 $n4 $null0

$ns connect $udp0 $null0

$ns at 0.0 "$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"

$ns at 5.0 "finish"

$ns run
```

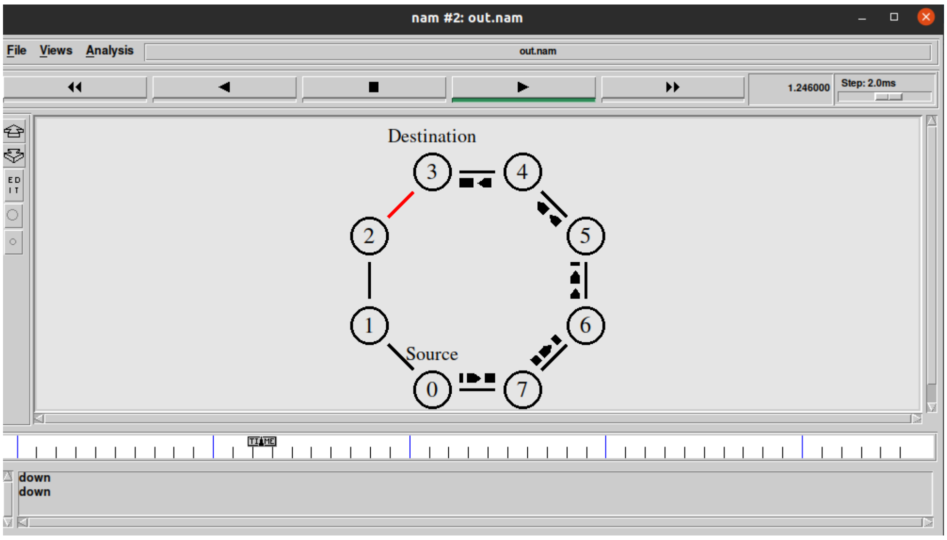
OUTPUT:



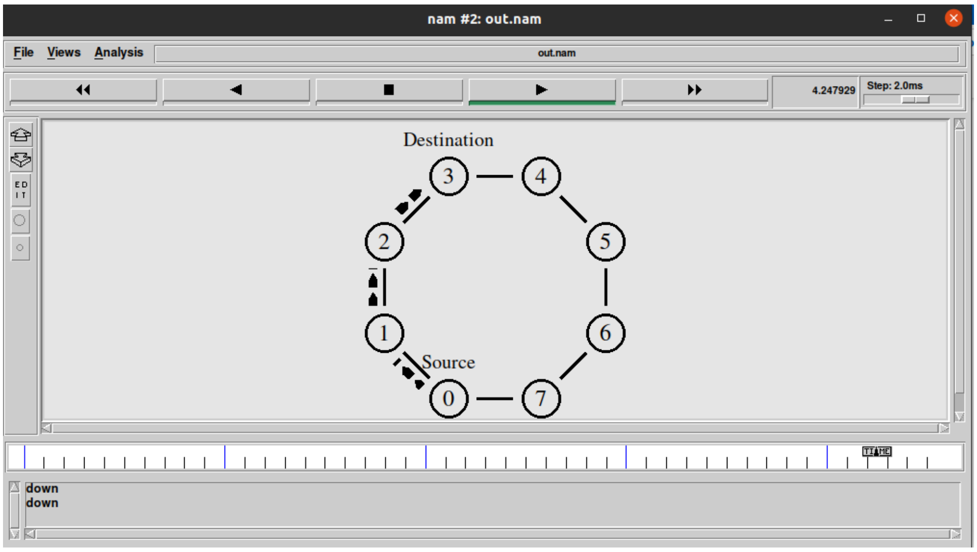




```
down
down
```



```
down
down
```



Step: 2.0ms

```
down
down
```