



**SEMBODAI RUKMANI VARATHARAJAN ENGINEERING
COLLEGE**

SEMBODAI - 614809

(Approved By AICTE, New-Delhi – Affiliated To ANNA UNIVERSITY::Chennai)

**EC 6611 COMPUTER NETWORKS
LABORATORY
(REGULATION-2013)**

LAB MANUAL

**DEPARTMENT OF ELECTRONICS AND
COMMUNICATION ENGINEERING**

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(REGULATION 2013)
AS PER ANNA UNIVERSITY SYLLABUS
SYLLABUS

LIST OF EXPERIMENTS:

1. Implementation of Error Detection / Error Correction Techniques
2. Implementation of Stop and Wait Protocol and sliding window
3. Implementation and study of Go-back-N and selective repeat protocols
4. Implementation of High Level Data Link Control
5. Study of Socket Programming and Client – Server model
6. Write a socket Program for Echo/Ping/Talk commands.
7. To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
8. Network Topology - Star, Bus, Ring
9. Implementation of distance vector routing algorithm
10. Implementation of Link state routing algorithm
11. Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS
12. Encryption and decryption.

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EX.NO:01

IMPLEMENTATION OF ERROR DETECTION / ERROR CORRECTION
TECHNIQUES

DATE:

AIM:

To Implementation of error detection and error correction protocol.

APPARATUS REQUIERD:

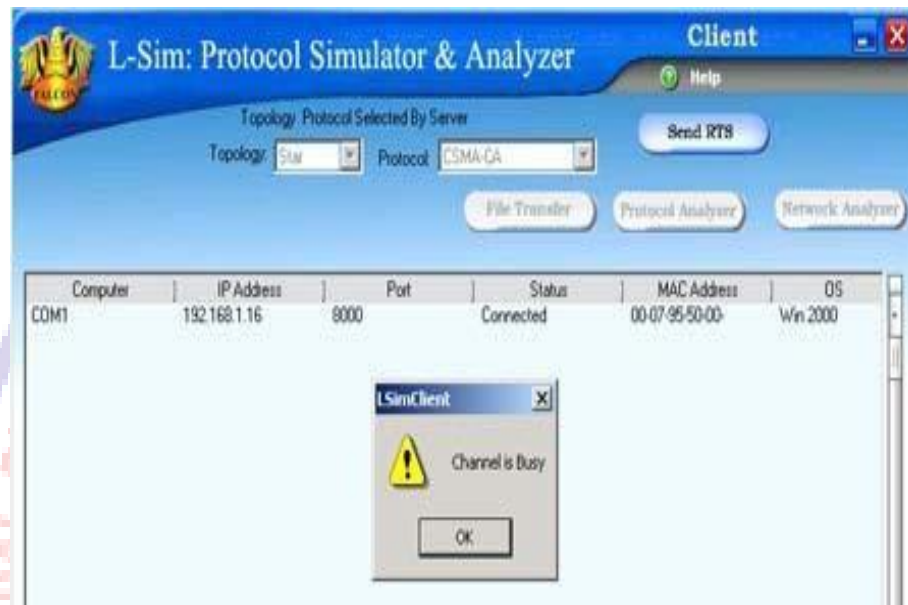
- LTS-01 trainer kit
- 3 Computers with win-2K / XP and Ethernet port available on them
- RJ-45 to RJ-45 LAN connecting cables
- L-SIM LAN protocol analyzer and simulator software

PROCEDURE:

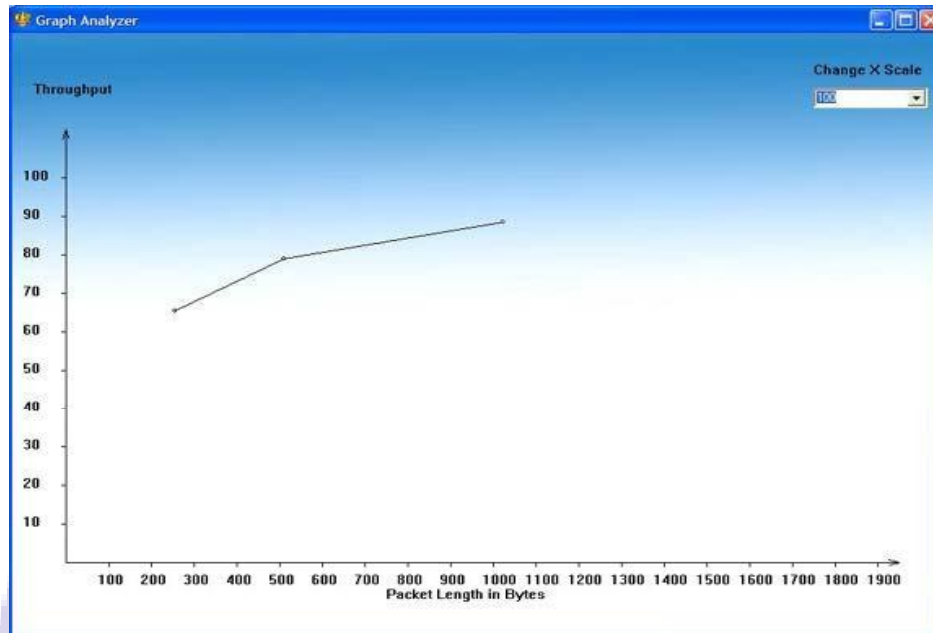
1. Connect 3 or more computer LAN ports using RJ-45 to RJ-45 LAN connecting cables provided with the system to LTS-01 star topology ports.
2. Switch on the LTS-01 & Computers.
3. Run L-SIM software on all the computers, one should be server and others should be clients.
4. On the server computer select type of network as LAN.
5. On the server computer select the topology as STAR, select protocol as CSMA-CA click on create network button.
6. Remote computer details will appear on the computers connected in network, server will be able to see all clients and all clients will be able to see only server.
7. Click on the Send RTS button to get your computer into transmitter mode.
8. Select the computer to whom data file is to be transferred, from the load button, previously stored/selected file information can be loaded or you can select any file, which is to be transmitted.
9. File size will appear in the software window, select the packet size, inter packet delay and click OK.

10. Total packets formed for that file will be indicated on computers, same details of file will appear on remote computer to which file is to be transmitted.
11. Click on file transfer button to transfer file.

a.



12. During file transfer process try to get access to transmit file by clicking on Send RTS button on other computers, you will be prompted with channel is busy message.
13. Thus collision of two packets transmitted simultaneously from two senders is avoided.
14. File transfer from one computer to another will take place.
15. Multiple file transfer between various server-client combinations should be performed to observe throughput v/s packet size graph on transmitter computer.
16. Close file transfer window and click on protocol analyzer and Network analyzer buttons on transmitter computer to view details of the log created.
17. Under Network analyzer window click on Graph analyzer button.
18. Calculate throughput and click on Plot graph button.



ERROR DETECTION

PROCEDURE:

1. Connect 3 or more computer LAN ports using RJ-45 to RJ-45 LAN connecting cables provided with the system to LTS-01 star topology ports.
2. Switch on the LTS-01 & Computers.
3. Run L-SIM software on all the computers, one should be server and others should be clients.
4. On the server computer select type of network as LAN.
5. On the server computer select the topology as STAR, select protocol an CSMA-CD click on create network button.
6. Remote computer details will appear on the computers connected in network, server will be able to see all clients and all clients will be able to see only server.
7. Select the server computer to whom data file is to be transferred from one of the client computer; from the load button, previously stored/selected file information can be loaded or you can select any file, which is to be transmitted.
8. File size will appear in the software window, select the packet size, inter packet delay and click OK.
9. Total packets formed for that file will be indicated on computers, same details of file will appear on remote computer to which file is to be transmitted.

10. Click on file transfer button to transfer file.
11. During file transfer process try to send file to server from another client computer, file transfer from second transmitter will also get initiated.
12. Once the first sender file reached to server its display is refreshed and server will show packet status for second sender.
13. Second sender file transfer will also get completed and thus collision of two packets transmitted simultaneously from two senders is detected and cleared.
14. Multiple file transfer between various server-client combinations should be performed to observe throughput v/s packet size graph on transmitter computer.
15. Close file transfer window and click on protocol analyzer and Network analyzer buttons on transmitter computer to view details of the log created.
16. Under Network analyzer window click on Graph analyzer button.

RESULT:

Thus the Error detection and correction protocol was implemented by using L-sim software.

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EX.NO:2

DATE:

IMPLEMENTATION OF STOP AND WAIT PROTOCOL

AIM:

To implementation of Stop & Wait protocol using parallel port & LAN port interface.

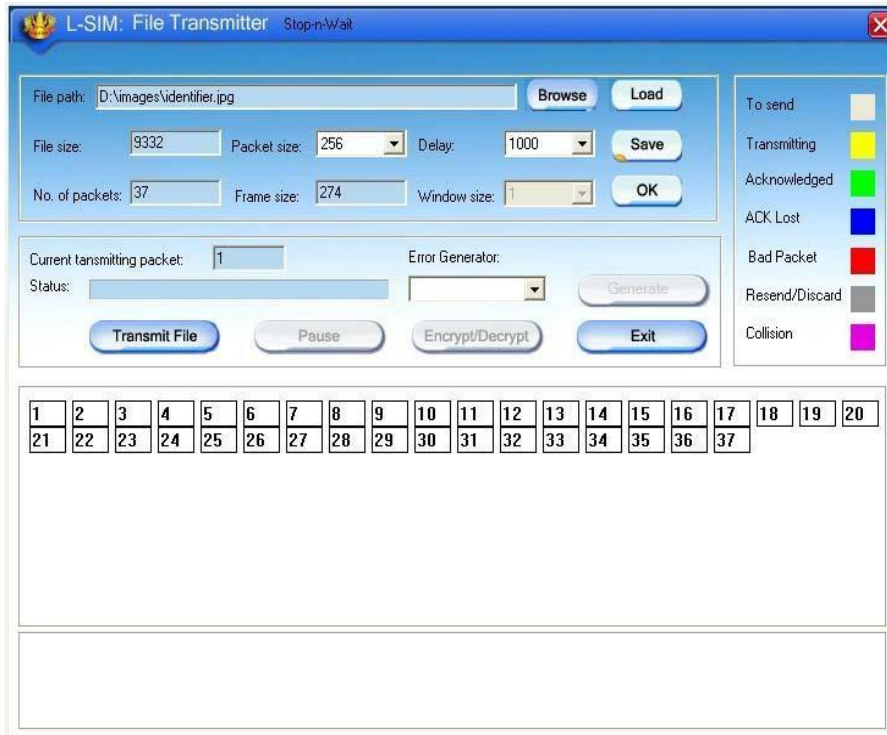
APPARATUS REQUIERD:

- LTS-01 trainer kit.
- 2 Computers with win-2K / XP and Ethernet port available on them
- RJ-45 to RJ-45 LAN connecting cables.
- L-SIM LAN protocol analyzer and simulator software

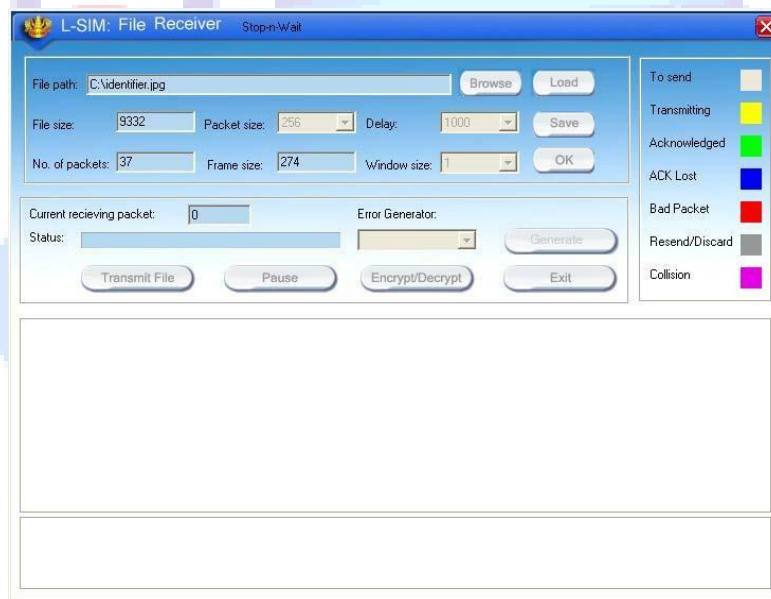
PROCEDURE

Connect 2 computer LAN ports using RJ-45 to RJ-45 LAN connecting cables provided with the system to LTS-01 star topology ports.

1. Switch on the LTS-01 & Computers.
2. Run L-SIM software on all the computers, one should be server and others should be clients.
3. On the server computer select type of network as LAN.
4. On the server computer select the topology as STAR, select protocol as Stop & Wait click on create network button.
5. Remote computer details will appear on the computers connected in network, server will be able to see all clients and all clients will be able to see only server.
6. Select the computer to whom data file is to be transferred, from the load button, previously stored/selected file information can be loaded or you can select any file, which is to be transmitted.
7. File size will appear in the software window, select the packet size, inter packet delay and click OK.

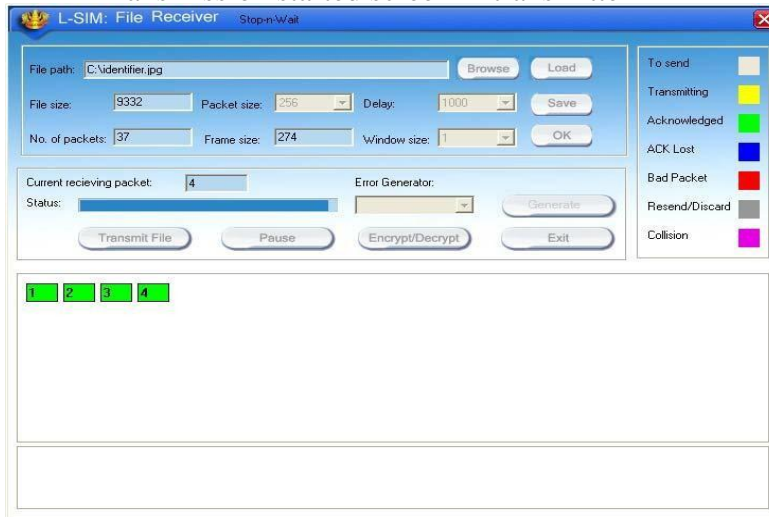


8. Total packets formed for that file will be indicated on computers.



9. Same details of file will appear on remote computer to which file is to be transmitted. Click on file transfer button to transfer file.

Transmission started screen in transmitter

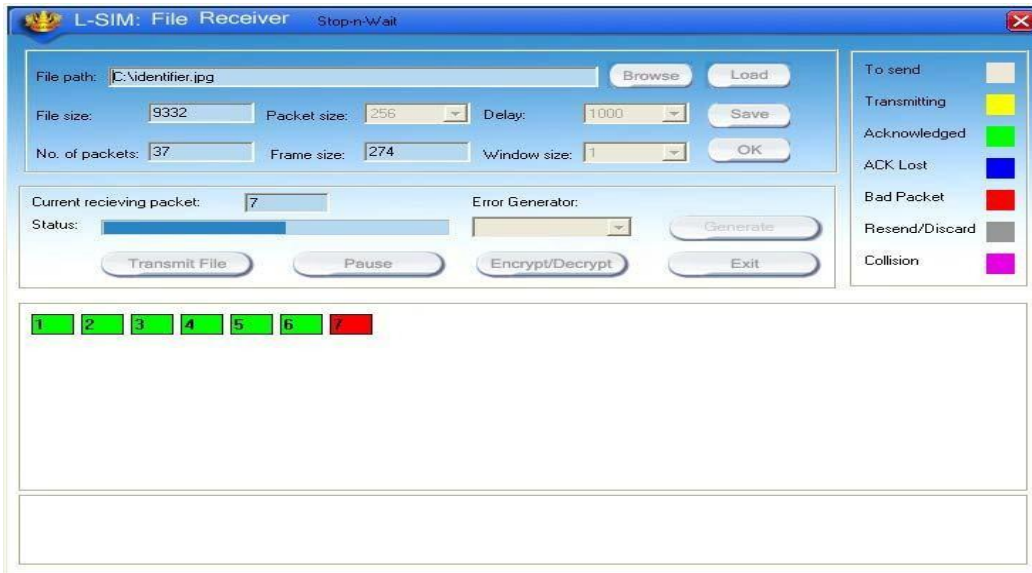


Transmission started screen in receiver

10. During file transfer process you can insert errors into data packets being transmitted through software window.
11. See the effect of Bad packet error, Packet negative acknowledgment error or auto errors on file transfer.
12. See the effect of Bad packet error, Packet negative acknowledgment error or auto errors on file transfer.



13. Select BAD PACKET error and click on Generate button in the transmitter window when say 7th packet is in the transmission state.



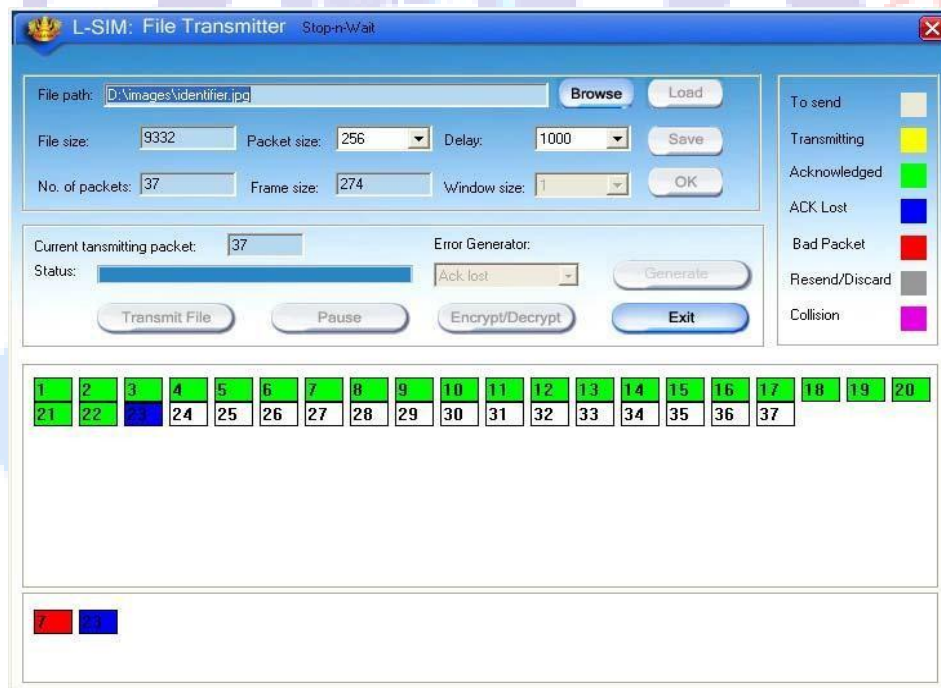
14. You will see that 7th packet in the receiver window will be marked as bad packet.



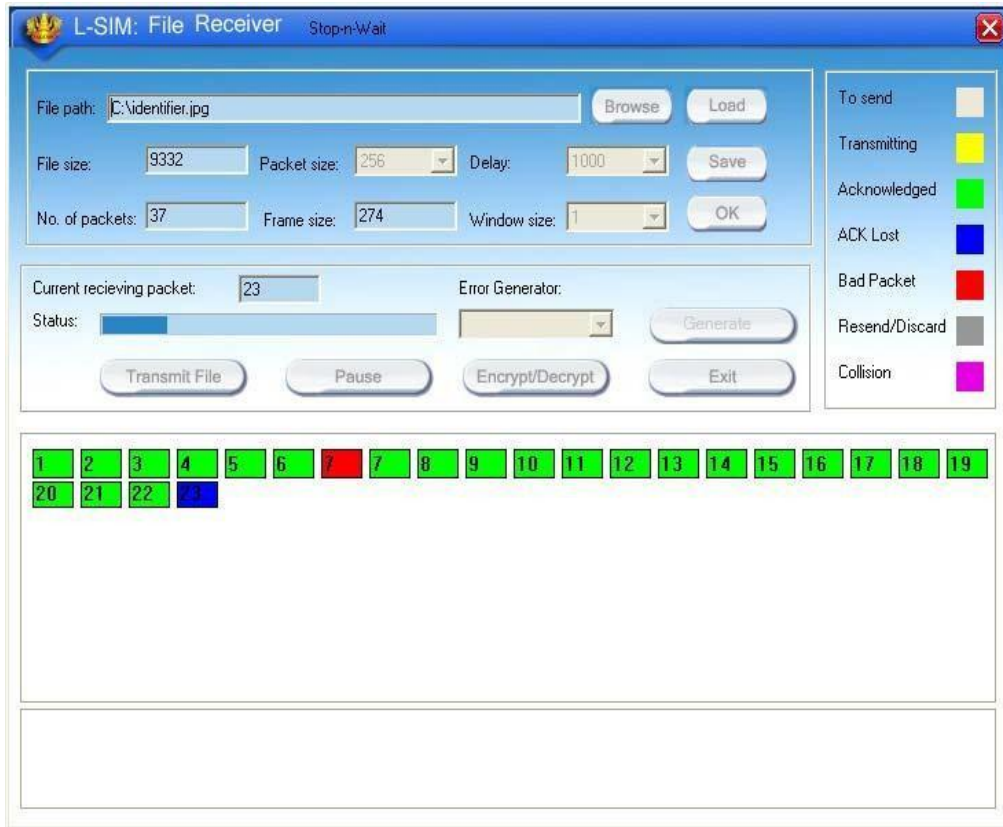
15. 7th packet will be retransmitted from transmitter.



16. Retransmitted 7th packet will be received correctly this time.



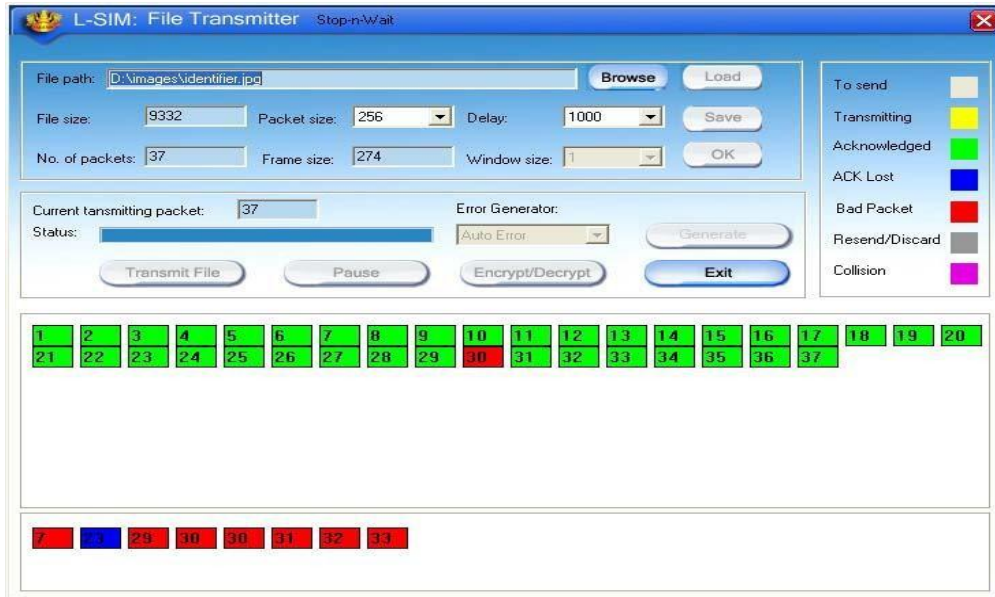
17. Select ACK LOST error and click on Generate button in the transmitter window when say 23rd packet is in the transmission state.



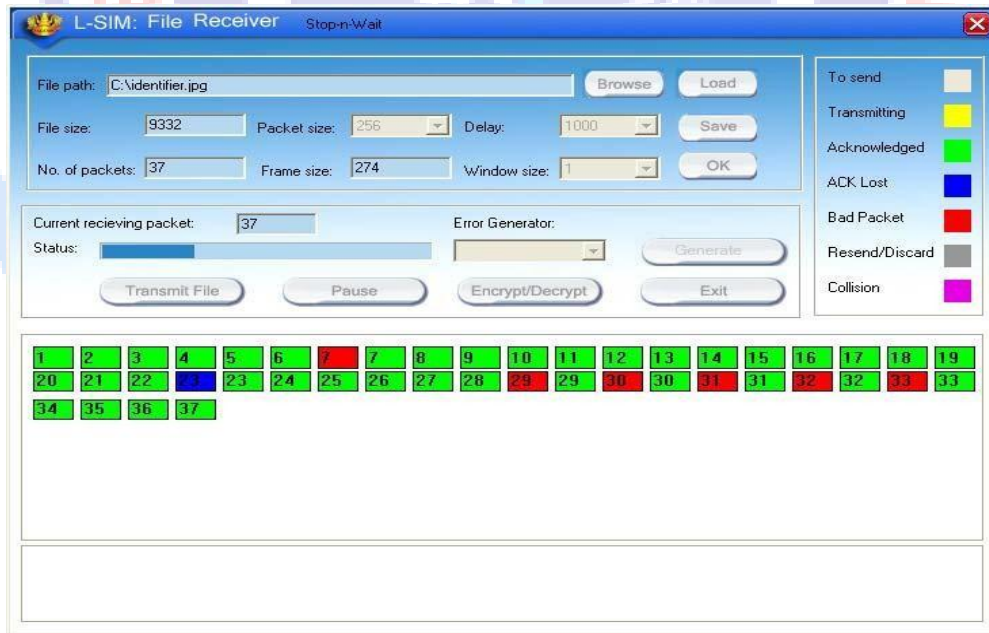
18. You will see that 23rd packet in the receiver window will be marked as unacknowledged.



19. 23rd packet will be retransmitted from transmitter.
Retransmitted 23rd packet will be received correctly this time.

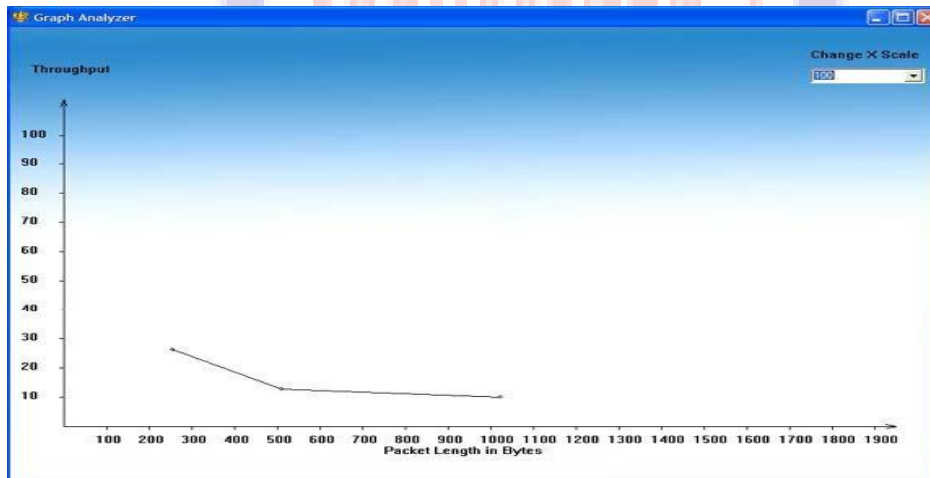


20. Select AUTO ERROR and click on Generate button in the transmitter Window at any packet is in the transmission state, errors are generated at random intervals and no other error insertion facility will be available to user.

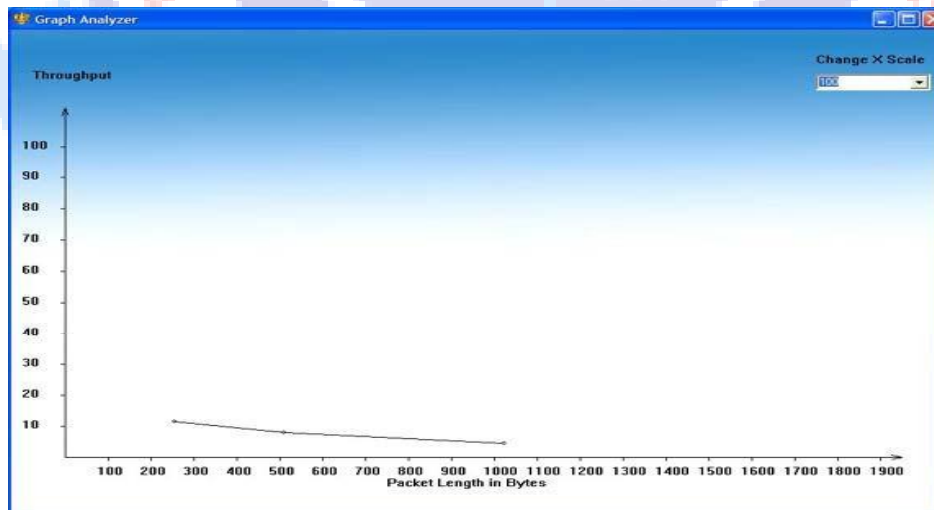


21. Status of packets received when auto error is selected.
22. File transfer from one computer to another will take place.
23. Multiple file transfer between various server-client combinations should be performed to observe throughput v/s packet size graph on transmitter computer.

24. Close file transfer window and click on protocol analyzer and Network analyzer buttons on transmitter computer to view details of the log created.
25. Under Network analyzer window click on Graph analyzer button.
26. Calculate throughput and click on Plot graph button.
27. Detailed graph of throughput v/s packet size for the total file transfer activity will appear on graph window.
28. This plot can be printed by clicking on print button.



Graph for Stop & Wait protocol without any packet errors



Graph for Stop & Wait protocol with one ACK lost packet error **RESULT**

Thus the Stop & Wait protocol using parallel port & LAN port interface was implemented and studied by using L-sim simulation software.

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EX.NO:3

STUDY OF SOCKET PROGRAMMING AND CLIENT – SERVER
MODEL

DATE:

PROGRAM:

//SERVER

```
import java.net.*;
import java.io.*;
import java.util.*;
class tcpupdateserver
{
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);
}
}
}
// CLIENT
import java.net.*;
import java.io.*;
class tcpdateclient
{
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**2. Time and Date****//SERVER**

```
C:\Documents and Settings\ADMIN>cd C:\Java\jdk1.6.0_02\bin
```

```
C:\Java\jdk1.6.0_02\bin>javac tcpdateserver.java
```

```
C:\Java\jdk1.6.0_02\bin>java tcpdateserver
```

```
Press Ctrl+C to quit
```

```
Client System/IP address is :SYSTEM-35/192.168.1.45
```

//CLIENT

```
C:\Documents and Settings\ADMIN>cd C:\Java\jdk1.6.0_02\bin
```

```
C:\Java\jdk1.6.0_02\bin>javac tcpdateclient.java
```

```
C:\Java\jdk1.6.0_02\bin>java tcpdateclient
```

```
The date/time on server is : Thu Mar 12 10:54:41 IST 2015
```

```
C:\Java\jdk1.6.0_02\bin>
```

RESULT

Thus Study Of Socket Programming And Client – Server Model has been studied and verified by using socket programming.

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EX.NO:4

DATE:

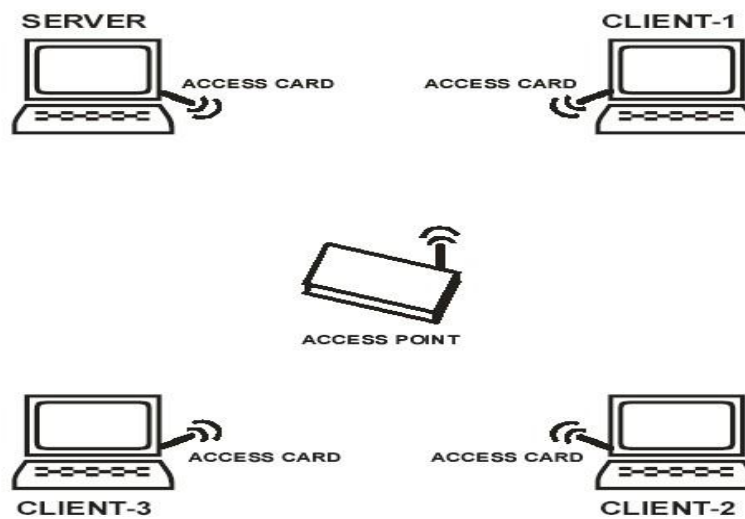
IMPLEMENTATION OF HIGH LEVEL DATA LINK CONTROL

AIM:

To study and Implementation and study of Wireless LAN.

APPARATUS REQUIERD:

- 3 or 4 Computers with win-2K / XP
- Access point with accessories
- Wireless LAN Access cards with USB driver installed on respective computers
- L-SIM LAN protocol analyzer and simulator software

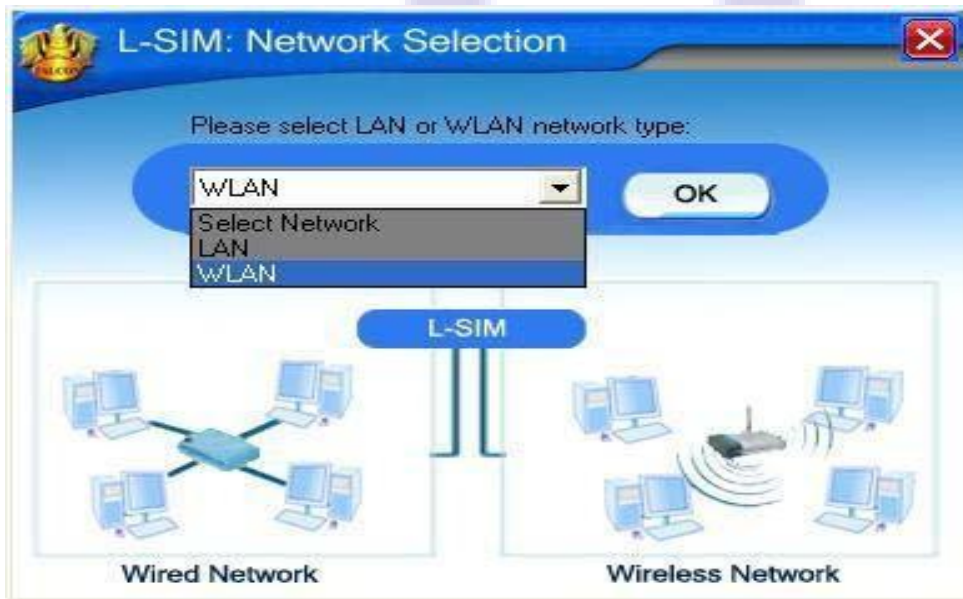


Connection of computers for Wireless LAN

PROCEDURE:

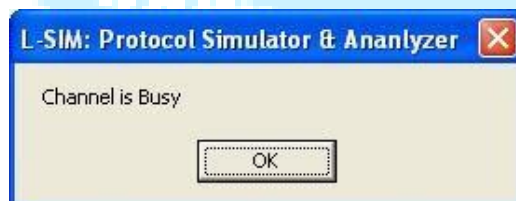
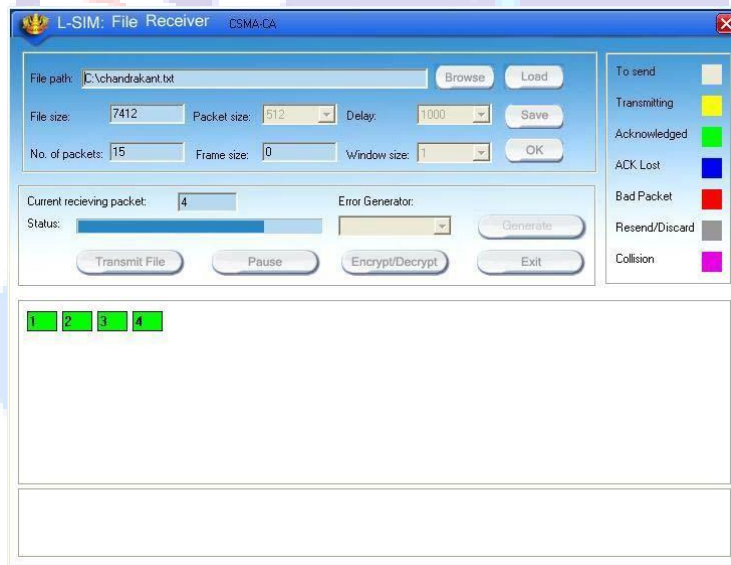
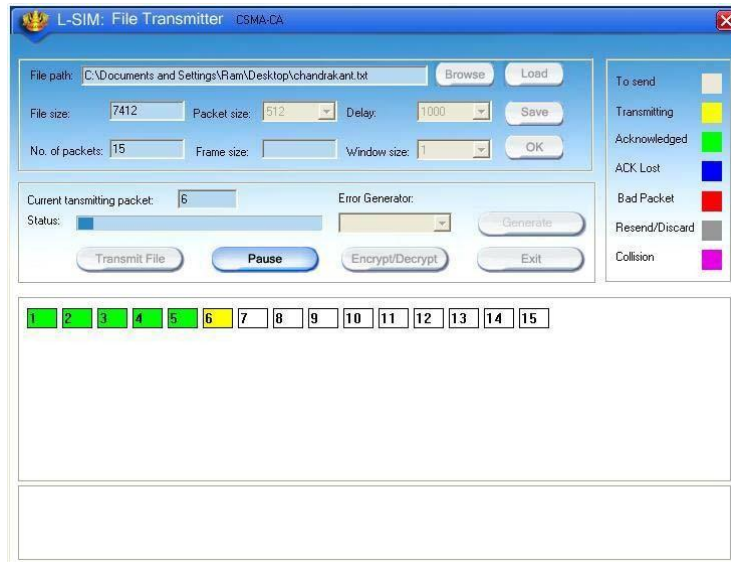
1. Connect Access point to power outlet and switch it on.
2. Connect USB wireless access cards to computer USB ports and check for driver installed on respective computers.

3. See appendix for installation guide of LAN access cards.
4. You will find wireless LAN detection on your computers, Assign IP address to the detected wireless LAN and connect it. Connection of wireless LAN will be indicated on your computers.
5. Run L-SIM software on all the computers, one should be server and others should be clients.

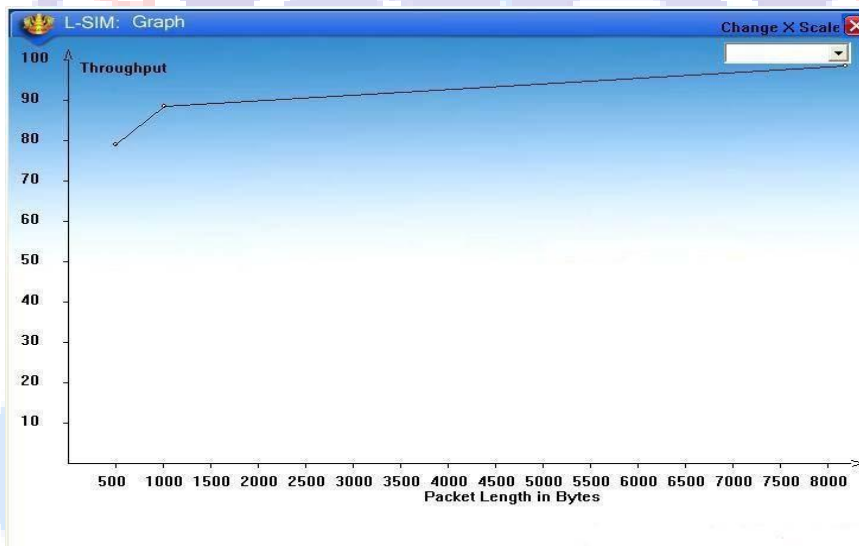


6. On the server computer select type of network as WLAN.
7. On the server computer select the topology as STAR, select protocol as CSMA-CA click on create network button.
8. Remote computer details will appear on the computers connected in network, server will be able to see all clients and all clients will be able to see only server.
9. Click on the Send RTS button to get your computer into transmitter mode.
10. Select the computer to whom data file is to be transferred, from the load button, previously stored/selected file information can be loaded or you can select any file, which is to be transmitted.
11. File size will appear in the software window, select the packet size, inter packet delay and click OK.

12. Total packets formed for that file will be indicated on computers, same details of file will appear on remote computer to which file is to be transmitted.
13. Click on file transfer button to transfer file.



14. During file transfer process try to get access to transmit file by clicking on Send RTS button, you will be prompted with channel is busy message.
15. Thus collision of two packets transmitted simultaneously from two senders is avoided.
16. File transfer from one computer to another will take place.
17. Multiple file transfer between various server-client combinations should be performed to observe throughput v/s packet size graph on transmitter computer.
18. Close file transfer window and click on protocol analyzer and Network analyzer buttons on transmitter computer to view details of the log created.
19. Under Network analyzer window click on Graph analyzer button.
20. Calculate throughput and click on Plot graph button.



21. Detailed graph of throughput v/s packet size for the total file transfer activity will appear on graph window.
22. This plot can be printed by clicking on print button.

RESULT:

Thus the study and Implementation of Wireless Local Area Network. Was implemented and verified.

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EX.NO:5

IMPLEMENTATION AND STUDY OF GO-BACK-N PROTOCOL
AND SELECTIVE REPEAT PROTOCOL

DATE:

AIM:

To study and implementation of Go Back N protocol using LAN port interface

EQUIPMENTS:

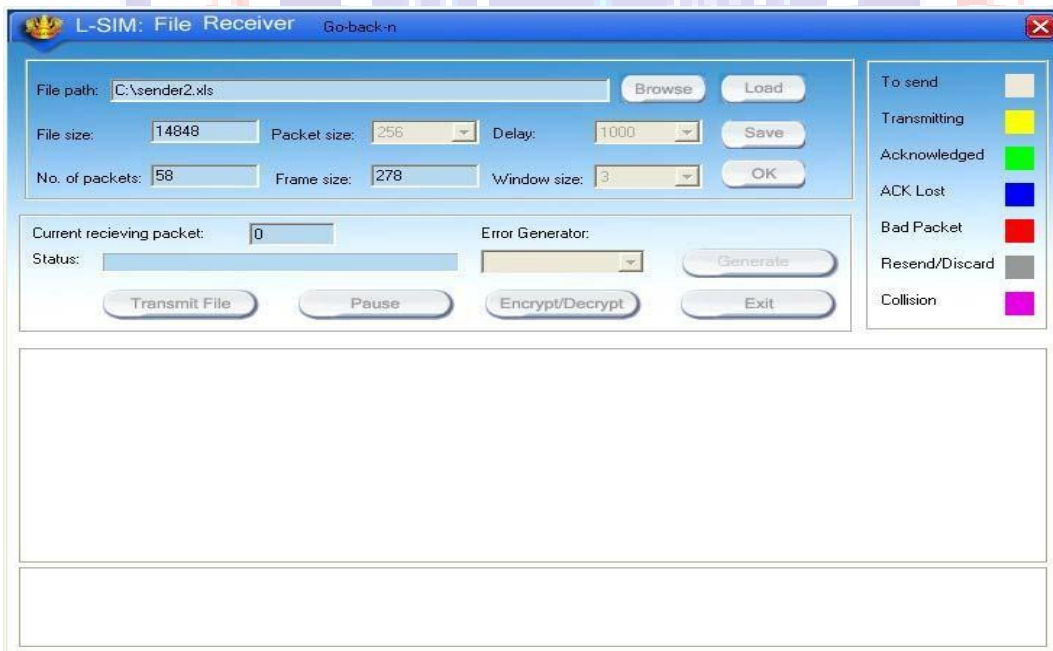
- LTS-01 trainer kit.
- 2 Computers with win-2K / XP and Ethernet port available on them.
- RJ-45 to RJ-45 LAN connecting cables.
- L-SIM LAN protocol analyzer and simulator software

PROCEDURE:

1. Connect 3 or more computer LAN ports using RJ-45 to RJ-45 LAN connecting cables provided with the system to LTS-01 star topology ports.
2. Switch on the LTS-01 & Computers.
3. Run L-SIM software on all the computers, one should be server and others should be clients.
4. On the server computer select type of network as LAN.
5. On the server computer select the topology as STAR, select protocol as Go Back N click on create network button.
6. Remote computer details will appear on the computers connected in network, server will be able to see all clients and all clients will be able to see only server.
7. Select the computer to whom data file is to be transferred, from the load button, previously stored/selected file information can be loaded or you can select any file, which is to be transmitted.
8. File size will appear in the software window, select the packet size, inter packet delay, window size and click OK.



9. Total packets formed for that file will be indicated on computers.



10. Same details of file will appear on remote computer to which file is to be transmitted.

11. Click on file transfer button to transfer file.

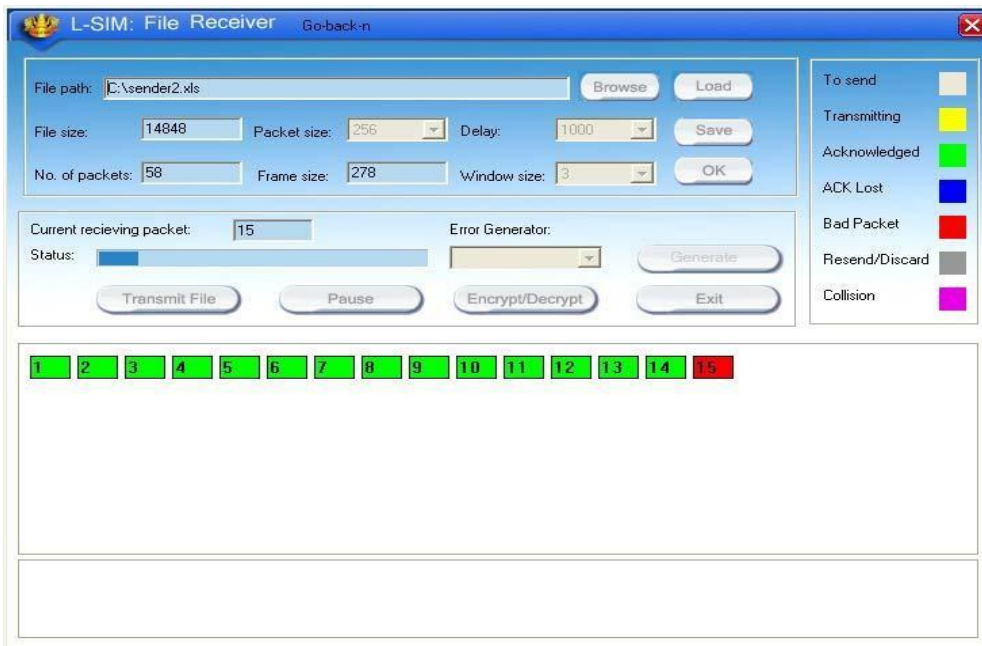


Transmission started screen in receiver

12. During file transfer process you can insert errors into data packets being transmitted through software window.
13. See the effect of Bad packet error, Packet negative acknowledgment error or auto errors on file transfer; observe carefully which packet/packets are transmitted.

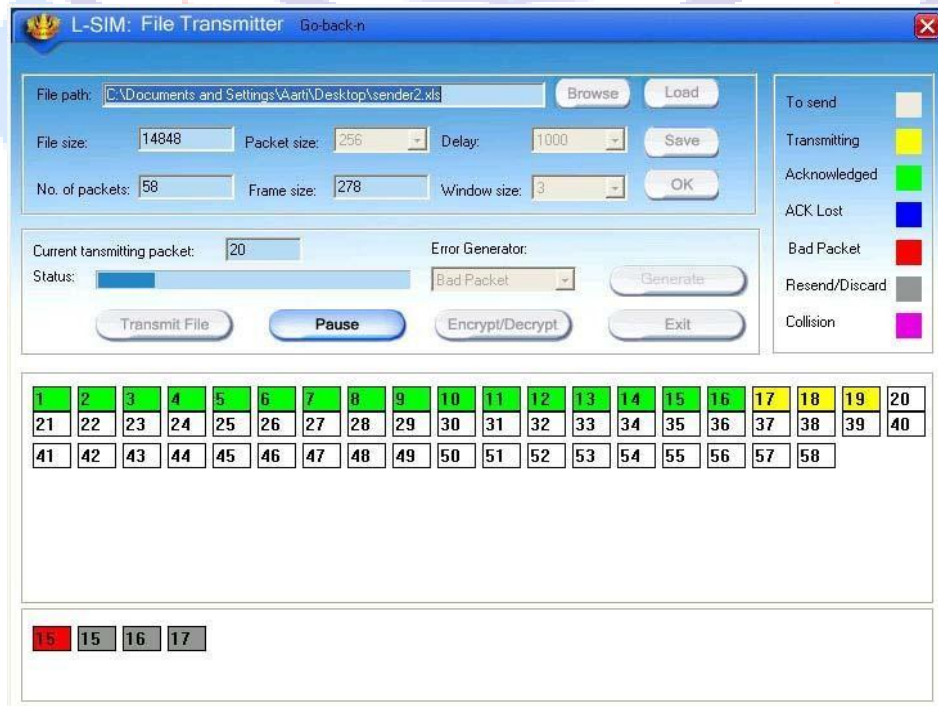


14. Select BAD PACKET error and click on Generate button in the transmitter window when say 15th packet is in the transmission state.

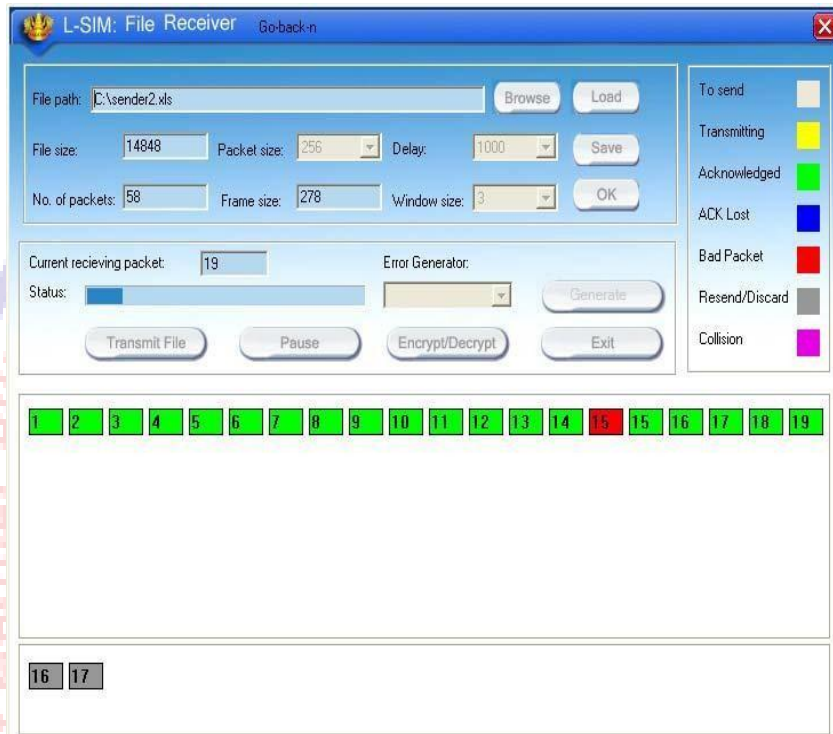


15. You will see that 15th packet in the receiver window will be marked as bad packet.

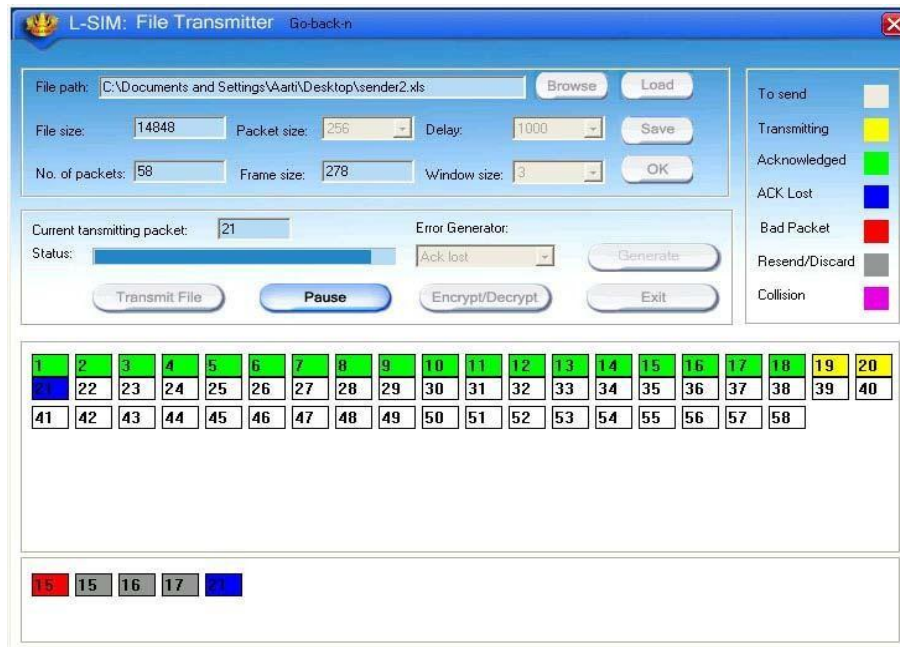
16. 15th, 16th & 17th packets will be retransmitted from transmitter.



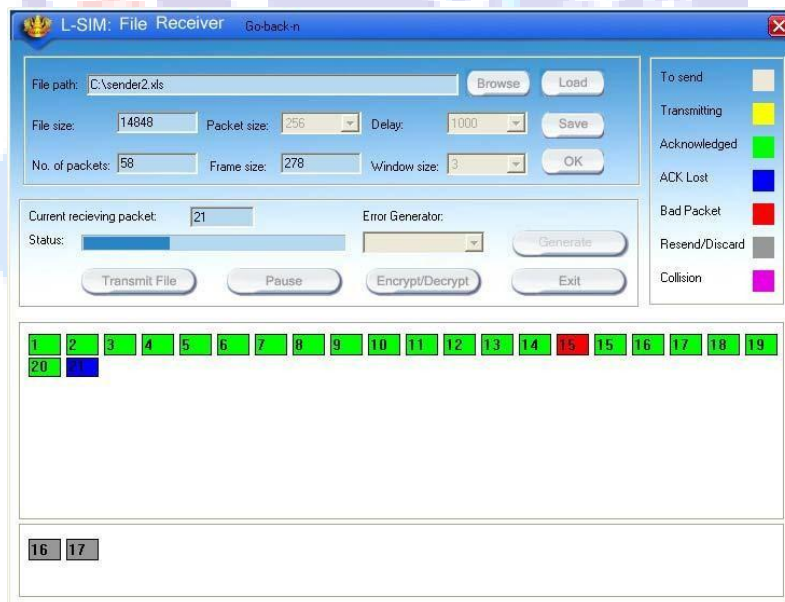
17. 15th, 16th & 17th packets will be retransmitted from transmitter.



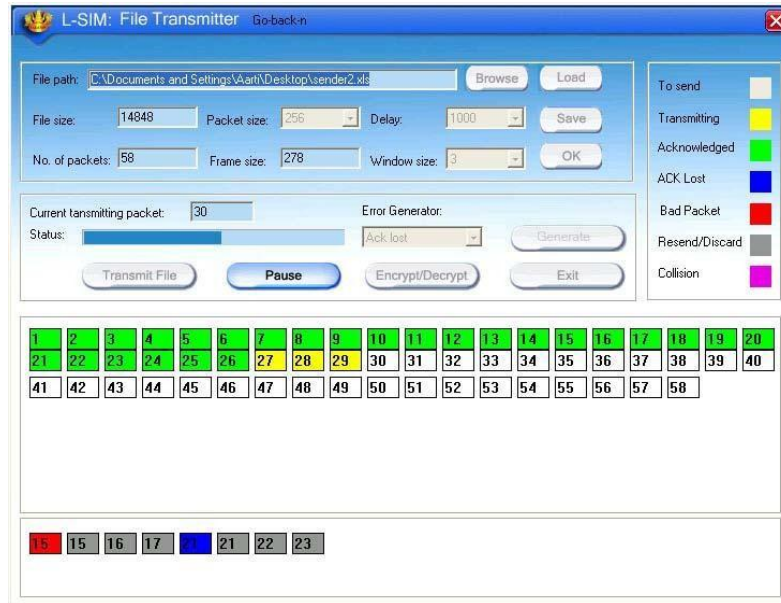
18. Retransmitted 15th, 16th & 17th packets will be received correctly this time, receiver will discard 16th & 17th packets and only 15th packet is accepted.



- Select ACK LOST error and click on Generate button in the transmitter window when say 21st packet is in the transmission state.



- You will see that 21st packet in the receiver window will be marked as unacknowledged.



21. 21st, 22nd & 23rd packets will be retransmitted from transmitter.

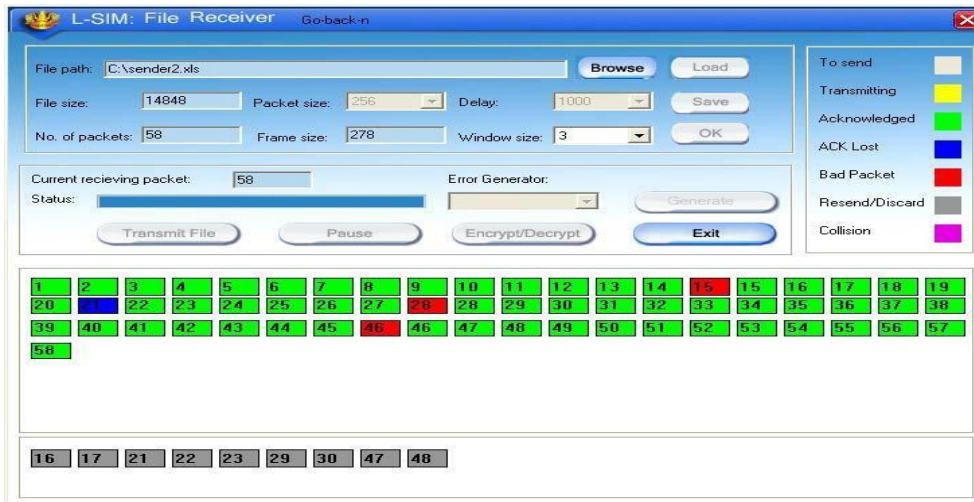


22. Retransmitted 21st, 22nd & 23rd packets will be received and discarded by receiver as they were received correctly earlier.

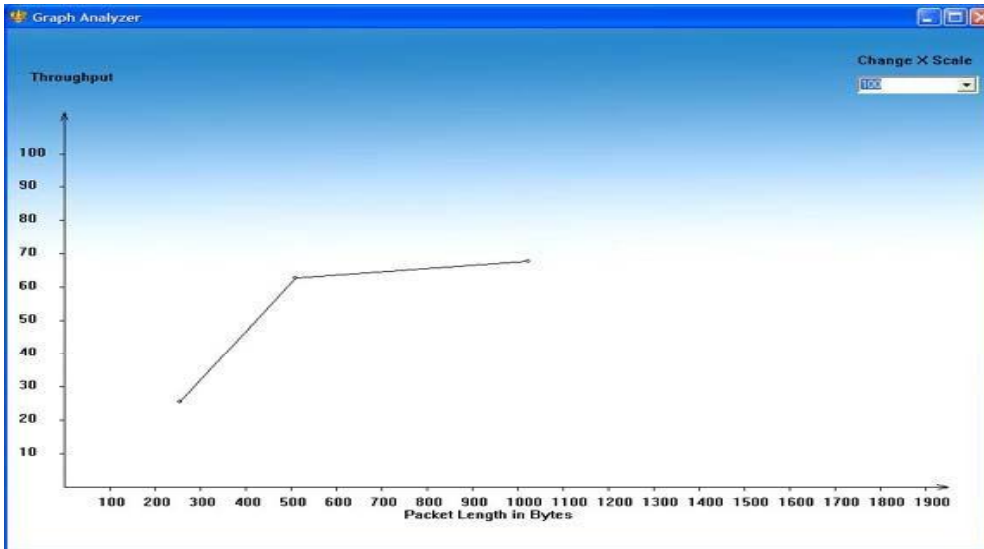


23. Select AUTO ERROR and click on Generate button in the transmitter

Window at any packet is in the transmission state, errors are generated at random intervals and no other error insertion facility will be available to user.



24. Status of packets received when auto error is selected.
25. File transfer from one computer to another will take place.
26. Multiple file transfer between various server-client combinations should be performed to observe throughput v/s packet size graph on transmitter computer.
27. Close file transfer window and click on protocol analyzer and Network analyzer buttons on transmitter computer to view details of the log created.
28. Under Network analyzer window click on Graph analyzer button.
29. Calculate throughput and click on Plot graph button.
30. Detailed graph of throughput v/s packet size for the total file transfer activity will appear on graph window.



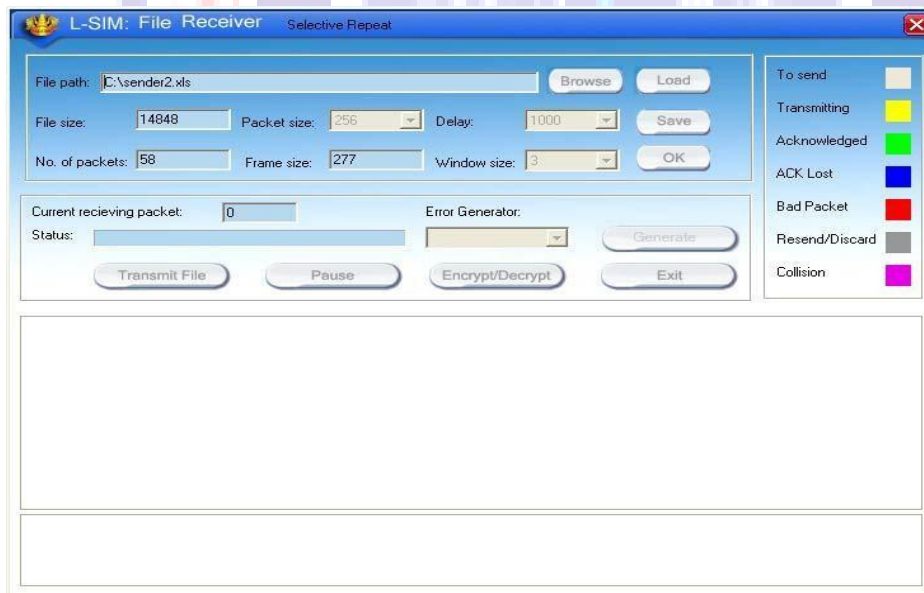
SELECTIVE REPEAT PROTOCOL

PROCEDURE:

1. Connect 3 or more computer LAN ports using RJ-45 to RJ-45 LAN connecting cables provided with the system to LTS-01 star topology ports.
2. Switch on the LTS-01 & Computers.
3. Run L-SIM software on all the computers, one should be server and others should be clients.
4. On the server computer select type of network as LAN.
5. On the server computer select the topology as STAR, select protocol as Selective Repeat click on create network button.
6. Remote computer details will appear on the computers connected in network, server will be able to see all clients and all clients will be able to see only server.
7. Select the computer to whom data file is to be transferred, from the load button, previously stored/selected file information can be loaded or you can select any file, which is to be transmitted.
8. File size will appear in the software window, select the packet size, inter packet delay, window size and click OK.



9. Total packets formed for that file will be indicated on computers.

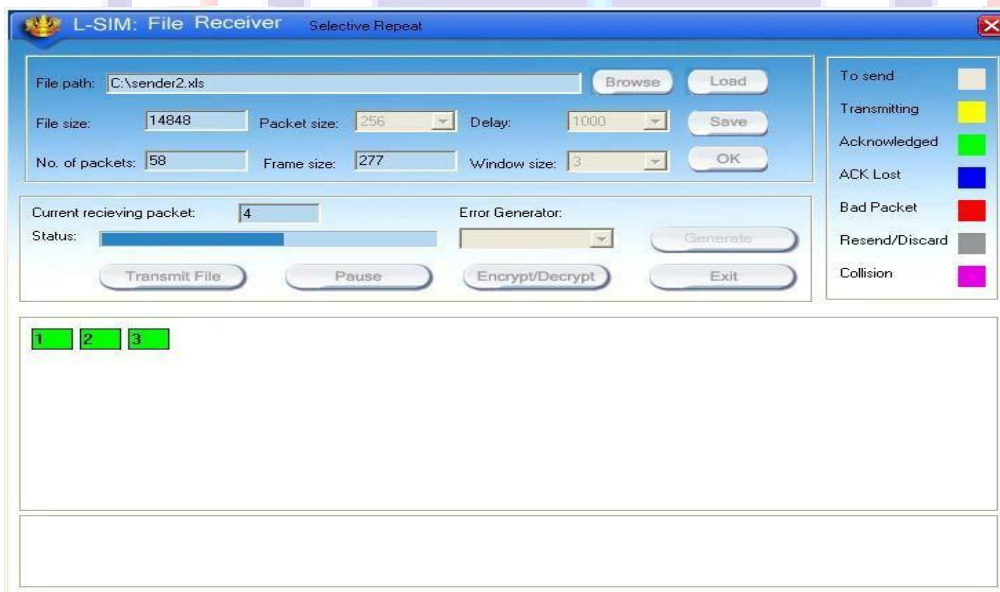


10. Same details of file will appear on remote computer to which file is to be transmitted.

11. Click on file transfer button to transfer file.



Transmission started screen in transmitter clearly show window size of 3 with 3 packets are transmitted at a time

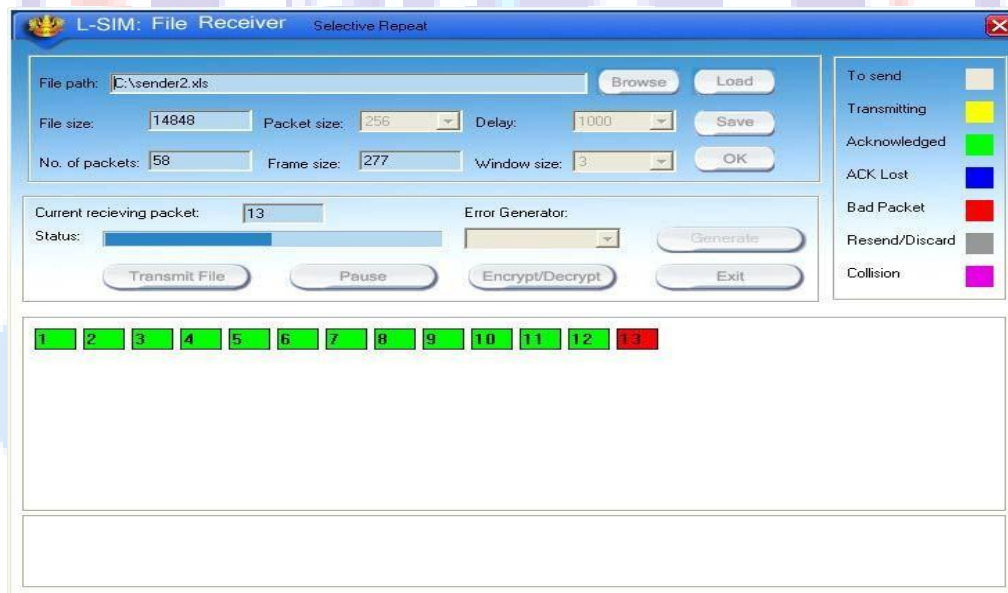


Transmission started screen in receiver

12. During file transfer process you can insert errors into data packets being transmitted through software window.
13. See the effect of Bad packet error, Packet negative acknowledgment error or auto errors on file transfer; observe carefully which packet/packets are transmitted.



14. Select BAD PACKET error and click on Generate button in the transmitter window when say 13th packet is in the transmission state.



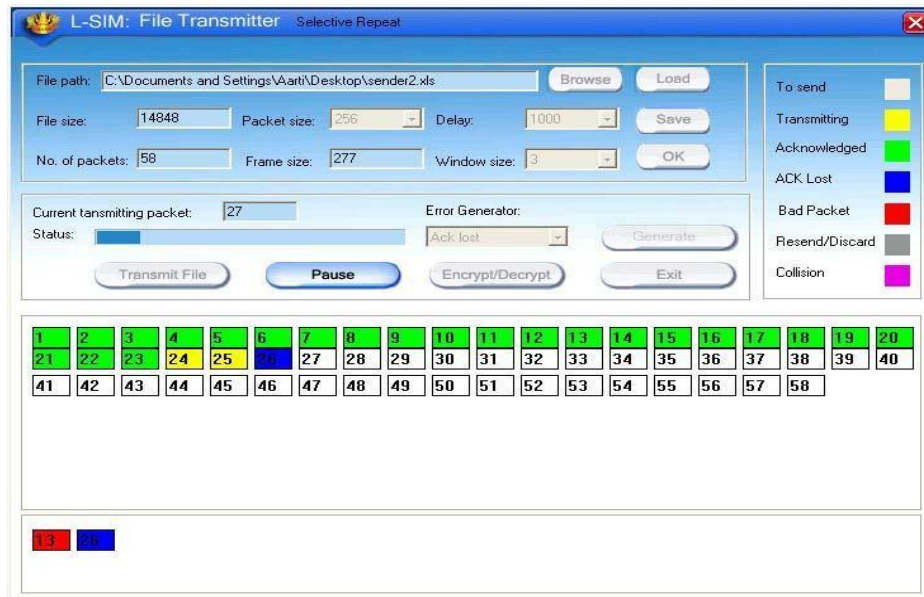
15. You will see that 13th packet in the receiver window will be marked as bad packet.



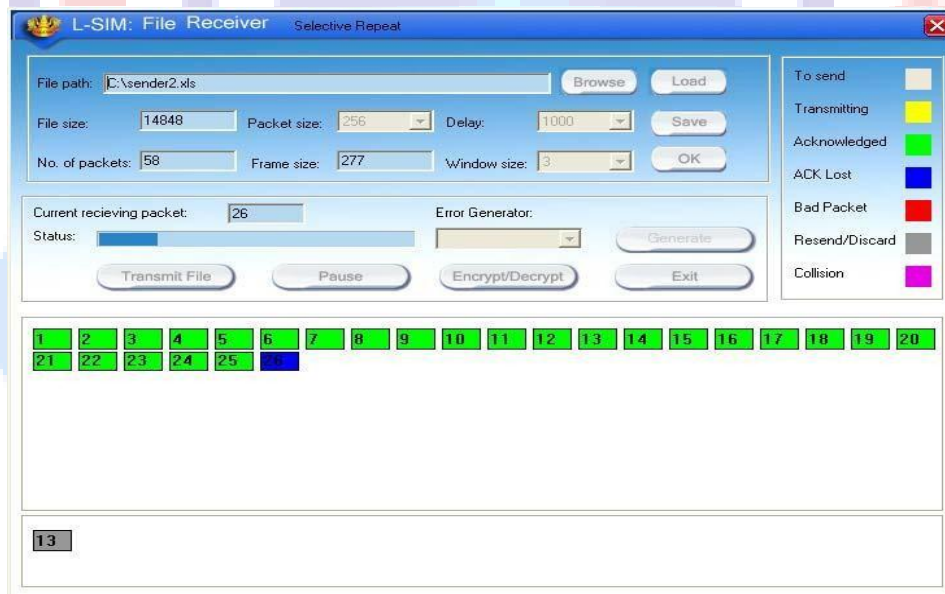
16. 13th packet will be retransmitted from transmitter.



17. Retransmitted 13th packet will be received correctly this time.



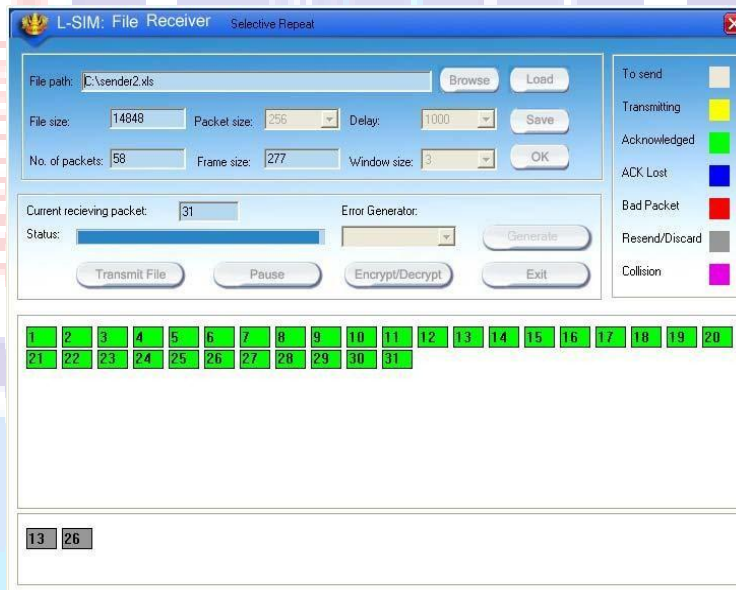
18. Select ACK LOST error and click on Generate button in the transmitter window when say 26th packet is in the transmission state.



19. You will see that 26th packet in the receiver window will be marked as unacknowledged.



20. 26th packet will be retransmitted from transmitter.



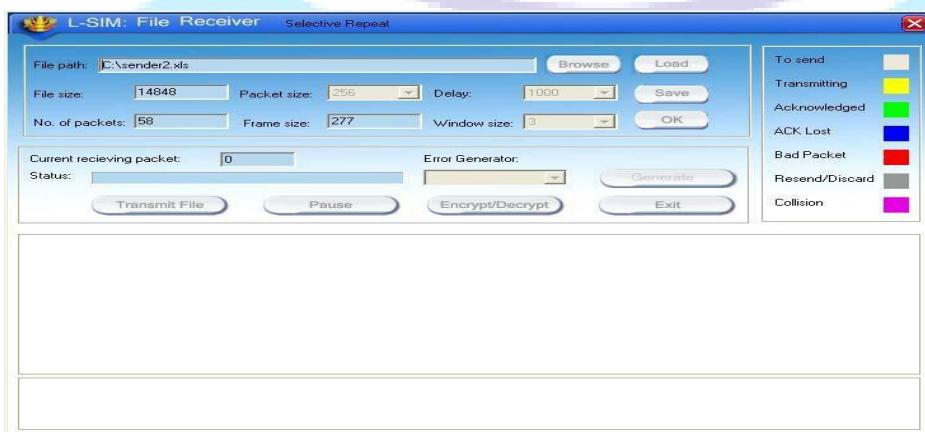
PROCEDURE:

21. Connect 3 or more computer LAN ports using RJ-45 to RJ-45 LAN connecting cables provided with the system to LTS-01 star topology ports.
22. Switch on the LTS-01 & Computers.
23. Run L-SIM software on all the computers, one should be server and others should be clients.
24. On the server computer select type of network as LAN.

25. On the server computer select the topology as STAR, select protocol as Selective Repeat
Repeat click on create network button.
26. Remote computer details will appear on the computers connected in network, server will be able to see all clients and all clients will be able to see only server.
27. Select the computer to whom data file is to be transferred, from the load button, previously stored/selected file information can be loaded or you can select any file, which is to be transmitted.
28. File size will appear in the software window, select the packet size, inter packet delay, window size and click OK.



29. Total packets formed for that file will be indicated on computers.

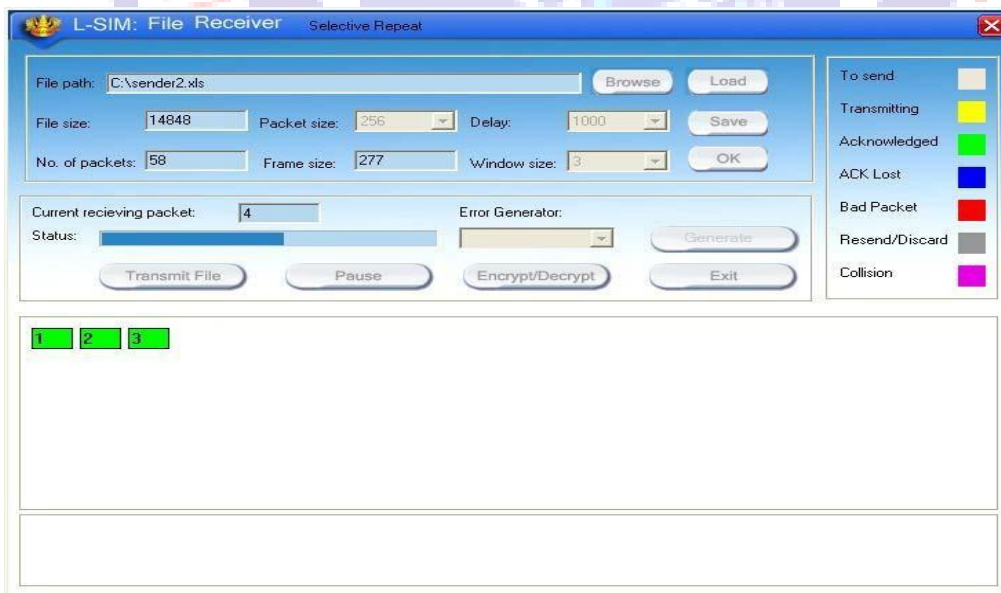


30. Same details of file will appear on remote computer to which file is to be transmitted.

31. Click on file transfer button to transfer file.



Transmission started screen in transmitter clearly show window size of 3 with 3 packets are transmitted at a time



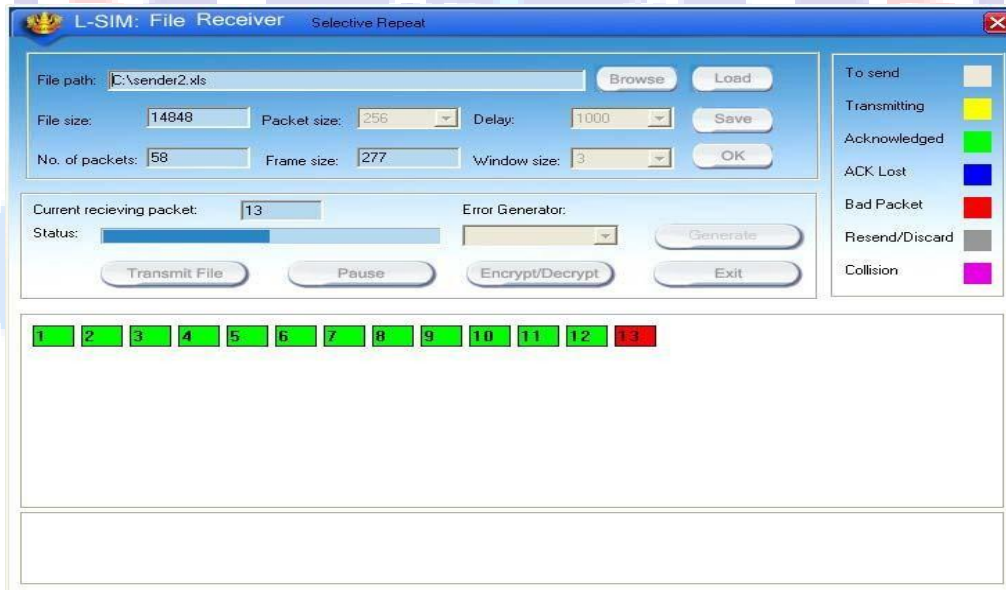
Transmission started screen in receiver

32. During file transfer process you can insert errors into data packets being transmitted through software window.

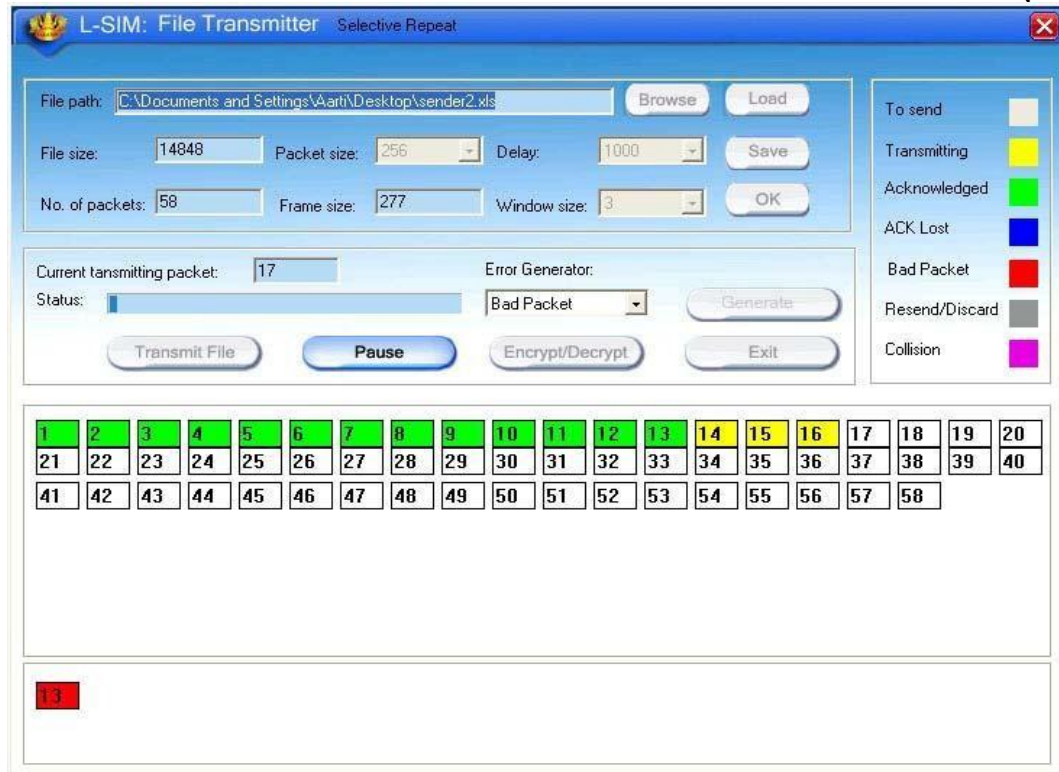
33. See the effect of Bad packet error, Packet negative acknowledgment error or auto errors on file transfer; observe carefully which packet/packets are transmitted.



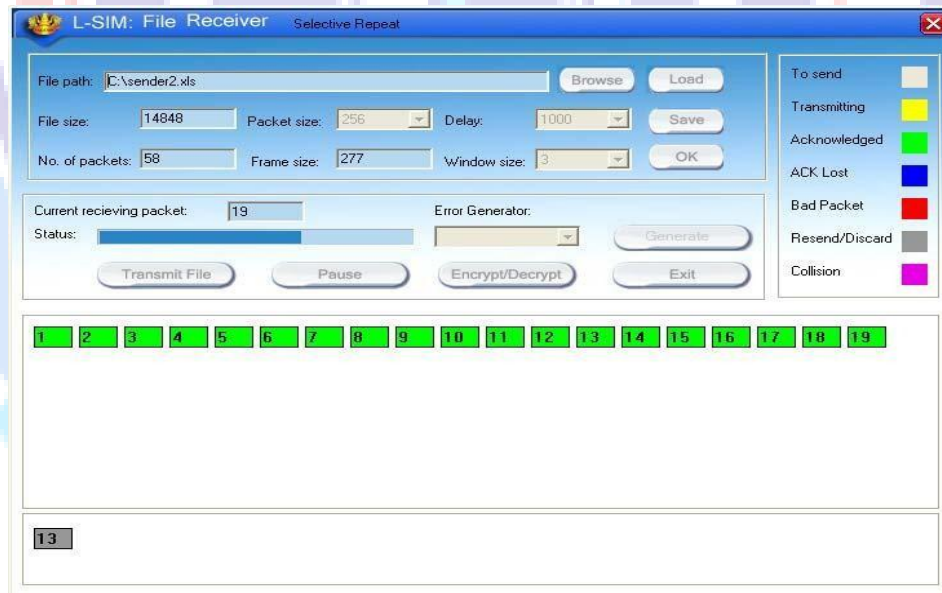
34. Select BAD PACKET error and click on Generate button in the transmitter window when say 13th packet is in the transmission state.



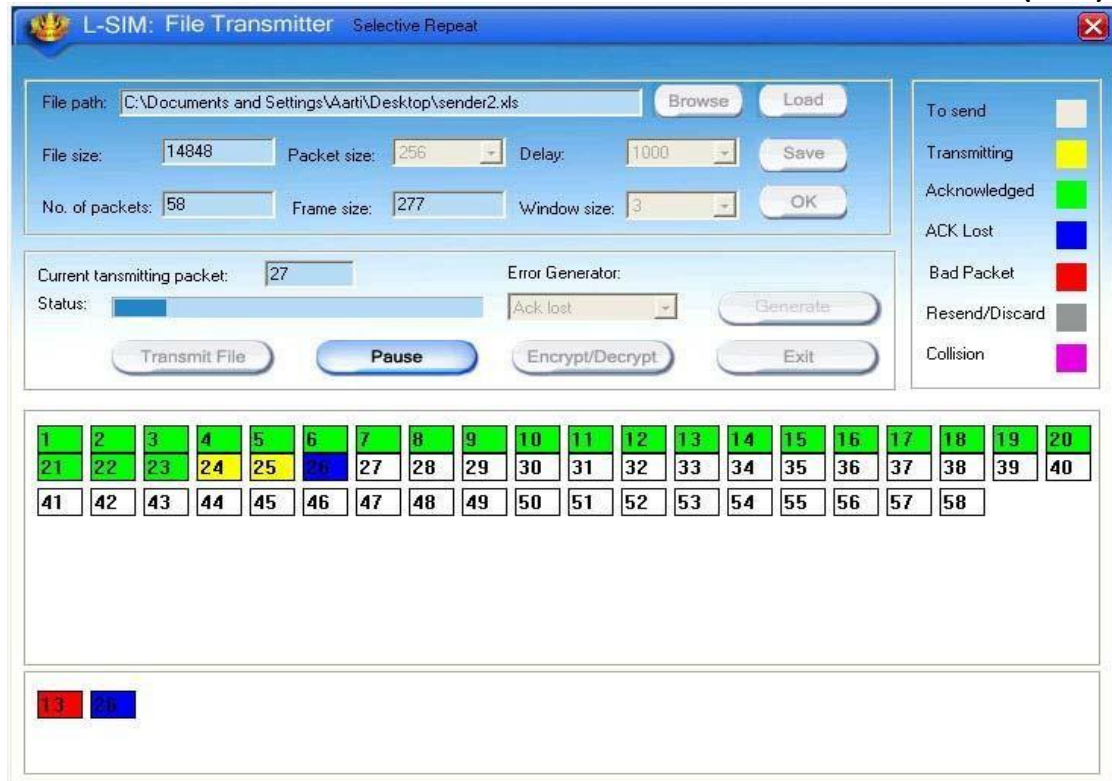
35. You will see that 13th packet in the receiver window will be marked as bad packet.



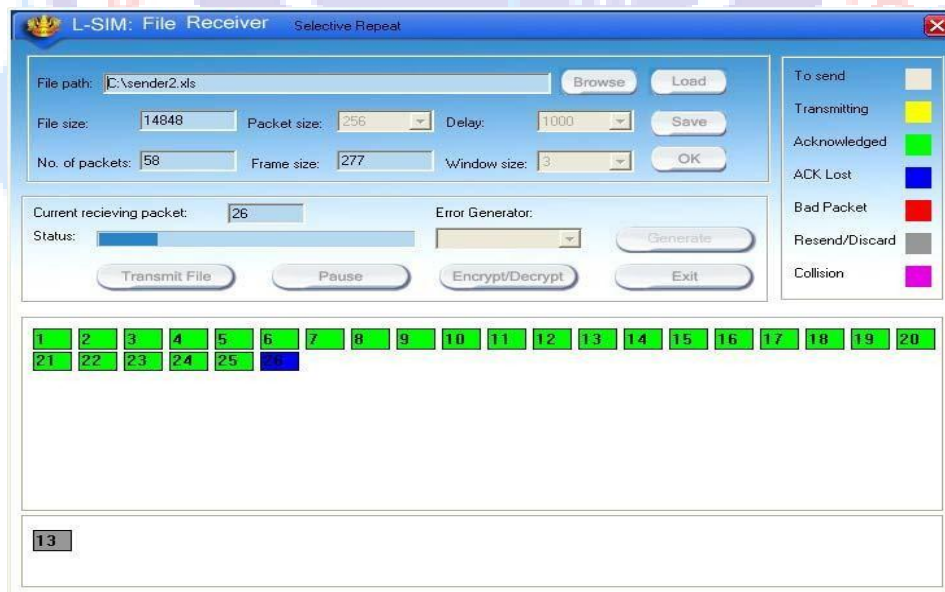
36. 13th packet will be retransmitted from transmitter.



37. Retransmitted 13th packet will be received correctly this time.



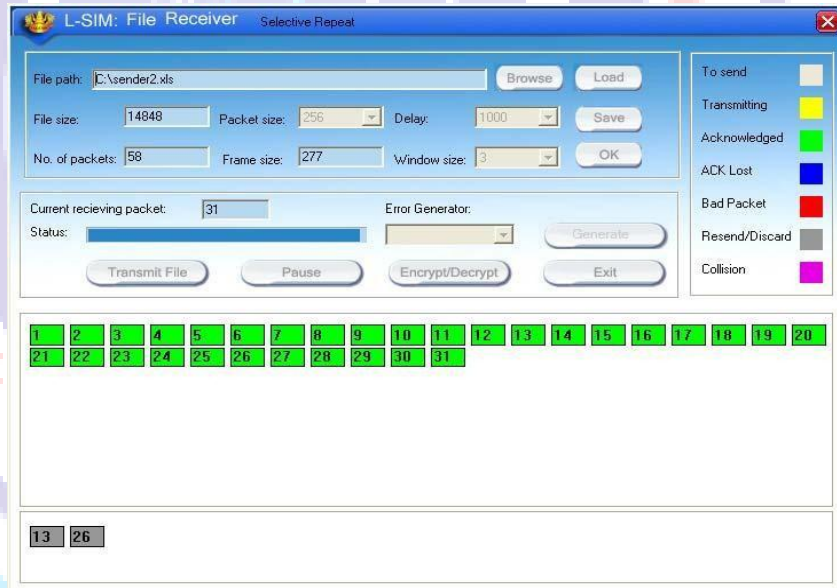
38. Select ACK LOST error and click on Generate button in the transmitter window when say 26th packet is in the transmission state.



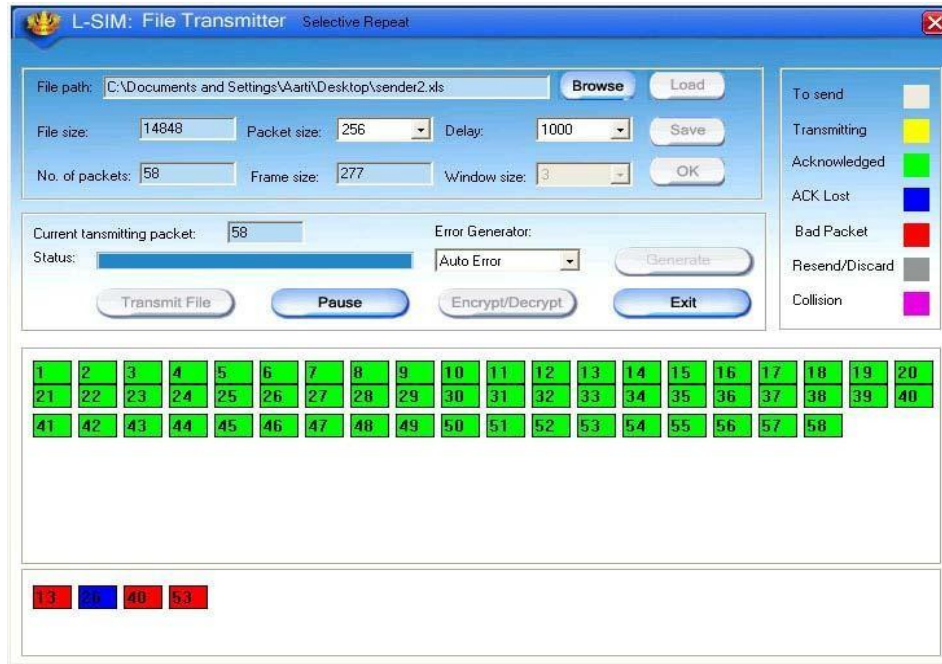
39. You will see that 26th packet in the receiver window will be marked as unacknowledged.



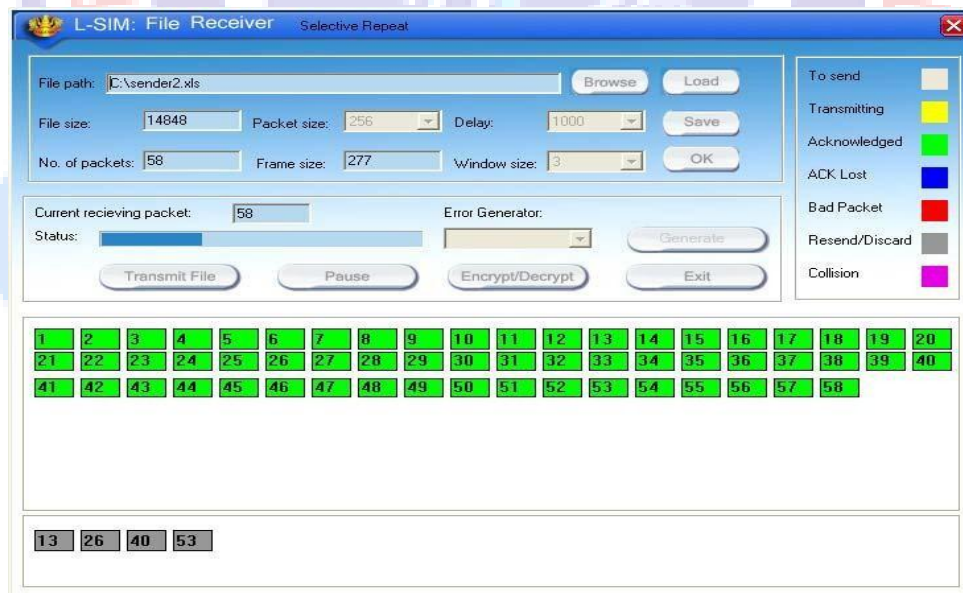
40. 26th packet will be retransmitted from transmitter.



Retransmitted 26th packet will be received and discarded by receiver as it was received correctly earlier.

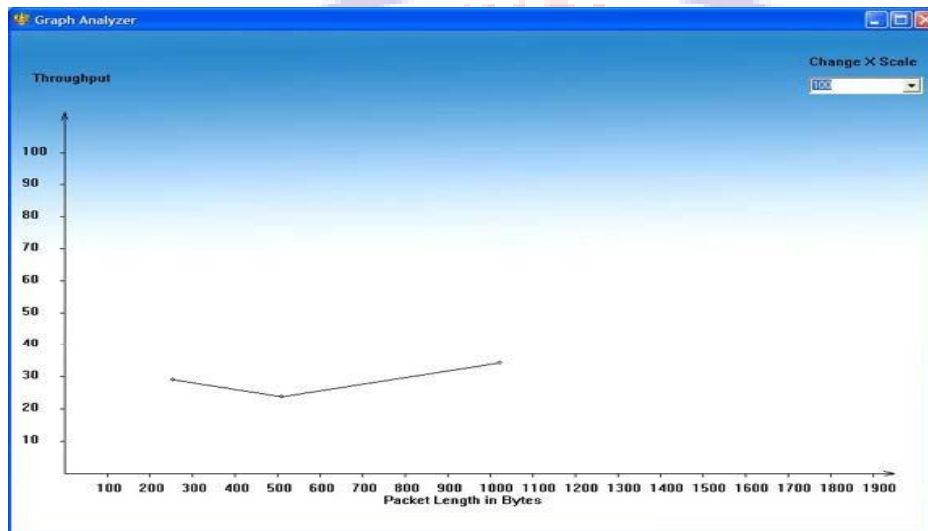


41. Select AUTO ERROR and click on Generate button in the transmitter Window at any packet is in the transmission state, errors are generated at random intervals and no other error insertion facility will be available to user.



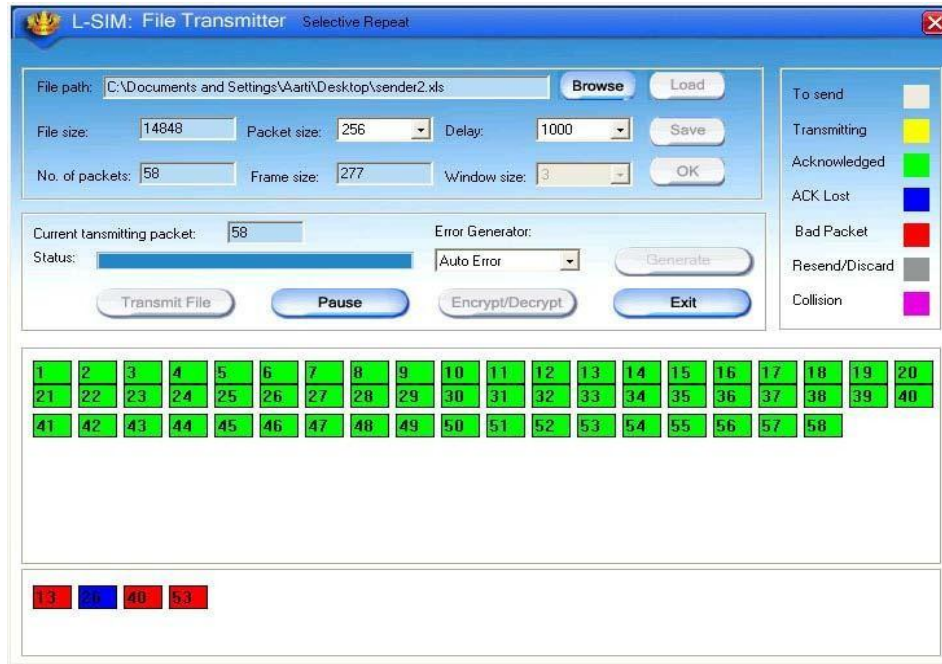
42. Status of packets received when auto error is selected.
43. File transfer from one computer to another will take place.
44. Multiple file transfer between various server-client combinations should be performed to observe throughput v/s packet size graph on transmitter computer.

45. Close file transfer window and click on protocol analyzer and Network analyzer buttons on transmitter computer to view details of the log created.
46. Under Network analyzer window click on Graph analyzer button.
47. Calculate throughput and click on Plot graph button.
48. Detailed graph of throughput v/s packet size for the total file transfer activity will appear on graph window.

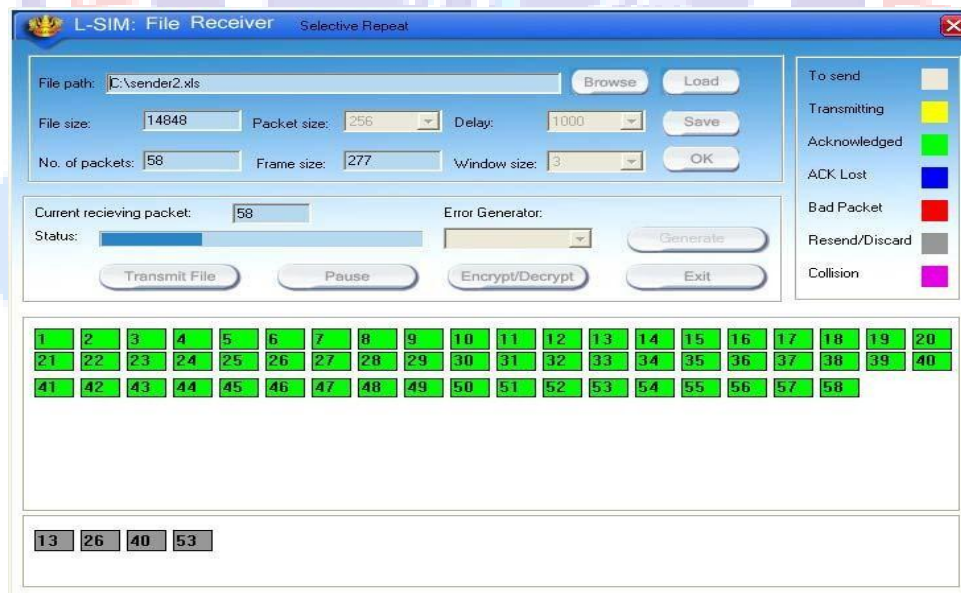


Graph for Selective Repeat protocol without any packet errors

49. This plot can be printed by clicking on print button.
26th packet will be received and discarded by receiver as it was received correctly earlier.

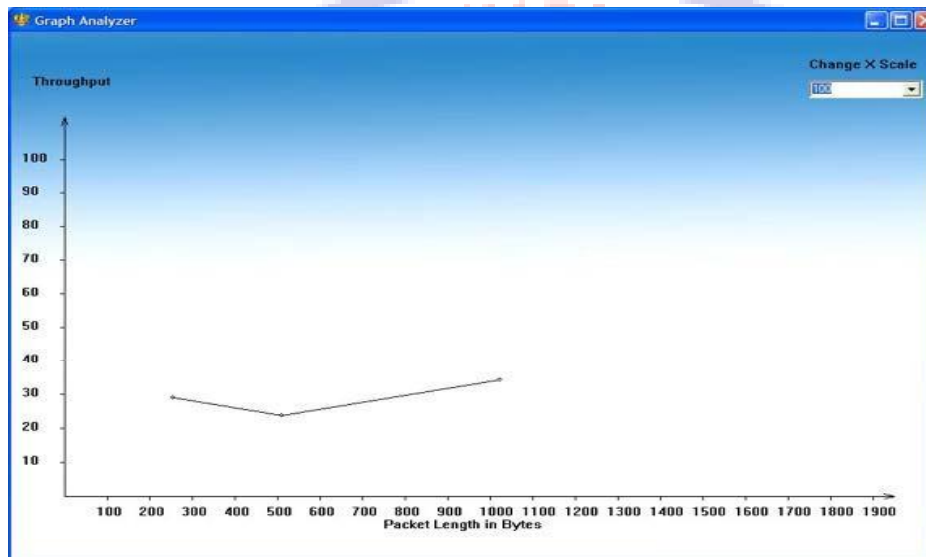


50. Select AUTO ERROR and click on Generate button in the transmitter Window at any packet is in the transmission state, errors are generated at random intervals and no other error insertion facility will be available to user.



51. Status of packets received when auto error is selected.
52. File transfer from one computer to another will take place.
53. Multiple file transfer between various server-client combinations should be performed to observe throughput v/s packet size graph on transmitter computer.

54. Close file transfer window and click on protocol analyzer and Network analyzer buttons on transmitter computer to view details of the log created.
55. Under Network analyzer window click on Graph analyzer button.
56. Calculate throughput and click on Plot graph button.
57. Detailed graph of throughput v/s packet size for the total file transfer activity will appear on graph window.



Graph for Selective Repeat protocol without any packet errors

58. This plot can be printed by clicking on print button.

RESULT:

Thus the GO-BACK-N and Selective Repeat protocol using parallel port & LAN port interface was studied and implemented by using L-sim software.

SEMBODAI RUKMANI VARATHARAJAN ENGINEERING COLLEGE

EX.NO:5

NETWORK TOPOLOGY STAR & BUS AND RING NETWORK

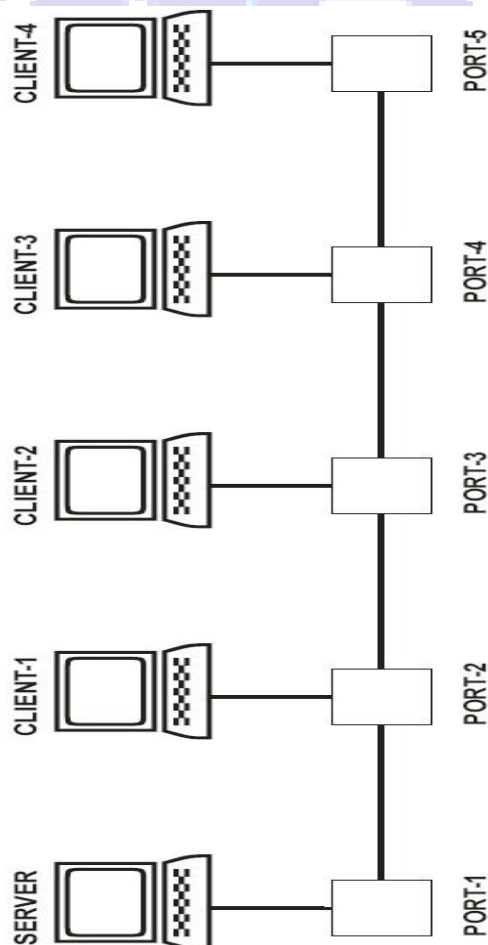
DATE:

AIM:

To study and implementation of token bus and token ring protocol

APPARATUS REQUIRED:

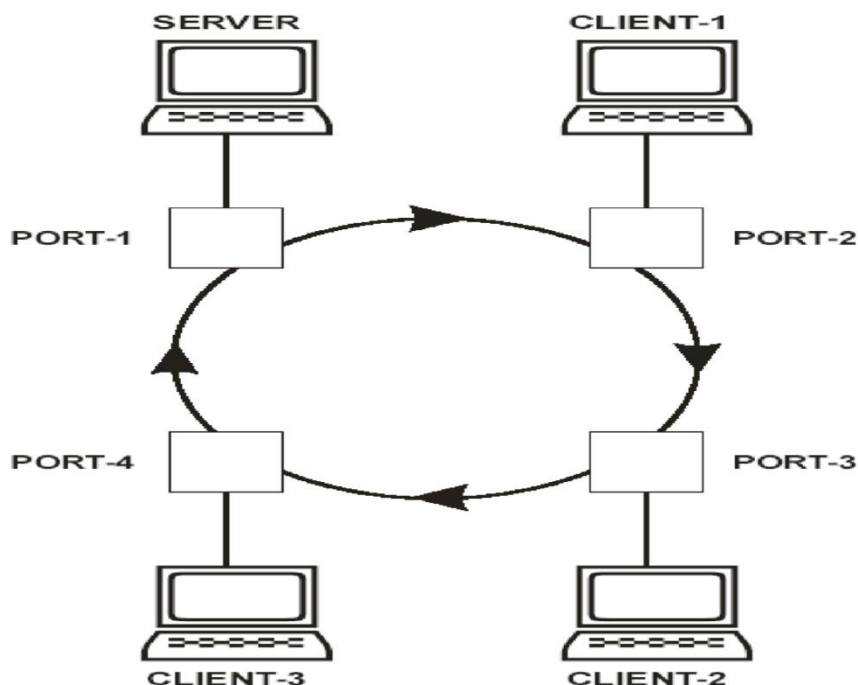
- LTS-01 trainer kit
- 4 or more Computers with win-2K / XP and Ethernet port available on them
- RJ-45 to RJ-45 LAN connecting cables
- L-SIM LAN protocol analyzer and simulator software



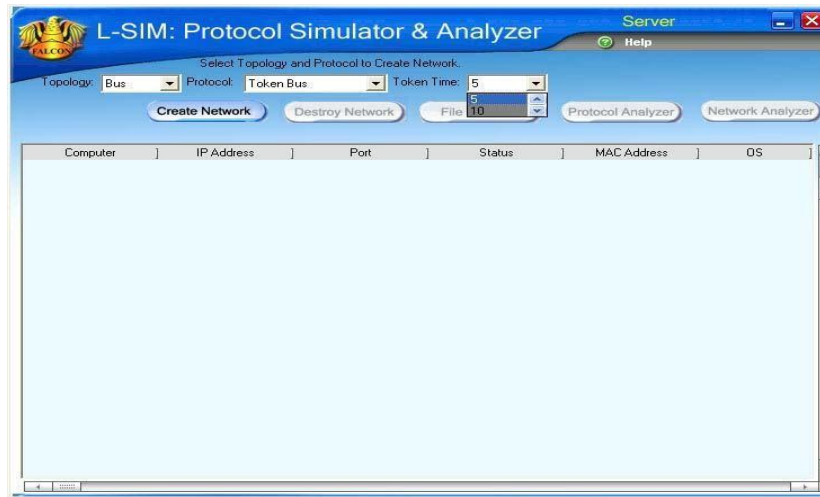
Connection of computers for BUS topology

A. TOKEN BUS:

1. Connect four or more computer LAN ports using RJ-45 to RJ-45 LAN connecting cables provided with the system to LTS-01 bus topology ports.
2. Switch on the LTS-01 & Computers.
3. Run L-SIM software on all the computers, one should be server and others should be client. Run the software in the sequence of connection i.e. server first followed by first client to last client.
4. On the server computer select type of network as LAN.
5. On the server computer select the topology as BUS, select protocol
6. As Token Bus and select token activation time as desired, click on create network button.
7. 6.To just observe how token passes from one computer to another computer and effect of token time keep token duration from 5 to 40 seconds and do actual file transfer keep token duration as 50 or 60 seconds.
8. Remote computer details will appear on the computers connected in network, server will be able to see all clients and all clients will be able to see only server.



Connection of computers for RING topology

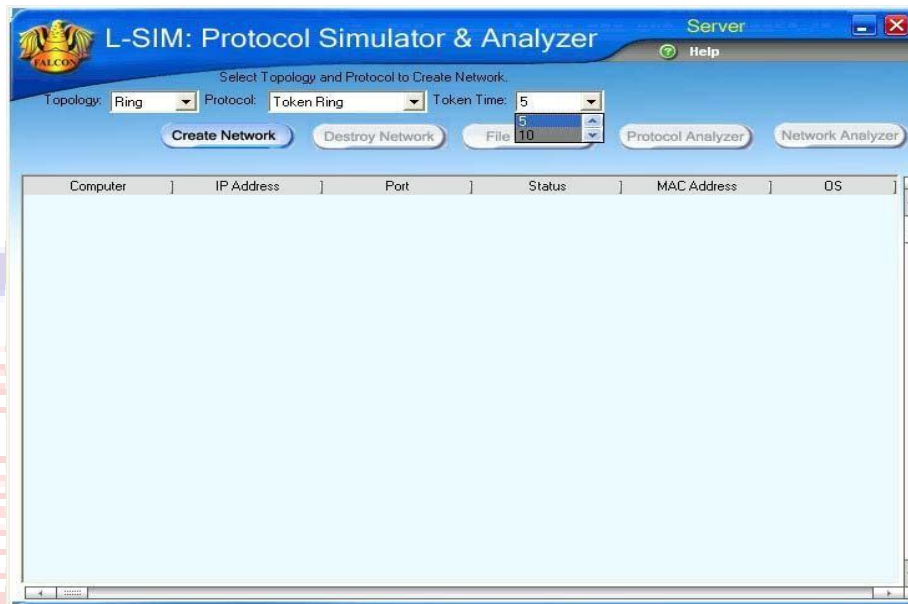


9. Select the computer to whom data file is to be transferred, from the load button, previously stored/selected file information can be loaded or you can select any file, which is to be transmitted.
10. File size will appear in the software window, select the packet size, inter packet delay click OK.
11. Total packets formed for that file will be indicated on computers, same details of file will appear on remote computer to which file is to be transmitted.
12. Click on file transfer button to transfer file.
13. File transfer from one computer to another will take place.
14. Remove connection of last client and see the effect on file transfer or token transfer. You will find that token will process till the client who is connected in network.
15. Remove connection of client which is in between the server and last client and see the effect on file transfer or token transfer. You will find that token will process till the client who is connected in network from client and will not process from the client got disconnected from network.

B. TOKEN RING:

1. Connect four computer LAN ports using RJ-45 to RJ-45 LAN connecting cables provided with the system to LTS-01 ring topology ports.
2. Switch on the LTS-01 & Computers.

3. Run L-SIM software on all the computers, one should be server and other 3 should be client. Run the software in the sequence of connection i.e. server first followed by first client to last client.
4. On the server computer select type of network as LAN.



5. On the server computer select the topology as RING, select protocol as Token Ring and select token activation time as desired, click on create network button.
6. To just observe how token passes from one computer to another computer and effect of token time keep token duration from 5 to 40 seconds and to do actual file transfer keep token duration as 50 or 60 seconds.
7. Remote computer details will appear on the computers connected in network, server will be able to see all clients and all clients will be able to see only server.
8. Select the computer to whom data file is to be transferred, from the load button, previously stored/selected file information can be loaded or you can select any file, which is to be transmitted.
9. File size will appear in the software window, select the packet size, inter packet delay and click OK.
10. Total packets formed for that file will be indicated on computers, same details of file will appear on remote computer to which file is to be transmitted.

11. Click on file transfer button to transfer file.
12. File transfer from one computer to another will take place.
13. To see the effect of ring break state remove any of the client from the hardware and close L-SIM window for that client. Ring broken message will be prompted on server computer and network will get destroyed, you need

**RESULT:**

Thus the token bus and token ring protocol was studied and implemented by using L-sim simulation software.

SEMBODAI RUKMANI VARATHARAJAN ENGINEERING COLLEGE

EX.NO:6

WRITE A SOCKET PROGRAM FOR ECHO/PING/TALK

DATE:

COMMANDS.

AIM:

To write a program for echo/ping/talk commands using socket programming.

EchoClient.c

```

#include<stdio.h>
#include<stdlib.h>
#include<errno.h>
#include<string.h>
#include<sys/types.h>
#include<sys/socket.h>
#include<sys/un.h>
#include<arpa/inet.h>
#include<netinet/in.h>
#define SOCK_PATH "echo_socket"
int main(void)
{
int s1,t,len;
struct sockaddr_un remote;
char str[100];
if((s1=socket(AF_UNIX,SOCK_STREAM,0))==-1)
{
printf("socket\n");
exit(1);
}
printf("Trying to connect\n");
remote.sun_family=AF_UNIX;
strcpy(remote.sun_path,SOCK_PATH);

```



```
len=strlen(remote.sun_path)+sizeof(remote.sun_family);
if(connect(s1,(struct sockaddr*)&remote,len)==-1)
{
perror("connect");
exit(1);
}
printf("Connectd\n");
while(printf("->"),fgets(str,100,stdin,!feof(stdin))
{
if(send(s1,str,strlen(str),0)==-1)
{
perror("send");
exit(1);
}
if((t=recv(s1,str,100,0))>0)
{
str[t]='\0';
printf(" echo->%s",str);
}
else
{
if(t<0)
perror("recv");
else
printf("server closed connection\n");
exit(1);
}
}
close(s1);
return 0;
}
```

```
//EchoServer.c
#include<stdio.h>
#include<stdlib.h>
#include<errno.h>
#include<string.h>
#include<sys/types.h>
#include<sys/socket.h>
#include<sys/un.h>
#include<netinet/in.h>
#include<arpa/inet.h>
#define SOCK_PATH "echo_socket"
int main(void)
{
int s1,s2,len;
struct sockaddr_un local;
struct sockaddr_un remote;
char str[100];
if((s1=socket(AF_UNIX,SOCK_STREAM,0))==-1)
{
printf("socket\n");
exit(1);
}
local.sun_family=AF_UNIX;
strcpy(local.sun_path,SOCK_PATH);
unlink(local.sun_path);
len=strlen(local.sun_path)+sizeof(local.sun_family);
if(bind(s1,(struct sockaddr*)&local,len)==-1)
{
printf("Bind");
exit(1);
}
if(listen(s1,5)==-1)
```

```
{  
printf("listen");  
exit(1);  
}  
for(;;)  
{  
int done,n,t;  
printf("Waiting for connection\n");  
t=sizeof(remote);  
if((s2=accept(s1,(struct sockaddr*)&remote,&t))===-1)  
{  
perror("accept");  
exit(1);  
}  
printf("Connected\n");  
done=0;  
do  
{  
n=recv(s2,str,100,0);  
if(n<=0)  
{  
if(n<0)  
perror("recv");  
done=1;  
}  
if(!done)  
if(send(s2,str,n,0)<0)  
{  
perror("send");  
done=1;  
}  
}  
}
```

```
while(!done);  
close(s2);  
}  
return 0;  
}
```

//OUTPUT

```
[exam01@localhost ~]$ cc EchoServer.c  
EchoServer.c: In function ΓÇÿmainΓÇÖ:  
EchoServer.c:41: warning: pointer targets in passing argument 3 of ΓÇÿacceptΓÇÿ  
differ in signedness  
[exam01@localhost ~]$ ./a.out 172.16.0.143  
Waiting for connection  
Connected
```

//OUTPUT

```
[exam01@localhost ~]$ cc EchoClient.c  
[exam01@localhost ~]$ cc EchoClient.c  
[exam01@localhost ~]$ ./a.out 172.16.0.143  
Trying to connect  
Connectd  
->hiii  
echo->hiii  
->what u want?  
echo->what u want?  
->india is my country  
echo->india is my country  
->
```

RESULT:

Thus the Socket Program for Echo/Ping/Talk Commands are Successfully Verified

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EX.NO:7

DATE:

IMPLEMENTATION OF DATA ENCRYPTION AND DECRYPTION

AIM:

To Study and implementation of data encryption and decryption

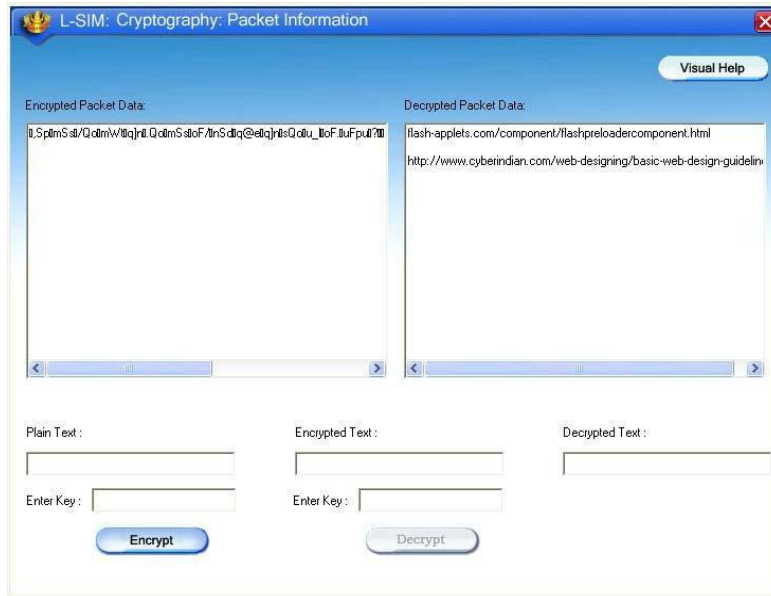
APPARATUS REQUIERD:

- LTS-01 trainer kit
- 2 Computers with win-2K / XP and Ethernet port available on them
- RJ-45 to RJ-45 LAN connecting cables
- L-SIM LAN protocol analyzer and simulator software

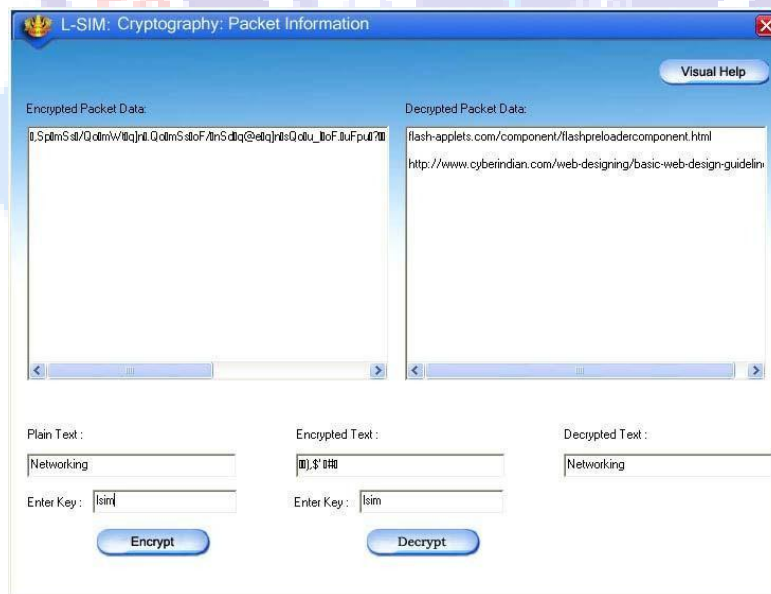
PROCEDURE:

1. Connect at least two computer LAN ports using RJ-45 to RJ-45 LAN connecting cables provided with the system to LTS-01 star topology ports.
2. Switch on the LTS-01 & Computers.
3. Run L-SIM software on both the computers, one should be server and another should be client.
4. On the server computer select type of network as LAN.
5. On the server computer select the topology as STAR and select protocol as Stop & Wait and click on create network button.
6. Remote computer details will appear on the computers connected in network, server will be able to see client and client will be able to see server.
7. Select the computer to whom data file is to be transferred, from the load button, previously stored/selected file information can be loaded or you can select any file, which is to be transmitted, if notepad text file is selected encryption information can be viewed very clearly for each packet formed for that file.
8. File size will appear in the software window, select the packet size, inter packet delay and click OK.
9. Total packets formed for that file will be indicated on computers, same details of file will appear on remote computer to which file is to be transmitted.

10. Click on file transfer button to transfer file.
11. Click on pause button to interrupt file transfer and click on encrypt/decrypt button to see file packet encrypted and decrypted.

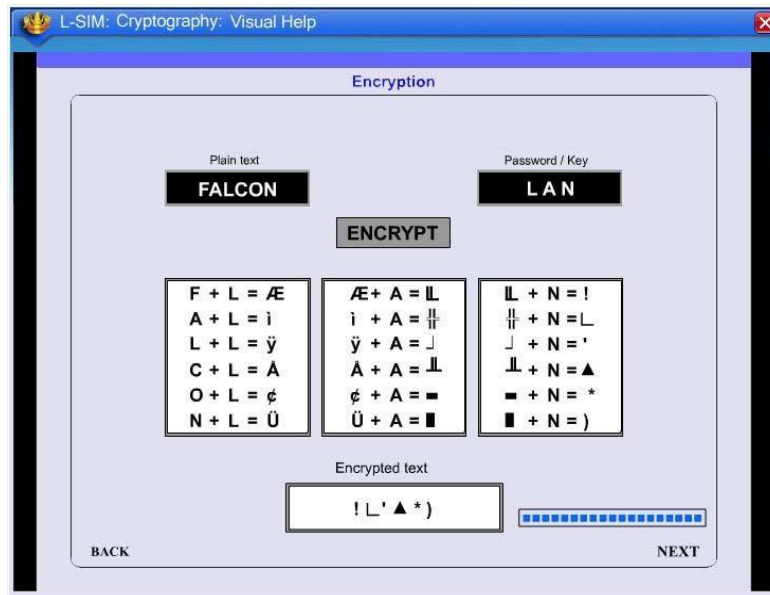


12. You will see actual file selected packet content and encrypted data content in encryption details window.

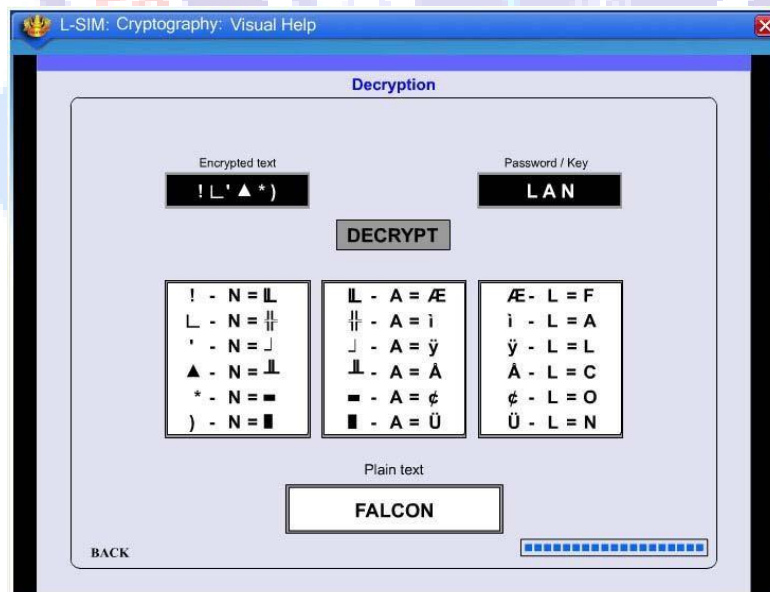


13. You can type any text at the bottom box, which you want to encrypt and provide key text for encryption. Similarly same key can be typed again to decrypt and recover

encrypted text. If the key at decryption stage differ from key at encryption stage, decrypted data will not be perfect as per original data.

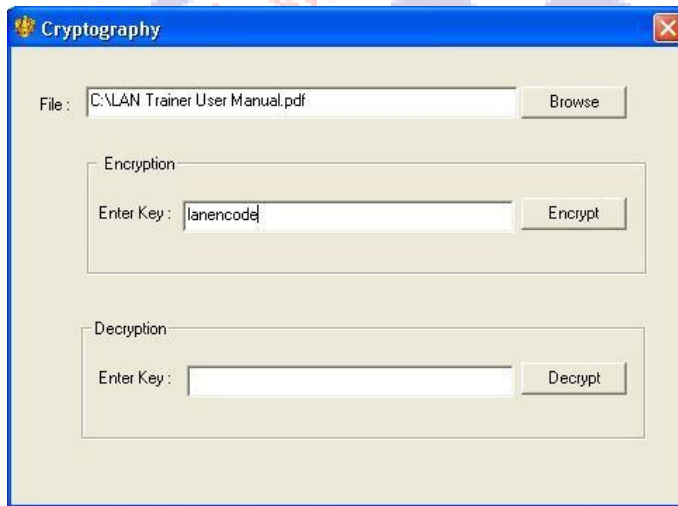


14. To understand the working of how encryption took place you can view visual explanation of encryption and decryption process by clicking on visual help button.



15. Visual help showing decryption procedure.
16. You can resume file transfer by clicking on continue button.

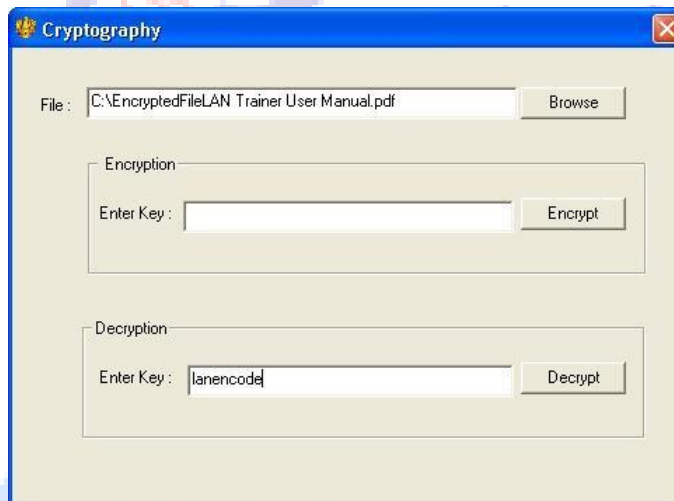
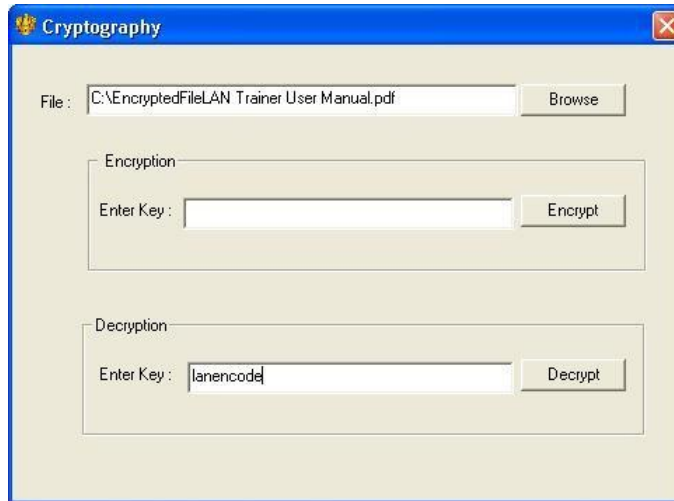
17. Encrypted format of each packet can thus be seen by pausing the file transfer at respective packet when it is under transmission state.
18. File transfer from one computer to another will take place.
19. To study programming of Cryptography with Encryption and Decryption process sample executable file & program is provided inside program files – Lsim – SampleApplication.zip.
20. When user extracts this folder he will find cryptography folder inside which cryptography.cpp & cryptography.exe files are provided.



21. If user runs the cryptography.exe file screen with browse option for selection of file to be encrypted and enter key for encryption option will get open for user to select the file and enter encryption key.



22. When user clicks on Encrypt button a message with Encryption completed Will popup. Encrypted file will be stored at the same location from where file for encryption is selected.



23. User has to select file to be decrypted and enter decryption key.



24. When user clicks on Decrypt button a message with Decryption completed Will popup. Decrypted file will be stored at the same location from where file for decryption is selected.
25. To verify encryption and decrypted files user has to close the cryptography.exe file.
26. Actual programming can be checked from cryptography.cpp program.

**RESULT:**

Thus the data encryption and decryption was studied and implemented by using L-sim software.

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EX.NO:8

PERFORMANCE ANALYSIS OF CSMA/CA AND CSMA/CD

DATE:

AIM:

To analysis the Performance of CSMA /CA and CSMA/CD Implementation and comparison study of CSMA-CD protocol

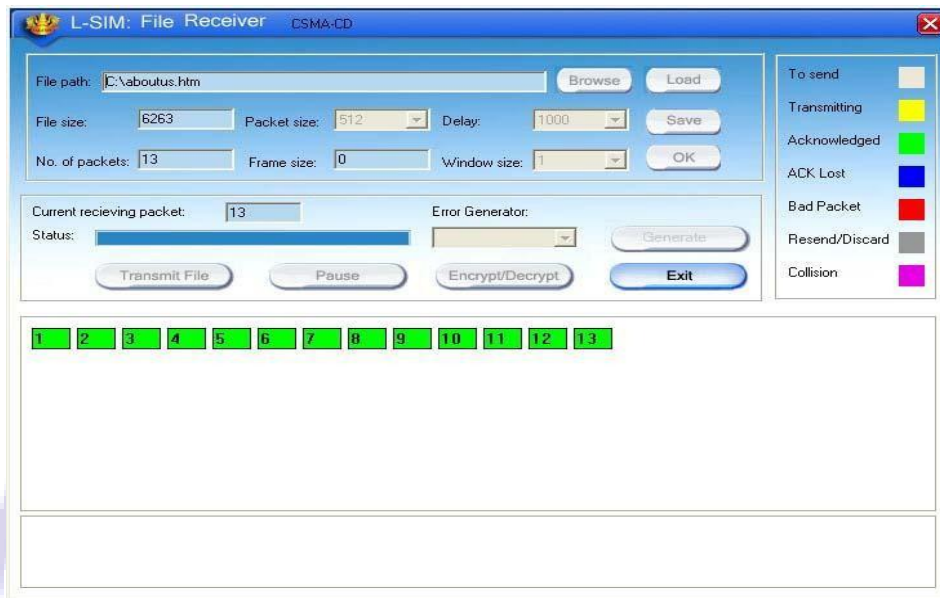
APPARATUS REQUIERD:

- LTS-01 trainer kit
- 3 Computers with win-2K / XP and Ethernet port available on them
- RJ-45 to RJ-45 LAN connecting cables
- L-SIM LAN protocol analyzer and simulator software

PROCEDURE:

1. Connect 3 or more computer LAN ports using RJ-45 to RJ-45 LAN connecting cables provided with the system to LTS-01 star topology ports.
2. Switch on the LTS-01 & Computers.
3. Run L-SIM software on all the computers, one should be server and others should be clients.
4. On the server computer select type of network as LAN.
5. On the server computer select the topology as STAR, select protocol an CSMA-CD click on create network button.
6. Remote computer details will appear on the computers connected in network, server will be able to see all clients and all clients will be able to see only server.
7. Select the server computer to whom data file is to be transferred from one of the client computer; from the load button, previously stored/selected file information can be loaded or you can select any file, which is to be transmitted.
8. File size will appear in the software window, select the packet size, inter packet delay and click OK.
9. Total packets formed for that file will be indicated on computers, same details of file will appear on remote computer to which file is to be transmitted.
10. Click on file transfer button to transfer file.

11. During file transfer process try to send file to server from another client computer, file transfer from second transmitter will also get initiated.

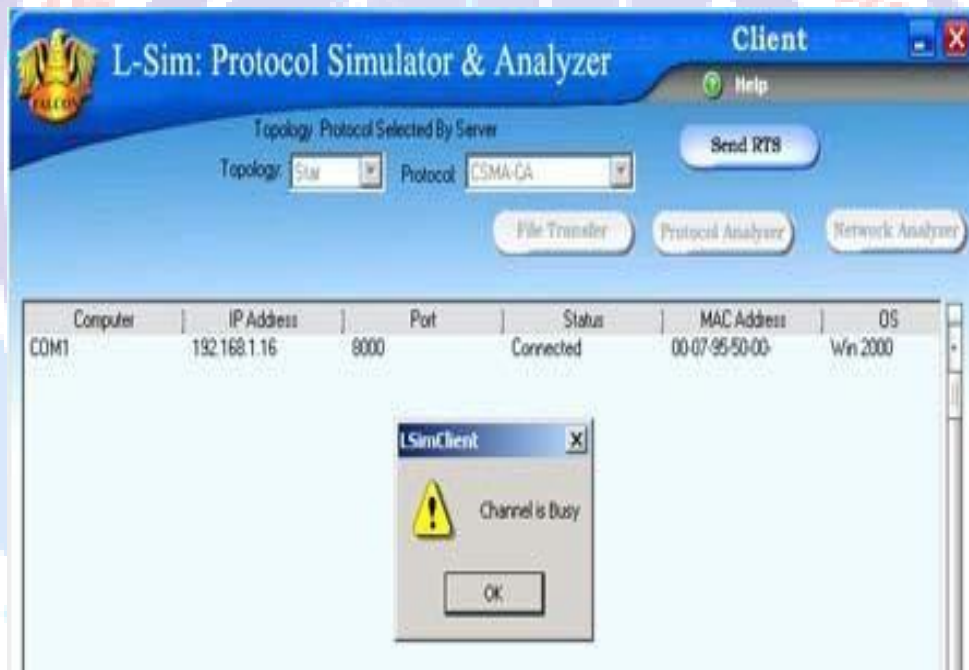


12. Once the first sender file reached to server its display is refreshed and server will show packet status for second sender.
13. Second sender file transfer will also get completed and thus collision of two packets transmitted simultaneously from two senders is detected and cleared.
14. Multiple file transfer between various server-client combinations should be performed to observe throughput v/s packet size graph on transmitter computer.
15. Close file transfer window and click on protocol analyzer and Network analyzer buttons on transmitter computer to view details of the log created.
16. Under Network analyzer window click on Graph analyzer button.

And compare with CSMA /CD

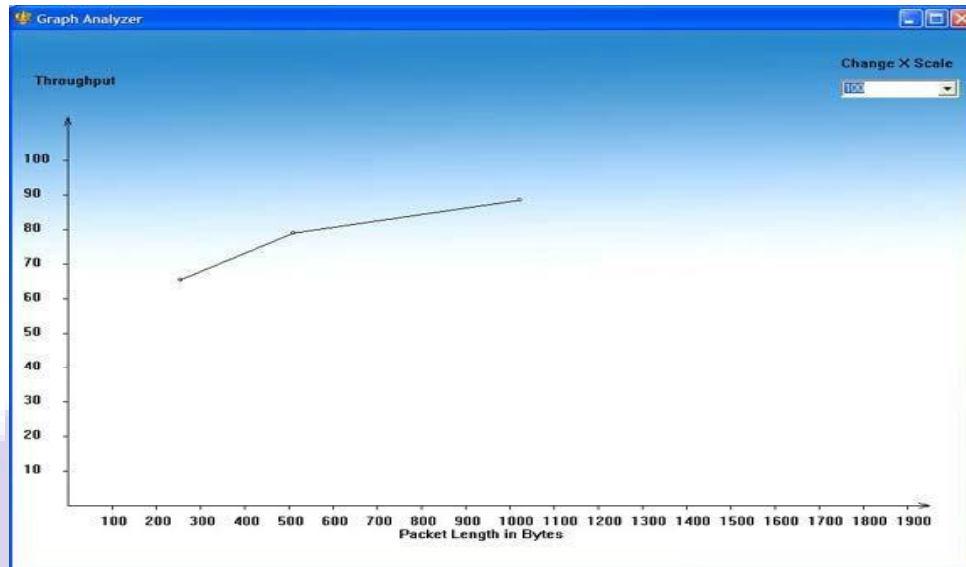
19. Connect 3 or more computer LAN ports using RJ-45 to RJ-45 LAN connecting cables provided with the system to LTS-01 star topology ports.
20. Switch on the LTS-01 & Computers.
21. Run L-SIM software on all the computers, one should be server and others should be clients.
22. On the server computer select type of network as LAN.
23. On the server computer select the topology as STAR, select protocol as CSMA-CA click on create network button.

24. Remote computer details will appear on the computers connected in network, server will be able to see all clients and all clients will be able to see only server.
25. Click on the Send RTS button to get your computer into transmitter mode.
26. Select the computer to whom data file is to be transferred, from the load button, previously stored/selected file information can be loaded or you can select any file, which is to be transmitted.
27. File size will appear in the software window, select the packet size, inter packet delay and click OK.
28. Total packets formed for that file will be indicated on computers, same details of file will appear on remote computer to which file is to be transmitted.
29. Click on file transfer button to transfer file.



30. During file transfer process try to get access to transmit file by clicking on Send RTS button on other computers, you will be prompted with channel is busy message.
31. Thus collision of two packets transmitted simultaneously from two senders is avoided.
32. File transfer from one computer to another will take place.
33. Multiple file transfer between various server-client combinations should be performed to observe throughput v/s packet size graph on transmitter computer.

34. Close file transfer window and click on protocol analyzer and Network analyzer buttons on transmitter computer to view details of the log created.
35. Under Network analyzer window click on Graph analyzer button.
36. Calculate throughput and click on Plot graph button.



Graph for CSMA-CA protocol

8. Detailed graph of throughput v/s packet size for the total file transfer activity will appear on graph window.
9. This plot can be printed by clicking on print button.

RESULT:

Thus the Performance analysis of CSMA /CA and CSMA/CD Implemented and study studied by using L-sim software.

SEMBODAI RUKMANI VARATHARAJAN ENGINEERING COLLEGE

EX.NO:09

DATE:

IMPLEMENTATION OF DISTANCE VECTOR ROUTING ALGORITHM

AIM:

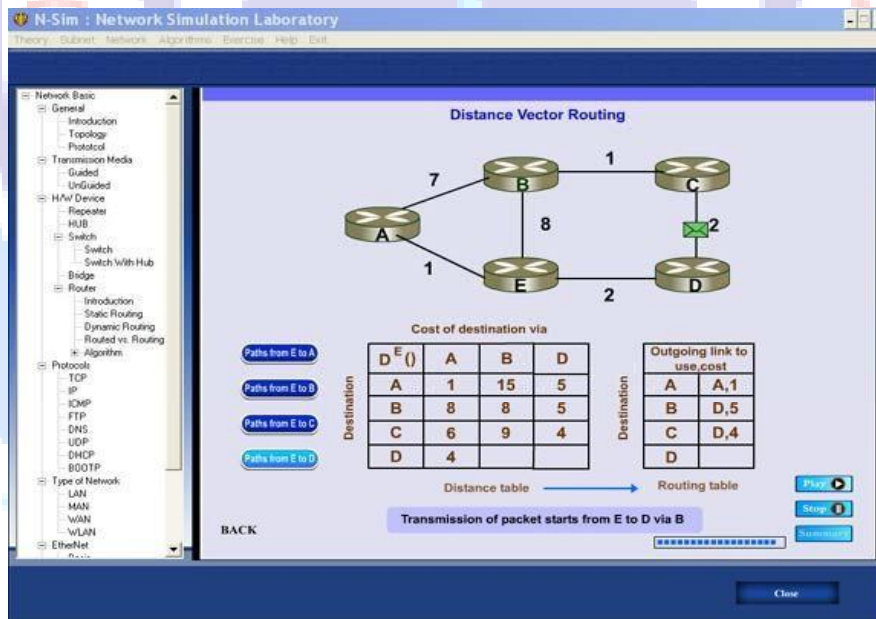
To Implementation of distance vector routing algorithm.

APPARATUS REQUIERD:

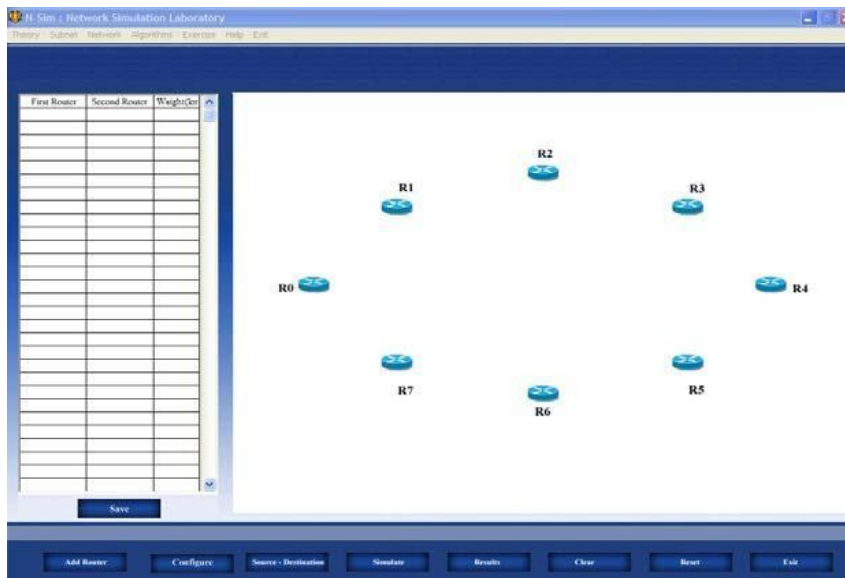
- N-SIM
- Computer with win-2K / XP

PROCEDURE:

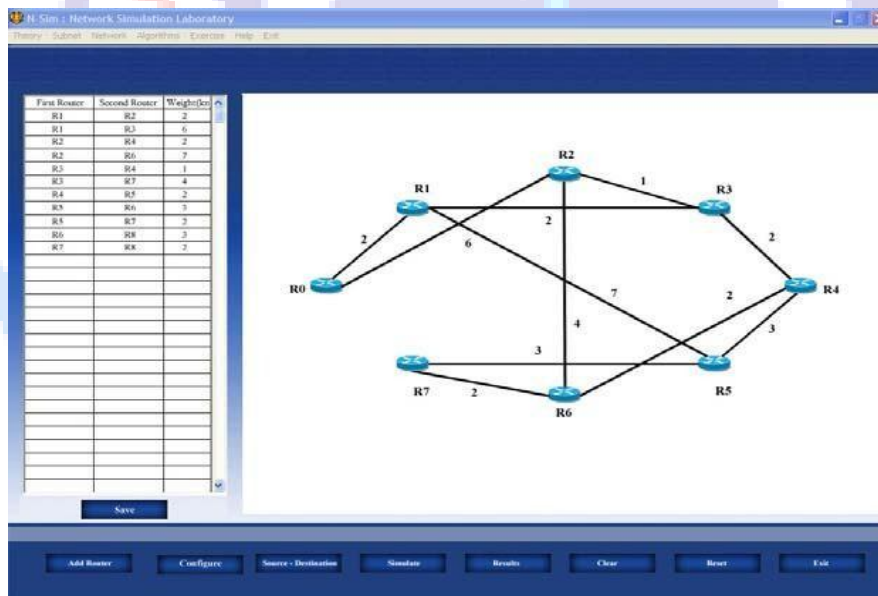
1. Run N-SIM software from your computer.
2. To check working of distance vector routing algorithm in the form of animated representation click on distance vector routing under routing protocols.



3. You can study the working of distance vector routing algorithm through this animated movie.
4. To implement this algorithm click on algorithms under menu and click on distance vector routing.

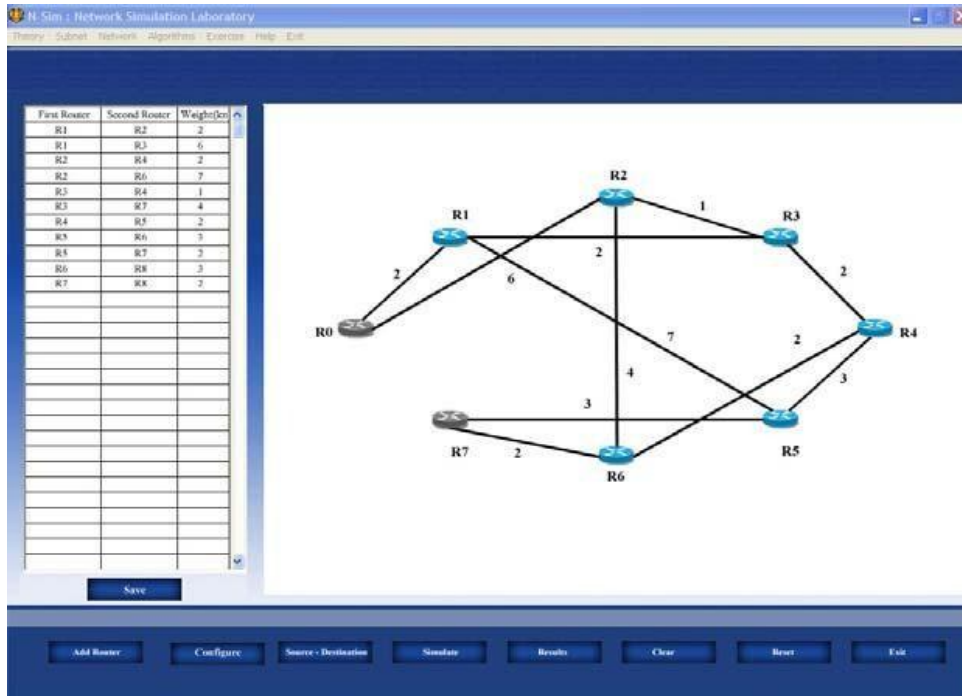


5. Add the number of routers you want to, select one by one, maximum 8 routers can be added, all the added routers will appear in the window.

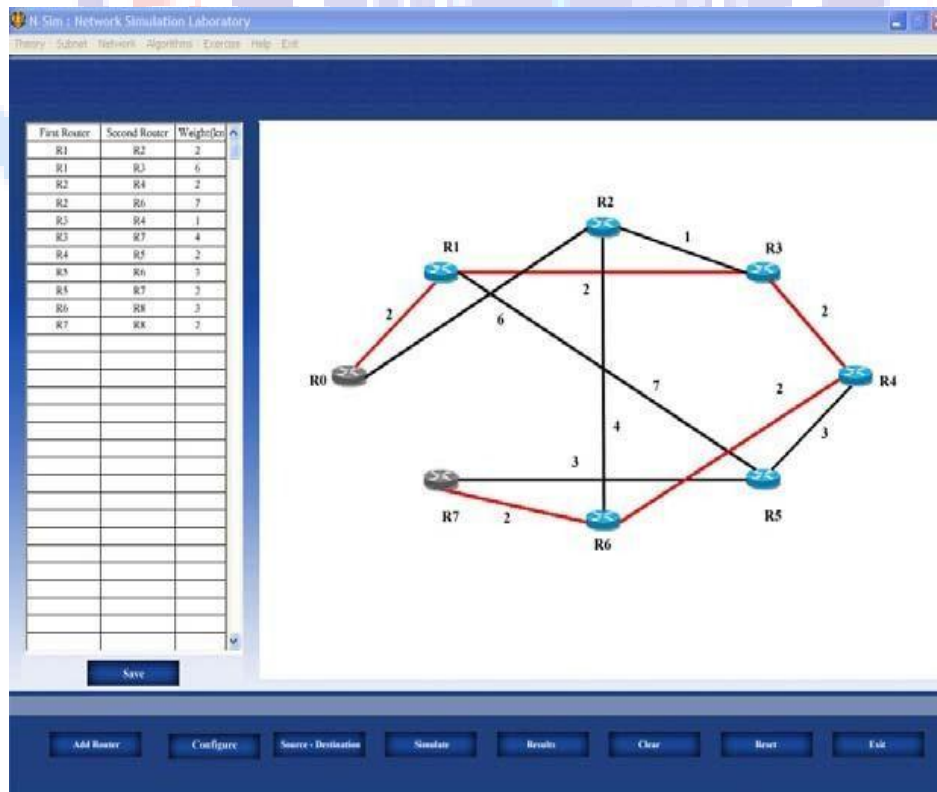


6. Click configure button to define the links between pair of routers and define its cost in kilometers.
7. Once all the possible pairs have been defined click save button to save the configuration defined by you.
8. Depending on the configuration you will see all the possible links defined by you are implemented and drawn in the screen near the routers added.

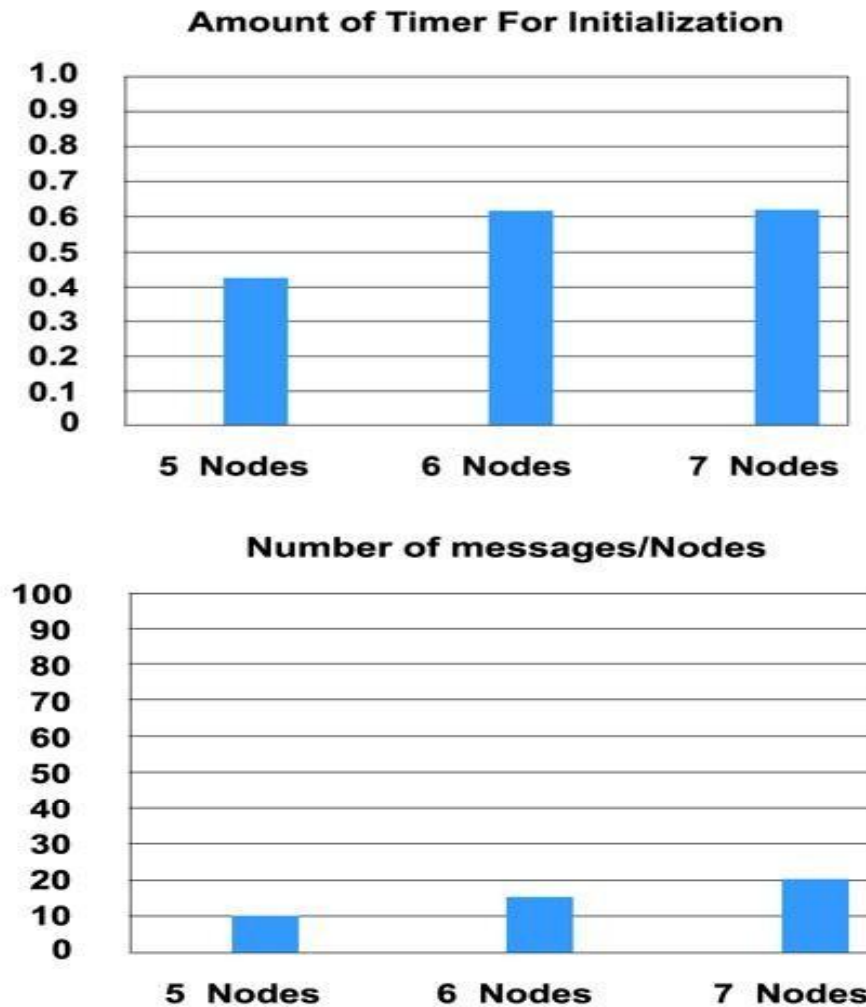
You can edit the configuration at any time by clicking on the value of the router number or cost.



9. To simulate and find out shortest path select the source and destination routers.



10. Click on the result button to see the parameters for shortest path. Click on graph button to plot the readings against the various parameters.



11. Click on simulate button to start the algorithm, this will calculate the shortest path and will be shown on the screen.

RESULT:

Thus the Implementation of distance vector routing algorithm was implemented and verified

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EX.NO:11

DATE:

IMPLEMENTATION OF LINK STATE ROUTING ALGORITHM

AIM:

To Implementation of link state routing algorithm.

APPARATUS REQUIERD:

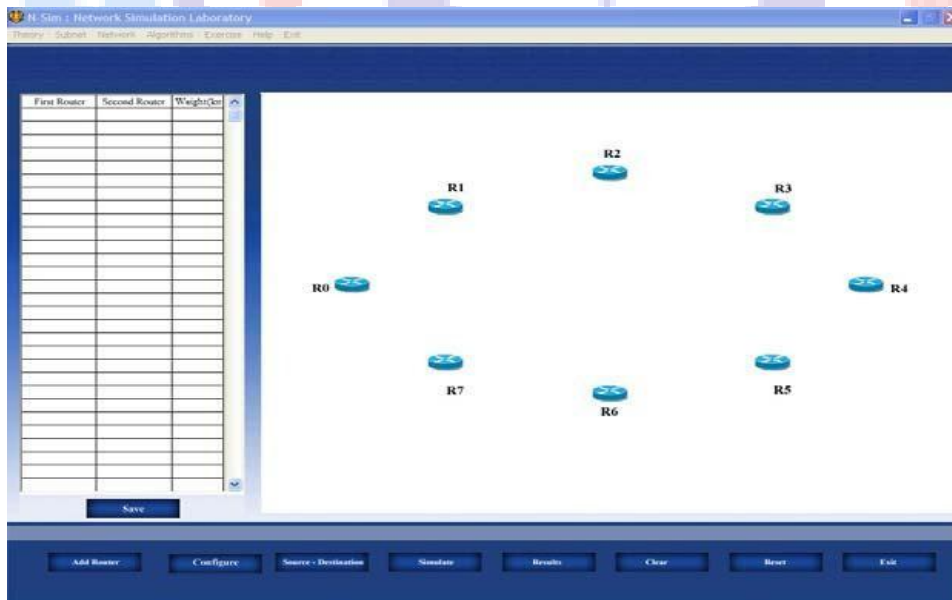
- N-SIM
- Computer with win-2K / XP

PROCEDURE:

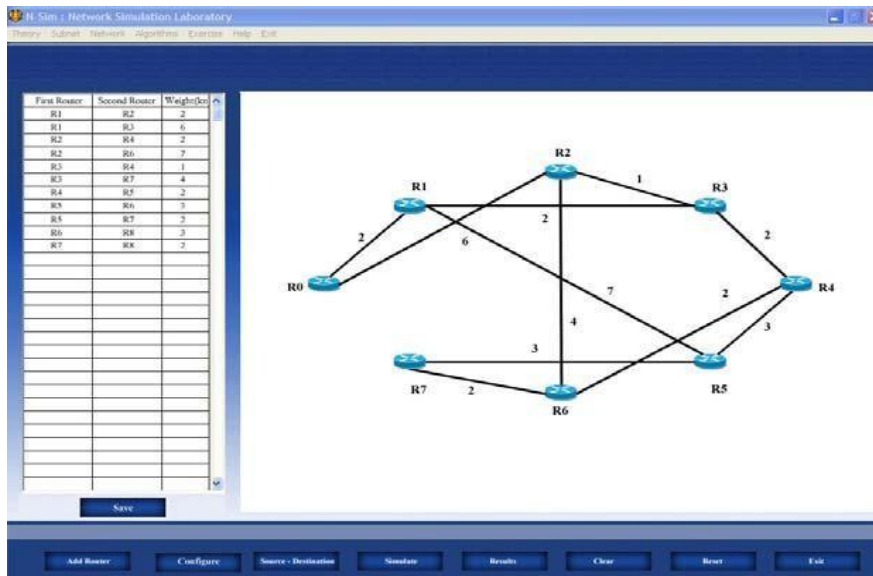
1. Run N-SIM software from your computer.

To check working of state routing algorithm in the form of animated representation click on state routing under routing protocols

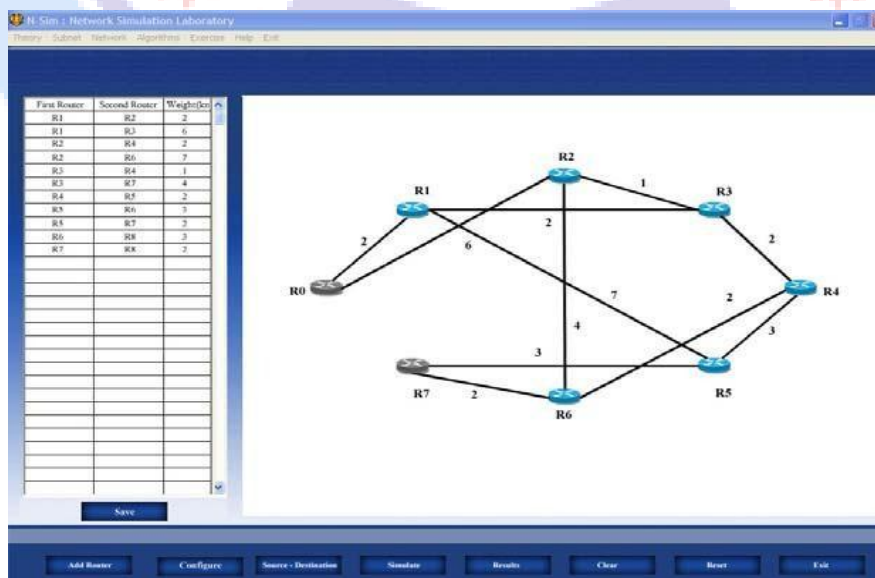
2. You can study the working of state routing algorithm through this animated movie.
3. To implement this algorithm click on algorithms under menu and click on state routing.



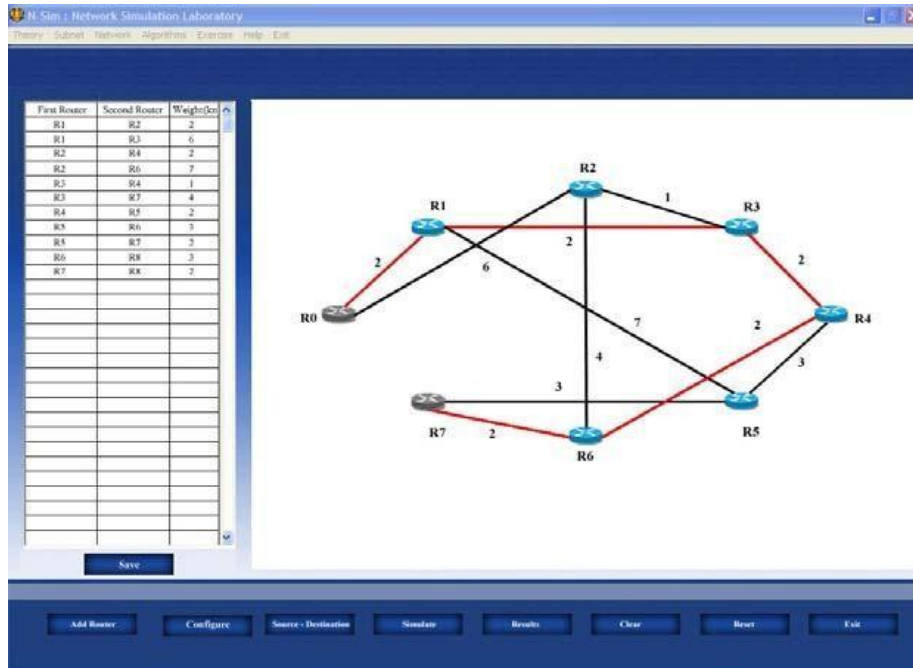
4. Add the number of routers you want to, select one by one, maximum 8 routers can be added, all the added routers will appear in the window.



5. Click configure button to define the links between pair of routers and define its cost in kilometers.
6. Once all the possible pairs have been defined click save button to save the configuration defined by you.
7. Depending on the configuration you will see all the possible links defined by you are implemented and drawn in the screen near the routers added.
8. You can edit the configuration at any time by clicking on the value of the router number or cost.



9. To simulate and find out shortest path select the source and destination routers.

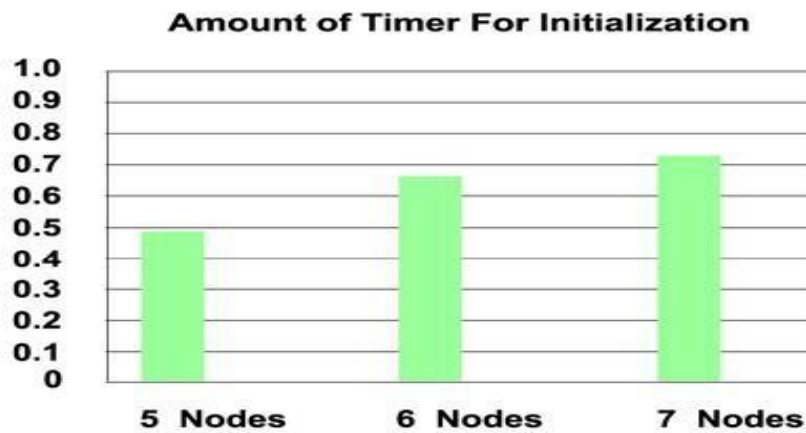
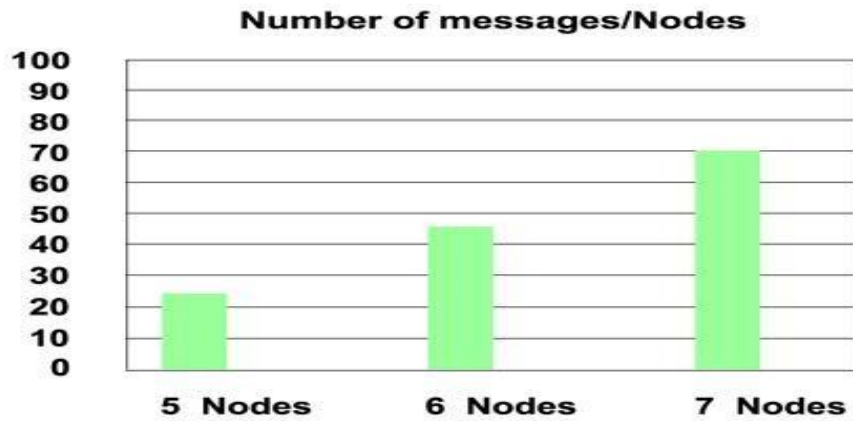


10. Click on simulate button to start the algorithm, this will calculate the shortest path and will be shown on the screen.
11. Click on the result button to see the parameters for shortest path.

The screenshot shows the Routing Protocol Analysis Viewer window. It contains a table with the following data:

No.	No. of Routers	No. of Links	Source	Destination	Metric	BandWidth	No. of Message	Shortest Path	Simulation Time	Message/Node
1	8	11	R1	R8	Distance(k)	0		R1-R2-R4-R5-R6-R8	8000	
2	4	4	R1	R4	Distance(k)	0		R1-R2-R4	2000	
3	8	11	R1	R8	Distance(k)	0		R1-R2-R4-R5-R6-R8	9000	
4	8	12	R1	R8	Distance(k)	0		R1-R2-R6-R8	9000	
5	8	12	R1	R8	Distance(k)	0		R1-R2-R6-R8	8000	

12. Click on graph button to plot the readings against the various parameters.

**RESULT:**

Thus the Implementation of link state routing algorithm was implemented and verified by using N-sim software.

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EX.NO:12

STUDY OF NETWORK SIMULATOR (NS).AND SIMULATION
OF CONGESTION CONTROL ALGORITHMS USING NS.

DATE:

Aim:

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

Introduction:

ns (from **network simulator**) is a name for series of discrete event network simulators, specifically **ns-1**, **ns-2** and **ns-3**. All of them are discrete-event network simulator, primarily used in research^[4] and teaching. ns-3 is free software, publicly available under the GNU GPLv2 license for research, development, and use.

The goal of the ns-3 project is to create an open simulation environment for networking research that will be preferred inside the research community

It should be aligned with the simulation needs of modern networking research.

- It should encourage community contribution, peer review, and validation of the software.

Since the process of creation of a network simulator that contains a sufficient number of high-quality validated, tested and actively maintained models requires a lot of work, ns-3 project spreads this workload over a large community of users and developers.

ns-1

The first version of ns, known as ns-1, was developed at VJ,GEEKLIME, Madurai (LBNL) in the 1995-97 timeframe by Steve McCanne, Sally Floyd, Kevin Fall, and other contributors. This was known as the LBNL Network Simulator, and derived from an earlier simulator known as REAL by S. Keshav. The core of the simulator was written in C++, with Tcl-based scripting of simulation scenarios.^[5] Long-running contributions have also come from Sun Microsystems, the UC Berkeley Daedalus, and Carnegie Mellon Monarch projects.it used.

ns-2

In 1996-97, ns version 2 (ns-2) was initiated based on a refactoring by Steve McCanne. Use of Tcl was replaced by MIT's Object Tcl (OTcl), an object-oriented dialect Tcl. The core of ns-2 is also written in C++, but the C++ simulation objects are linked to shadow objects in OTcl and variables can be linked between both language realms. Simulation scripts are written in the OTcl language, an extension of the Tcl scripting language.

Presently, ns-2 consists of over 300,000 lines of source code, and there is probably a comparable amount of contributed code that is not integrated directly into the main distribution (many forks of ns-2 exist, both maintained and unmaintained). It runs on GNU/Linux, FreeBSD, Solaris, Mac OS X and Windows versions that support Cygwin. It is licensed for use under version 2 of the GNU General Public License

ns-3

A team led by Tom Henderson, George Riley, Sally Floyd, and Sumit Roy, applied for and received funding from the U.S. National Science Foundation (NSF) to build a replacement for ns-2, called ns-3. This team collaborated with the Planete project of INRIA at Sophia Antipolis, with Mathieu Lacage as the software lead, and formed a new open source project.

In the process of developing ns-3, it was decided to completely abandon backward-compatibility with ns-2. The new simulator would be written from scratch, using the C++ programming language. Development of ns-3 began in July 2006. A framework for generating Python bindings (pybindgen) and use of the Waf build system were contributed by Gustavo Carneiro.

The first release, ns-3.1 was made in June 2008, and afterwards the project continued making quarterly software releases, and more recently has moved to three releases per year. ns-3 made its eighteenth release (ns-3.18) in the third quarter of 2013.

Current status of the three versions is:

- ns-1 is no longer developed nor maintained,
- ns-2 build of 2009 is not actively maintained (and is not being accepted for journal publications)
- ns-3 is actively developed (but not compatible for work done on ns-2).

Design

ns-3 is built using C++ and Python with scripting capability. The ns-3 library is wrapped to python thanks to the pybindgen library which delegates the parsing of the ns-3 C++ headers to gccxml and pygccxml to generate automatically the corresponding C++ binding glue. These automatically-generated C++ files are finally compiled into the ns-3 python module to allow users to interact with the C++ ns-3 models and core through python scripts. The ns-3 simulator features an integrated attribute-based system to manage default and per-instance values for simulation parameters. All of the configurable default values for parameters are managed by this system, integrated with command-line argument processing, Doxygen documentation, and an XML-based and optional GTK-based configuration subsystem.

- The large majority of its users focuses on wireless simulations which involve models for Wi-Fi, WiMAX, or LTE for layers 1 and 2 and routing protocols such as OLSR and AODV.

Components

ns-3 is split over couple dozen modules containing one or more models for real-world network devices and protocols.

ns-3 has more recently integrated with related projects: the Direct Code Execution extensions allowing the use of C or C++-based applications and Linux kernel code in the simulations.

Simulation workflow

The general process of creating a simulation can be divided into several steps:

1. Topology definition: to ease the creation of basic facilities and define their interrelationships, ns-3 has a system of containers and helpers that facilitates this process.
2. Model development: models are added to simulation (for example, UDP, IPv4, point-to-point devices and links, applications); most of the time this is done using helpers.
3. Node and link configuration: models set their default values (for example, the size of packets sent by an application or MTU of a point-to-point link); most of the time this is done using the attribute system.
4. Execution: simulation facilities generate events, data requested by the user is logged.
5. Performance analysis: after the simulation is finished and data is available as a time-stamped event trace. This data can then be statistically analysed with tools like R to draw conclusions.
6. Graphical Visualization: raw or processed data collected in a simulation can be graphed using tools like Gnuplot, matplotlib or XGRAPH.

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

Packet loss

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 high bandwidths. 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.